Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

FINAL REPORT

April 2016

Approved - April 27, 2018

CDM Smith

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

APR 24 2018

CERTIFIED MAIL 7017 1450 0000 7973 3097
RETURN RECEIPT REQUESTED

City of Jackson
c/o Mr. Robert Miller
Director
Department of Public Works
P.O. Box 17
Jackson, Mississippi 39205-0017

Re: Composite Correction Program
City of Jackson, Mississippi Consent Decree
Case No.: 3:12-cv-790 TSL-JMR

Dear Mr. Miller:

The U.S. Environmental Protection Agency Region 4 and the Mississippi Department of Environmental Quality (MDEQ) have reviewed the City of Jackson's (the City) Composite Correction Program (CCP), dated April 25, 2016. The EPA, after consultation with MDEQ, hereby approves the CCP. The City shall update the EPA and MDEQ on the implementation of the CCP in the Semi-Annual Reports.

If you have any questions, please contact Mr. Brad Ammons at (404) 562-9769 or via email at ammons.brad@epa.gov or Mr. Dennis Sayre at (404) 562-9756 or via email at sayre.dennis@epa.gov.

Sincerely,

Maurice L. Horsey, IV, Chief
Municipal & Industrial Enforcement Section
NPDES Permitting & Enforcement Branch

cc: Mr. Les Herrington, P.E.
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Tony T. Yarber, Mayor

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April 25, 2016

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RE: City of Jackson, Mississippi, EPA Consent Decree
Composite Correction Program

Dear Gentlemen:

Attached please find the Composite Correction Plan being proposed by the City of Jackson for your review, comment, and approval.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Tony T. Yarber
Mayor

cc: Les Herrington, P.E., Mississippi Department of Environmental Quality
Gus McCoy, Chief Administrative Officer
Monica Joiner, City Attorney
Kishia L. Powell, Director, Department of Public Works
Terry Williamson, Consent Decree Manager
Public Depository, Eudora Welty Public Library

City of Jackson, Mississippi
Savanna Street Wastewater Treatment Plant
Composite Correction Program

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kishia Powell, P.E., Director
Department of Public Works

4.21.16
Date

Savanna Street Wastewater Treatment Plant

Composite Correction Program

April 2016

Prepared for:

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Acronyms and Abbreviations

AADF	Annual Average Daily Flow
ADA	Americans with Disabilities
AHJ	Authority Having Jurisdiction
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning
ASTM	American Society for Testing and Materials
ATS	Automatic Transfer Switch
AWWA	American Water Works Association
BNR	Biological Nutrient Removal
BTF	Biological Treatment Facility
BOD_5	Influent Biochemical Oxygen Demand
CCP	Composite Correction Plan
CFM	Cubic Feet Per Minute
City	City of Jackson
CPE	Comprehensive Performance Evaluation
CMOM	Capacity, Management, Operations and Maintenance
CT	Contact Time
CWA	Clean Water Act
Decree	Consent Decree
DIP	Ductile Iron Pipe
DMR	Discharge Monitoring Report
D.O.	Dissolved Oxygen
dppd	Dry Pounds Per Day
EPA	U.S. Environmental Protection Agency
EBPR	Enhanced Biological Phosphorus Removal

EPBR	Effluent Phosphorus Biological Removal
EQ	Equalization
ft2	Square Foot
FRP	Fiberglass Reinforced Plastic
FSF	Fine Screen Facility
GBT	Gravity Belt Thickening
gpd	Gallons per Day
GPM or gpm	Gallons per Minute
GRF	Grit Removal Facility
HI	Hydraulic Institute
HP	Horsepower
hrs	Hours
HVAC	Heating, Ventilation, and Air Conditioning
IBC	International Building Code
IFC	International Fire Code
I/I	Infiltration/Inflow
IPS	Influent Pump Station
kVA	Kilovolt amps
kW	Kilowatts
LF	Linear foot
mA	Milliamp
MCC	Motor Control Centers
MDEQ	Mississippi Department of Environmental Quality
MDF	Maximum Daily Flow
MG	Million Gallons
MGD or mgd	Million Gallons per Day
Mg/L	milligrams per liter

MH	Manhole
MLSS	Mixed Liquor Suspended Solids
MMADF	Maximum Month Average Daily Flow
MPH	Miles Per Hour
M-T-M	Main-Tie-Main
MWF	Maximum Week Daily Flow
NEC	National Electric Code
NEMA	National Electric Manufacturer's Association
NFPA	National Fire Protection Association
No.	Number
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
P&ID	Process and Instrumentation Diagram
PCF	Pounds per Cubic Foot
PHF	Peak Hour Flow
Plant	Savanna Street Wastewater Treatment Plant
PLF	Performance Limiting Factor
POTW	Publicly Owned Treatment Works
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PTB	Preliminary Treatment Building
PTF	Power Transfer Factor
RAS	Return Activated Sludge
RDT	Rotary Drum Thickening
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition

SND	Simultaneous Nitrification/Dentrification
SOP	Standard Operation Procedure
SRT	Solids Retention Time
SSO	Sanitary Sewer Overflow
SSWWTP	Savanna Street Wastewater Treatment Plant (or Savanna St. WWTP)
SVI	Sludge Volume Index
TDH	Total Dynamic Head
TM	Technical Memorandum
TSS	Total Suspended Solids
UL	Underwriters Laboratories
UV	Ultraviolet
U.S.	United States
UWS-MS	United Water Services - Mississippi
VFD	Variable Frequency Drives
WAS	Waste Activated Sludge
WBI	West Bank Interceptor
WCTS	Wastewater Collection and Transmission System
WEF	Water Environment Federation
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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Section 1
Introduction

The City of Jackson (City) owns the Savanna Street Wastewater Treatment Plant (SSWWTP or plant), located on Savanna Street just south of the I-55/Archer Street exit in Jackson, MS. The plant is currently operated by United Water Services Mississippi, LLC; the contract is set to expire at the end of October 2016. The City is under a Consent Decree to implement improvements within the timelines of the program.

The Composite Correction Program (CCP) report is the last step in the SSWWTP Consent Decree process prior to detailed design of improvements. The CCP report addresses the process limiting factors identified in the Savanna Street Wastewater Treatment Plant Comprehensive Performance Evaluation (CPE) report (included in Appendix A), which was issued in May 2014 and approved in April 2015.

The CPE/CCP process is a process described in the EPA documents "Retrofitting POTWs" (July 1989) and "Improving POTW Performance Using the Composite Correction program Approach" (October 1984). The process outlined in these documents has been modified within the Consent Decree documents (Filed 11-20-12 and included in Appendix B); the Consent Decree document is therefore the controlling document in how the SSWWTP improvements are being implemented.

1.1 Savanna Street WWTP History and Current Configuration

The SSWWTP was originally constructed in 1970-1971 as an extended aeration lagoon treatment plant, which was a common design of the time if land area (and separation from residential areas) was available for use. Subsequent improvements throughout the 1980s and 1990s converted the plant from the lagoon plant to the current mechanical/biological process plant that is in use today. The last major plant expansion / improvement was completed in the late 1990s. The plant is currently configured as follows:

- Influent flows are received from the West Bank Interceptor, the Caney Creek Interceptor, the West Rankin Utility Authority force main, and the return flow from the on-site equalization basins. These flows enter the influent pump station screening channels.
- Influent Pump Station (IPS) consisting of three 31.7 mgd pumps and one 100 mgd pump, The IPS pumps to the SSWWTP process train and, during wet weather flow periods that exceed the existing plant treatment capacity, to the equalization basins.
- Headworks, consisting of 3/8" mechanical climber screens, vortex grit removal, and anoxic treatment basins.
- Conventional activated sludge system, with aerated digestion of waste solids, within a combined treatment basin footprint. Aeration blowers are in a building adjacent to the basins and WAS pumps are in the pipe gallery within the basin footprint.

- Final clarification, with 5 clarifier basins and RAS pumps.
- Chlorination system – chlorine gas cylinder storage, chlorinators, injectors, and regulators. No chlorine contact basin at this time.
- UV disinfection – still on-site, but out of service for the last 15 years.
- Dechlorination System - sulfur dioxide gas cylinder storage, sulfonators, injectors and regulators.
- Gravity discharge channel, used whenever the channel is not flooded.
- Effluent Pump Station, for use when the effluent channel is flooded.
- Biosolids dewatering system, including WAS holding tank, belt filter presses, centrifuge, conveyors to deliver dewatered solids to the biosolids storage area, uncovered biosolids storage area, and bucket truck.
- Single feed incoming power supply.
- Backup power generation for influent and effluent pump stations, disinfection system, and administration building. Generators are not considered reliable at this time; three of the four on-site generators are out of service.

1.2 Summary of City of Jackson Consent Decree

A Consent Decree (Decree), Case No. 3:12-cv-790TSL-MTP, was filed on November 20, 2012 (See Appendix A). This Decree defines the process the City must follow to determine what improvements must be made to the wastewater collection and treatment system to meet compliance with the performance parameters set within the Decree. A general summary of the Decree is provided below.

1.2.1 Summary of Overall Decree

Section VI.A.17 of the Decree states that, in general, the City must perform a CPE and CCP for the SSWWTP and the development and implementation of programs to insure proper Capacity, Management, Operations and Maintenance (CMOM) of the Sewer System. Also, per Section VI.D.44 (referenced as Section VI.E earlier in the Decree; the D is actually a typographical error), the City must implement a sludge and solids removal program for the solids in the storm diversion cells and implement remedial measures to address NPDES permit violations at the Presidential Hills WWTP.

1.2.2 Decree Contents Specific to Savannah Street WWTP

The Decree defines that the City must prepare a CPE report in accordance with the EPA documents “Retrofitting POTWs” (July 1989) and “Improving POTW Performance Using the Composite Correction program Approach” (October 1984), as well as the latest version of MDEQ’s “Guidance for the Design of Publicly Owned Treatment Works”. The CPE was submitted for approval in May 2014 and was approved in April 2015.

The requirements defined in the Decree vary from the EPA CPE document in that the City was instructed to perform an analysis of each individual unit process within the plant and provide performance limiting factor rankings for same, whereas the end product of the EPA CPE process is to develop an overall plant rating which would be used to determine if the CCP process should be initiated. Under the EPA process, if the CPE indicates that process and administrative modifications made to the existing facility could potentially bring plant performance into compliance with the requirements of the Decree, then the CCP step would be undertaken. If the CPE indicates that major capital improvements are required, the CCP step is negated in favor of moving directly into design of the improvements. In other words, if the EPA's CPE process were adhered to, the CCP step would have been bypassed and a Basis of Design report would have been the next step in the process.

Per the Decree, upon approval of the CPE, the City has 12 months to prepare the CCP report. The CCP report is to identify potential solutions to address the process limiting factors identified in the CPE. The Decree defines three Types of remedial measures. Types 1 and 2 are "minor process changes, minor equipment additions or enhancements, or flow configuration changes to meet NPDES Permit effluent limits and to maximize Secondary Treatment of peak wet weather flow through the Savanna Street WWTP". Type 3 is defined as "any capital improvements, including, without limitation, the addition of a clarifier of equal size to the existing clarifiers at the Savanna Street WWTP and Biological Nutrient Removal ("BNR"), necessary for the Savanna Street WWTP to meet the May 4, 2012 NPDES Permit effluent limits including nutrient limits." A schedule is also provided: Type 1 and 2 improvements are to be implemented within 24 months of CCP approval and Type 3 improvements are to be implemented within 60 months of CCP approval.

The Decree's CCP definition varies significantly from the EPA documents. The CCP document outlined in the EPA documents is a document prepared to improve plant operational and administrative processes in an effort to bring the plant into operational compliance. The CCP in the Decree lists multiple capital intensive implementation items, and is more in line with what a preliminary design Basis of Design Report would be. As the Decree is the controlling document, this CCP is, in form, a document that in many respects approximates a Basis of Design report, but does not contain a sufficient level of analytics to be considered a Basis of Design report.

1.3 CPE Summary

A brief summary of the CPE follows. CPE summaries for each process unit, including the list of Performance Limiting Factor (PLFs), are reproduced in subsequent sections of this report.

In general, the CPE results found a plant that is in need of repair, upgrade or replacement for every process unit. Plant controls are inadequate to operate the plant effectively, and there are safety concerns in the way the plant is operated. A summary by system is provided below.

- The Influent Pump Station is not adequate to handle future projected flows. Either complete replacement or addition of a second station and rehabilitation of the existing station is required.
- The headworks is not designed to handle future flows, is not a truly redundant system, and must be replaced in its entirety.

- The biological process is functioning well enough to meet permit limits for nutrient removal, but it is not working as designed. The system is receiving less oxygen than it should be due to broken diffusion equipment within the basins, but this has the unintended benefit of providing a level of simultaneous nitrification / denitrification that is sufficient to meet permit. It is noted that all parties agree an insufficiently maintained plant that provides acceptable results is not an appropriate way to operate the plant moving forward, but that the simultaneous nitrification/denitrification process is a viable alternative that will be analyzed.
- Clarifier capacity is insufficient and three existing mechanisms require replacement.
- The chlorination / dechlorination system works because excessive chemical usage overcomes the lack of contact time. Adding a contact tank will allow for optimization of chemical usage. The gas storage buildings for both chlorine and sulfur dioxide are inadequate and pose a hazard in the event of a gas leak or tank rupture.
- The effluent pump station is the only mechanical system that does not require an overhaul at this time.
- The biosolids dewatering system requires replacement. Existing equipment and the building do not meet reliability requirements.
- The electrical switchgear and generators require repair or replacement. Other electrical components also require upgrade or replacement.
- The operations contract in place with United Water Mississippi, LLC requires renegotiation and redefinition; it is not serving the best interest of the City or UWS-MS.

1.4 CCP Approach

The CCP report is prepared using a Technical Memoranda (TM) approach. Each process unit described in the CPE report is afforded its own technical memorandum. In each memorandum, the process limiting factors defined in the CPE are reviewed in further detail. Where singular recommendations for process improvements can be made, they are made (examples include the preliminary treatment system and the disinfection system). Where, in the judgement of the engineer, alternatives exist that must be developed to a level of detail that is beyond the scope of a CCP document, the alternatives are introduced, reviewed to the point of determining the viability of the alternative, and the decision remains open until further analysis during detailed design determines the best course of action for the City to comply with the Decree.

The main body of the CCP report text provides a summary of pertinent information contained within each TM. If the reader wishes to review the detailed information and analysis for any unit process, they can go the TM and review all the information provided (All TMs are attached as appendices to the CCP report). Otherwise, a reviewer can review the summary data provided within the main body of text.

Section 2
Design Flows

Design flows have been challenging to quantify throughout the entire CPE/CCP process, primarily because influent flow data measurement from all incoming flow sources has not been available until July 2015. This challenge, and how the City has determined the flow rates used for the CPE and CCP, are described below.

2.1 CPE Summary

The CPE provided a peak design flow of 120 MGD with 90 MGD quantified as peak hydraulic capacity of the mechanical portion of SSWWTP following the completion of upgrades/modifications as required by the Consent Decree. The remaining 30 MGD of the peak design flow was to be pumped into the equalization basins and subsequently returned to the West Bank Interceptor (WBI) for treatment. This conclusion was based on the review of the existing flow data (which was effluent flow data; reliable, measured influent flow data did not exist as noted above) and engineering judgment that the toppled 48" manhole riser section of a Lynch Creek Interceptor manhole was allowing large quantities of inflow into the Wastewater Collection and Transmission System (WCTS), where it was ultimately conveyed to the SSWWTP. It was noted in the CPE that, due to the plant flow data limitations (i.e., no reliable influent flow measurement) and the high level of uncertainty in the magnitude of the infiltration/inflow (I/I) impact to the system, the design flow would need to be re-evaluated during the CCP phase. Consequently, the request was made to install influent flow measuring equipment on the West Bank Interceptor and the Caney Creek Interceptor in order to provide more accurate flow data to be assessed as part of the re-evaluation.

It is noted that there were no "process limiting factors" identified in the CPE report for design flows.

2.2 New Flow Data Summary

The WBI temporary flow meters were installed in early 2014 as part of the WBI Flow Monitoring Program. The Caney Creek temporary flow meter was installed in August 2015. The West Rankin Force Main has two flow meters permanently installed, one at the SSWWTP and one at the West Rankin Pump Station. While the flow meters are now in place, the delay in installation of the Caney Creek Interceptor meter prevents a truly accurate influent flow analysis at this time; there is not enough data history to develop a reliable analysis. As such, the flow data analysis using actual plant data was performed using the two SSWWTP effluent parshall flumes. While this is not a true representation of day to day influent flow – i.e., flow in does not always equal flow out – it does provide an acceptable level of accuracy when measuring annual average flows. In addition, the influent flow data from August through December 2015 was used to corroborate the effluent flume data and industry standard flow and peaking factors were used to develop peaking flows.

It is important to note the following assumptions in influent flow:

1. All existing customers remain as flow contributors, including the West Rankin Utility Authority.

2. While the Consent Decree discusses the possibility that inflow and infiltration (I/I) reduction as part of the CMOM program can be taken into account, the SSWWTP plant improvements will be completed before any of these improvements can be constructed. The City would be at risk of having a prohibited discharge during the period of operation prior to the I/I improvements. The City elected to minimize this risk, so I/I reduction is not included in design flow calculations.

3. A key design assumption is to design the plant for a high enough flow rate to avoid the EPA 80% and 90% max month flow triggers for future improvements. The goal is to provide enough treatment capacity to avoid these triggers for the foreseeable future.

2.3 Plant Design Flows

Daily historical influent flow data was reviewed from the past five years (October 1, 2010 through September 30, 2015) to generate influent flow peaking factors relative to the annual average daily flow (AADF). Historical flows and peaking factors for the past 5 years are summarized in Table 2-1.

Table 2-1 Historical Flows and Peaking Factors (October 1, 2010 to September 30, 2015)

Year	AADF (MGD)	MMADF (MGD)	MWF (MGD)	MDF (MGD)	MMADF/ AADF	MWF/ AADF	MDF/ AADF
10/10 – 9/11	43.26	63.00	98.32	140.87	1.46	2.27	3.26
10/11 – 9/12	48.02	65.20	91.19	117.99	1.51	2.11	2.73
10/12 – 9/13	53.92	95.17	140.30	163.20	1.77	2.60	3.03
10/13 – 9/14	49.55	84.65	115.72	162.38	1.71	2.34	3.28
10/14 – 9/15	48.58	68.19	95.16	129.61	1.40	1.96	2.67
Average	**48.67**	**75.24**	**108.14**	**142.81**	**1.55**	**2.22**	**2.93**

In addition to examination of the annual data, the flow peaking factors were evaluated using probability analysis of the historical data. The daily flow data for each of the past five years were averaged to determine the AADF for each year. A ratio of daily flow to each year's AADF was then calculated for each data point, which was then utilized to generate a plot of the ratios for frequency distribution analysis. Based on WEF Manual of Practice No. 8, the MMADF, MWF, and MDF peaking factors were estimated by looking at the ratios at the 91.7th, 98th, and 99.7th percentile, respectively. A summary of the peaking factors determined through this method is shown in Table 2-2.

Table 2-2 Flow Peaking Factors from Frequency Distribution Analysis

Ratio	Percentile	Peaking Factor
MMADF/AADF	91.7th	1.60
MWF/AADF	98th	2.30
MDF/AADF	99.7th	2.90

As demonstrated in Table 1-1 and Table 1-2, both analyses resulted in similar results. Peaking factors from Table 2 will be used for the SSWWTP upgrades design.

The flow data conclusively demonstrate that the current 46 MGD AADF capacity of SSWWTP is no longer adequate and thus, will need to be increased. The SSWWTP upgrades design will incorporate two influent peaks; a design hydraulic capacity peak and a design biological process peak. The peak hour flow is industry standard for hydraulic capacity of a WWTP but due to the SSWWTP's equalization basin system, the peak hour design can be reduced to the maximum week daily flow, with the peak hour and maximum daily flow temporarily stored in the equalization basins for eventual routing back into the SSWWTP for treatment. The design biological process peak is based on the maximum month and week as defined in the NPDES permit.

Using the AADF of 48.67 MGD, the peak rolling AADF of 56.20 MGD, the peak daily flows from October 1, 2010 to September 30, 2015, not accounting for any I/I reduction as described above, and 20% excess capacity to provide a buffer for future development, the SSWWTP design flows are shown in Table 2-3.

Table 2-3 SSWWTP Design Flows

Parameter	Flow
Annual Average Daily Flow (AADF)	60 MGD
Maximum Month Average Daily Flow (MMADF)	96 MGD
Maximum Week Daily Flow (MWF)	138 MGD
Maximum Daily Flow (MDF)	174 MGD
Peak Hour Flow (PHF)	216 MGD

Note: 138 MGD flow to plant for full treatment with excess flow being temporarily stored within equalization basins.

Additionally, it is recommended that SSWWTP's NPDES permit Effluent Flow parameter be modified and defined as follows:

> "This is an annual average limit, which shall be reported as a rolling average. The first value will be calculated using the monthly average flow for the first full month ending after the effective date of the permit and the 11 previous monthly flows. Each subsequent month's discharge monitoring report will report the annual average flow that is calculated from that month and the previous 11 months."

The Total Nitrogen and Total Phosphorus parameter would need to be an annual average limit as well.

If, for any reason, the permit cannot be modified to accommodate the aforementioned reporting limit, it will be required that the NPDES permit Effluent Flow parameter be increased to the maximum month flow of 96 MGD in order to eliminate the permit violation that would occur if the

AADF is established as the monthly effluent flow parameter. Defining the Effluent flow as maximum month flow would cause the Total Nitrogen and Total Phosphorus treatment level, in terms of pollutant concentration, to become very low during the wet weather months.

It is noted that, regardless of any I/I improvements that are made to the system as part of the Consent Decree CMOM program, the historical data review indicates that the average annual daily flow over the last 5 years into the SSWWTP is over 48 mgd. What this means is that, even if the I/I improvements are taken into account, The average annual daily design flow of 60 mgd is still a valid value and the 138 mgd peak week treatment capacity flow is still an appropriate value for peak treatment capacity. The I/I reductions will likely reduce the peak flows above 138 mgd that need to be diverted to the storage ponds, but the peak week values are within the industry standard peaking factors and should not be significantly reduced.

Section 3
Plant Hydraulics

The ability to hydraulically pass the required wet weather flow through the plant without a prohibited discharge is the foundation of any design that meets Consent Decree and MDEQ requirements. Short-term and long-term improvements are proposed to achieve this end.

3.1 CPE Summary

The CPE report listed several process limiting factors in the wet train of the treatment process. Table 3-1 presents these factors.

Table 3-1 Performance Limiting Factors for Savanna Street WWTP Hydraulics

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Overflowing of Headworks	B	Type 2
Anoxic Basin Effluent Channel Restriction	B	Type 2
Overflowing of Clarifier Splitter Box (During Wet Weather)	A	Type 2

Proposed solutions to these factors are provided below. Detailed information is not provided in the Hydraulics TM; it is provided in the sections noted below.

3.2 Proposed Solutions to Existing Hydraulic Issues

3.2.1 Overflowing of Inlet Channel (see Preliminary Treatment TM)

The headworks receiving channel overflows during wet weather events. Overflow due to turbulence in the inlet box and direct overtopping due to flow backups in the preliminary treatment facility have been reported. These events will only be exacerbated as plant flow increases. To provide short-term relief of this issue, the inlet box walls will be heightened by 42 inches to prevent turbulence splash overflow or direct overflow. Details of this are provided in the Preliminary Treatment TM.

3.2.2 Anoxic Basin Effluent Channel Restriction (see Preliminary Treatment TM)

The openings in the anoxic basin effluent channel are too small to pass wet weather flow. As a result, the headworks treatment processes experience hydraulic backup during these events. To alleviate this restriction, the concrete openings will be expanded from a 4’ x 6’ opening to a 4’ x 15’ opening. This increase in area should allow the channel to pass any flow that can be experienced by the headworks during the construction period for the new preliminary treatment structure. Details of this are provided in the Preliminary Treatment TM.

3.2.3 Clarifier Flow Splitter Box Overflow during Wet Weather (see Biological Process TM)

During wet weather events, there are overflows that occur in the clarifier splitter box. Modifications to the weir structures in the box and raising the wall height of each chamber will be implemented to mitigate short-term overflow issues and to provide proper flow-splitting of maximum long-term plant flows. Details of this are provided in Section 6 and in the Biological Process TM.

3.3 Hydraulic TM Overview

The hydraulics TM is a document that presents hydraulic scenarios and issues that may occur as part of the short-term and long-term corrective actions taken to meet Consent Decree and MDEQ requirements. Because there are multiple viable IPS and biological process alternatives, a plant hydraulic profile is not provided in the TM. Instead, the TM represents a basis of hydraulic design that the detailed designer can use to develop a plant hydraulic profile that addresses hydraulic concerns of the various process units. During detailed design, the hydraulic profile will be developed for the flow conditions identified in the Design Flow memo, with an additional criteria that a minimum flow of 30 mgd will also be modeled.

Key hydraulic elements are listed below.

1. The Influent Pump Station must be able to pump 138 mgd through the wet treatment train and ALL wet process train elements must be able to provide full treatment of and hydraulically pass this flow rate.

2. An additional 48 mgd flow rate must be pumped to the storage ponds to divert a peak hour flow of 186 mgd. This assumes that the West Rankin Force Main can pump directly to the storage ponds.

3. The plant must continue to function properly at a minimum flow rate of 30 mgd.

4. Flow split structures are critical hydraulic components. Hydraulic design must focus on accurate design and, if possible, provide for flexibility in these structures.

5. Hydraulic design of the chlorine contact tank is a critical component. This structure is being placed in a gravity flow portion of the plant with the intent of maintaining gravity flow.

6. The plant hydraulics cannot contribute to the potential of a prohibitive discharge.

Section 4
Influent Pump Station

The influent pump station (IPS) is required to pump the peak hour flow rate. This flow rate has been calculated at 216 mgd, but the 30 mgd peak hour flow from West Rankin can be pumped directly to the storage ponds. This leaves the IPS responsible for a pumping rate of 186 mgd, with 138 mgd pumped to the treatment plant and 48 mgd pumped to the storage ponds. The existing IPS cannot meet this design criteria. Upgrading, replacing, or a combination of new and rehabilitated pump stations are alternatives that have been considered.

4.1 CPE Summary

The CPE listed multiple performance-limiting factors for the IPS. Table 4-1 presents these factors.

Table 4-1 Influent Pump Station Performance Limiting Factors for Savanna Street WWTP

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Reliability of Station Pumps	A	Type 2
Reliability of Trash Racks	B	Type 2
Structural Deterioration	A	Type 2
Reliability of 84" Line to EQ Basins	B	Type 2
Reliability of Station's Electrical System	B	Type 3
Lack of HVAC/Odor Control System	B	Type 3
Lack of Hydraulic Control and Ability to Isolate Station	B	Type 3

It is noted that the performance limiting factors do not indicate an inability of the station to meet the peak flows calculated for the CPE. That is because the design flow listed in the CPE – 90 mgd to the treatment train, an additional 30 mgd to the storage ponds – could be met with a rehabilitated pump station that has slightly upsized pumps. The updated flow conditions calculated for the CCP have changed the process limiting factors to include the need for a comprehensive station upgrade, replacement, or combination thereof because projected flows can no longer be met by the existing pump station. A description of alternatives reviewed and proposed corrective actions is described below.

4.2 Overview of Alternatives Reviewed

As noted above, when the design flows increased to 138 mgd / 186 mgd, the alternative of rehabilitating the existing station became infeasible within the existing footprint. Two alternatives were reviewed: (1) a new station to replace the existing station; (2) build a new station with partial capacity and rehabilitate the existing station with partial capacity. In addition, improvements will be made to the existing IPS to guarantee station operating integrity during the construction period.

Alternative 1, new station design, would include the following components:

- Two independent wetwells
- Three automatic trash racks
- Eight submersible pumps, 18,500 gpm capacity, with discharge check and isolation valves
- A meter pit housing the three influent flow meters
- A meter pit housing the meter to measure flow to the equalization basin
- Valve pit in the yard, if needed
- Electrical system
- HVAC system
- Temperature-controlled electrical/operations building.

As part of the implementation of Alternative 1**,** the IPS existing equipment would be repaired prior to the start of construction on the new station so as to maintain the plant's ability to convey influent flows during the entirety of the new pump station design and construction.

Alternative 2 consists of construction of a new five pump 122 MGD (each pump is 17,000 gpm) total and firm capacity IPS and rehabilitation of the existing IPS for conveyance of 96 MGD (each pump is 22,300 gpm) total capacity, 64 MGD firm capacity (capacity of both structures combined equals the required firm capacity (one system pump out of service) of 186 MGD). The proposed configuration would have the two stations operating co-dependently. This alternative was investigated as the most feasible method for salvaging the existing IPS structure.

Alternative 2 would involve construction of the new facility first, with associated repair of the existing IPS as needed to maintain IPS station integrity during construction. Once the construction of the new pumping structure was completed, the influent flow would be transferred to the new station, thus allowing the existing IPS to be taken offline to complete the necessary rehabilitation.

The new station in Alternative 2 would have the same equipment as the new station (Pump quantities are the only difference) in alternative 1, but the system would be sized for 122 mgd total/firm capacity. Besides new pumps and appurtenances in the wet flow train, structural rehabilitation of the existing IPS wetwells and existing dry pit building would be performed and the building electrical and HVAC infrastructure would be upgraded to meet current Codes.

4.3 Short-Term Corrective Actions

To address the performance limiting factors requiring short-term corrective actions, the following work should be performed:

4.3.1 Reliability of the Station Pumps

- Replacement of at least one of the 22,000 gpm raw wastewater pumps
- Repair/replacement of existing piping and piping appurtenances required to maintain functional pumping system

It has been confirmed that the station's existing pumps are still manufactured and available. Therefore, the replacement pumps can be matched to the existing pumps to expedite corrective actions to the pumping system.

4.3.2 Reliability of the Trash Racks

- Maintain functionality of the four existing trash racks so that they can remain in service until the completion of the long-term improvements.
- Regular inspection of each of the four trash racks to determine their overall condition and functionality
- Repair/replacement of any mechanical components associated with the effective operation of the trash racks
- Operation of the wetwell so that the water level remains below 10'. By operating the wetwell below 10', it ensures that the flow passes through the trash racks prior to entering the suction inlets, thus protecting the pumps from debris that might cause pump damage or failure

4.3.3 Reliability of 84" Line to EQ Basins

Replacement of the 84" line to the EQ basins is the specific corrective action necessary to eliminate this performance limiting factor; the pipe is too badly damaged to be effectively rehabilitated. Replacement with a 60-inch DIP pipe is proposed; the 48 mgd flow demand can be met at this size.

4.3.4 Structural Improvements to Maintain Building Integrity

As noted in the TM, the City has proactively begun to address structural deficiencies in the IPS. These deficiencies will continue to be addressed, and will be completed, as short-term corrective actions.

4.4 Long-Term Corrective Actions

A comparison of the two alternatives for station flow upgrades indicated that both alternatives are viable improvements that meet the needs of the Consent Decree and the City. It is recommended that these alternatives be scrutinized further by the detailed design engineer and that a final decision be made as part of the Basis of Design Report. This recommendation is partly based on the fact that, by the time a detailed designer is hired by the City, there will be at least one year of data from all plant influent flow meters and there may be an opportunity to revisit the design flows of the plant. Changes in the design flow may favor one alternative or the other and that is why the recommendation is made to make the final determination during detailed design.

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Section 5

Preliminary Treatment Facility (Fine Screens and Grit Removal)

The existing preliminary treatment facility consists of an elevated structure housing automatically cleaned bar screens, Pista-Grit vortex style grit removal equipment, grit classifiers, grit pumps, grit and screenings solids collection equipment, and tanks designed for anoxic zone biological treatment. The equipment is over 30 years old and was identified as being hydraulically inadequate and without redundancy in the CPE. With the design flow increase, this situation is heightened to a degree that complete structure and equipment replacement is the appropriate alternative for this system.

5.1 CPE Summary

The CPE report listed the following process limiting factors for the preliminary treatment facility:

Table 5-1 Performance Limiting Factors for Savanna Street WWTP Headworks

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Non-operational Mechanical Bar Screens	B	Type 2
Non-operational Grit Removal System	B	Type 2
Redundant Screen Capacity	A	Type 3

In addition, as noted in Section 3, there are hydraulic restrictions in the inlet basin upstream of the screens and the anoxic zone effluent channel that cause local flow backup and, on occasion during wet weather flow, overtopping of the structure basins and channels. The recommended short-term corrective actions to improve hydraulic performance of the existing structure during construction are discussed in Section 3. Mechanical improvements are discussed below.

5.2 Short-Term Corrective Actions

The following corrective action will resolve performance limiting factor No. 2, rehabilitation of mechanical bar screens:

- Order and install all necessary parts required to keep bar screens operational.

The following corrective action will resolve performance limiting factor No. 3, rehabilitation of grit removal system:

- Purchase and install all necessary parts required to keep grit pumps and classifiers operational.

- If grit pump requires replacement during construction, coordinate with design engineer to purchase the grit pump being purchased for the new PTF.
- If classifier requires replacement during construction, coordinate with design engineer to purchase the classifier being purchased for the new PTF.

These improvements, and the hydraulic improvements noted in Section 3, would be implemented as early as possible to provide immediate improvement to the functional operation of the preliminary treatment facility.

5.3 Long-Term Corrective Action

The new PTF should consist of a Fine Screen Facility (FSF), a Grit Removal Facility (GRF), and a Preliminary Treatment Building (PTB). The proposed PTF should consist of three trains with each train having a peak flow of 69-MGD (full plant flow with one unit out of service can be achieved at this rate) and a minimum flow of 15-MGD.

The FSF should consist of the following elements:

- Inlet basin, designed to Hydraulic Institute standards and containing a mixing system to improve suspension of solids during low flow periods
- Three (3) screenings channels, each with 5 mm drum screens and brush units for solids removal into solids collection troughs for transport and dewatering. Channels are isolated at both ends by sluice gates.
- Three (3) dewatering brush screens
- Three (3) shaftless screw conveyors for moving solids from the dewatering brush screens to the main conveyance equipment.
- Two (2) shaftless conveyor systems that transport solids to the loading trucks or loading dumpsters.

The three screenings channels empty into a common flow collection basin. This allows for maximum unit flexibility; isolation of one drum screen flow train for maintenance or repair does not impact the ability to use the same train's grit removal system.

The GRF should consist of the following elements:

- Three (3) vortex style grit removal chambers; style to be determined during detailed design. Channels are isolated at both ends by sluice gates.
- Three (3) grit pumps
- Three (3) grit concentrator/cyclones, for initial grit dewatering and organics removal.
- Three (3) grit classifiers, for further dewatering, with screw conveyors to move the dewatered grit to the brush screen conveyors for final disposal.

The three grit effluent channels discharge into a common effluent channel. The effluent channel should be covered. This common effluent channel should provide flow distribution via weirs and piping to the Biological Treatment Facilities (BTF). Cost-effective flow metering should be installed at applicable locations. These meters will record flow to each aeration basin and total influent flow will be totalized as a process control measure.

The raw wastewater should be pumped from the Influent Pump Station (IPS) to the PTF. The conveyance piping is proposed as a multi-pipe system, using the existing pipes and adding pipes as necessary to handle the 138 mgd peak flow requirement. These raw wastewater lines should be isolated at the IPS and at the preliminary treatment facility inlet basin using sluice gates with remote manual electric actuators. All sluice gates should be fabricated of 316 stainless steel meeting AWWA C561. Final hydraulic review will occur during detailed design.

It is noted that the existing anoxic basins will likely not be needed as part of the preliminary treatment facility for Alternatives 2, 3 and 4. For Alternative 1, the anoxic selector zone is required for process success. The location of this volume can either be in separate tankage or in the existing aeration tankage.

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Section 6

Biological Processes, Including Clarifier Tanks

The biological treatment/clarification process at Savanna Street WWTP has been in operation since the early 1980s and is currently performing well enough to meet 2012 NPDES permit requirements for effluent water quality. However, a close examination during the CCP phase indicates that this process performance is due to a positive biological benefit from the underperformance of the existing aeration system. Discussion of this is detailed in the Biological Process TM and, along with information on alternative treatment technologies reviewed and how to address the short-term and long-term process limiting factors identified in the CPE, is summarized below.

6.1 CPE Summary

The CPE report listed the following process limiting factors for the biological process treatment facility:

Table 6-1 NPDES Effluent Limits for the Savanna Street WWTP

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Influent Samplers	A	Type 2
Aeration Basin Process/Flow Configuration	A	Type 3
Non-Automated Aeration Basin Influent Valves	B	Type 3
Non-Operational Dissolved Oxygen Meters	B	Type 3
Non-Operational pH Meters	B	Type 3
No Aeration Basin Flow Meters	B	Type 3
Non-Operational Standby Blower	B	Type 3
Clarifiers 1, 2 and 3 Mechanism Age	A	Type 2
Clarifier Splitter Box Overflow Issues	B	Type 2
Non-Operational RAS Pump	A	Type 2
No RAS Flow Meters	A	Type 2
Addition of 6th Clarifier	A	Type 3

Note: *85 percent monthly average removal also required.

As can be seen, there are multiple process limiting factors that, when taken as a whole, make meeting the NPDES permit limits an operational challenge. As explained below, however, the limits are being met. Through a combination of short-term and long-term corrective actions, the process reliability can be improved to meet both current and future projected flows.

6.2 Existing System Performance Summary

The existing process is not designed for nutrient removal. This typically requires incorporating anaerobic (no oxygen in any form) and anoxic (oxygen only in the form of nitrate) zones in the bioreactor. The existing process is equipped with a small anoxic selector but this is designed primarily for conditioning the biomass for enhanced settling in the secondary clarifiers. Despite not being designed for nutrient removal, the combination of a relatively dilute influent and an aging aeration system combine to create a simultaneous nitrification/denitrification process in the basins. This produces an effluent that meets the nutrient removal limits for calendar year 2015 and most of the time in previous years. The limiting unit process in the existing process that is preventing treatment of high wet weather flows are volumetric limits of the secondary clarifier system. The fact that the SSWWTP typically produces a low effluent total suspended solids (TSS) indicates that the anoxic selector basin is performing above expectations. However, to treat higher flows, additional secondary clarifier capacity is required to relieve the hydraulic restriction of not having enough clarifier volume.

A BioWin™ process simulator was used to model the existing process. Only 2015 data was used because prior data had sidestreams comingled with the influent sample. In general terms, a sufficient level of calibration was achieved to conclude the BioWin™ model was approximating real world treatment capability. Results of the calibration are provided in Table 6-2.

Table 6-2 Calibration of the Process Simulator

Parameter	2015 Average	Simulator Results
Flow	45 mgd	45 mgd
Influent Biochemical Oxygen Demand (BOD_5)	135 mg/L ($CBOD_5$)	154 mg/L*
Influent Total Suspended Solids (TSS)	235 mg/L	235 mg/L
Influent Total Nitrogen	23 mg/L	23 mg/L
Influent Total Phosphorus	3.5 mg/l	3.5 mg/L
Bioreactor Mixed Liquor Suspended Solids (MLSS)	3764 mg/L	3763 mg/L
Aerobic Solids Retention Time (SRT)	?	9.83 days
Effluent 5-day Carbonaceous BOD_5 ($CBOD_5$)	3.8 mg/L	3 mg/L
Effluent TSS	9.6 mg/L	11.7 mg/L
Effluent Ammonia	0.4 mg/L	0.4 mg/L
Effluent Nitrate + Nitrite	6.7 mg/L	6.5 mg/L
Effluent Total Nitrogen	9 mg/L	9 mg/L
Effluent Total Phosphorus	0.7 mg/L	1.6 mg/L

Note: *Adjusted upwards to account for the effects of the nitrification inhibitor in the raw sewage BOD test

In order to calibrate the simulator to match the effluent total nitrogen data, the dissolved oxygen (D.O.) concentration in the bioreactor had to be lowered to a relatively low concentration of 0.5 mg/L. This is an indication that the existing aeration system is not providing complete mixing and these unmixed zones are actually benefitting treatment by achieving denitrification in the aeration basins. This is a phenomenon referred to as simultaneous nitrification/denitrification (SND) and is one of the benefits of operating bioreactors at very low D.O. concentrations. Strict process controls are typically required in this system, as newly installed or properly maintained equipment can provide much higher levels of DO to the system. The existing system is not at

optimum oxygen delivery capacity due to age and repair state of the equipment, though, so the system is working without the control instrumentation typically required of such an operating system. In short, while inadvertent, the existing system has been proven to be a viable treatment alternative.

Figure 6-1 shows the simulator schematic for this option and Table 6-3 provides the process sizing and effluent quality results from the simulation. The process sizings reflect the existing process with three additional 180-foot diameter secondary clarifiers. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C. As can be seen in Table 6-3, the addition of a coagulant chemical would be required to comply with effluent total phosphorus permit requirements, but the process does meet the total nitrogen limit.

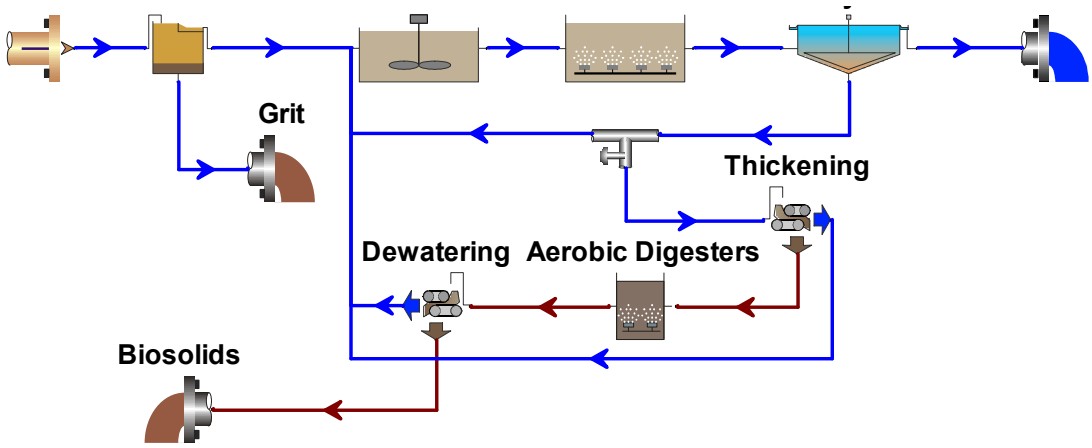

Figure 6-1
Existing Biological Process Simulator Schematic

Table 6-3 Process Sizing and Results of Existing Process Simulator

Element	Model Input/Results
Aerated Anoxic	0.47 MG
Aeration	22.88 MG
Secondary Clarifiers	153,300 ft2
Aerobic Digesters	4.58 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	3 mg/L
Effluent TSS	7 mg/L
Effluent Total Nitrogen	8.4 mg/L
Effluent Total Phosphorus	3.6 mg/L

6.3 Short-Term Corrective Actions

6.3.1 Install Influent Samplers and Flow Meters

Between the time of issuance of the CPE report and August 2015, automatic influent samplers and influent flow meters have been installed. As such, this item has been corrected.

6.3.2 Replace Clarifier 1, 2 and 3 Mechanisms and Walkways

A design and construction project must be implemented and completed within 24 months of CCP approval. Construction would be phased, as only one clarifier can be taken out of service at any one time. Historically dry weather periods would be targeted for construction.

6.3.3 New Clarifier No. 6

During the CCP plant review process, the priority of several systems was reviewed. One conclusion reached is that additional clarifier capacity is required as soon as possible. With this in mind, and as a means of balancing project cash flow, the City has decided that the construction of Clarifier No. 6 will be moved to a short-term corrective action. Design of the new clarifier will commence upon approval of the CCP report by EPA.

6.3.4 Clarifier Flow Splitter Box Overflow during Wet Weather (see Biological Process TM)

During wet weather events, there are overflows that occur in the clarifier splitter box. Modifications to the weir structures in the box and raising the wall height of each chamber will be implemented to mitigate short-term overflow issues and to provide proper flow-splitting of the long-term plant flow of 138 mgd.

- Raise the exterior walls of the clarifier splitter box as may be necessary, based on the improvement in hydraulic performance seen from the changes made below.
- Extend the existing wall at the end of each aeration basin to form a 26 foot wide weir with 2 feet contractions on both sides to establish water level in the aeration basin. This allows for the splitter box weirs to be lowered to provide free board in clarifier splitter box influent chamber.
- Adjust clarifier splitter box weirs to lower water level in influent chamber of splitter box.

6.3.5 Install New RAS Pumps and RAS Flow Meters

All RAS pumps will be evaluated during detailed design and pumps will be repaired or replaced as necessary to improve RAS system operation. In addition, magnetic flow meters will be installed on the discharge lines of both RAS pump stations. If the meter can be installed within the station, this would be preferable. If the straight pipe runs in the stations are insufficient to install meters that can provide reliable readings, install concrete yard vaults with meters on the discharge line of both RAS pump stations.

6.4 Long Term Corrective Actions

In addition to an upgrade to the existing process, which was deemed viable by analyzing the existing plant data and calibrating the BioWin™ process simulator to model future conditions, three other biological process were analyzed for viability. These are listed below.

1. Converting the existing process to a traditional biological nutrient removal (BNR) process by incorporating anaerobic and anoxic zones ahead of the aerated portion of the bioreactor (referred to as the A^2O process) and adding additional secondary clarification.

2. Converting the existing process to a BNR oxidation ditch technology known as the Verticel Loop Reactor and adding additional secondary clarification.

3. Adding primary clarifiers and anaerobic digestion to the A^2O process, eliminating the need for additional secondary clarification. This would require approval from MDEQ to waive the requirement for an additional secondary clarifier.

The evaluations did not take into account the additional nutrients to be removed when the Trahon Wastewater Treatment Plant's load sharing is added to the equation.

6.4.1 A2O Process with Additional Secondary Clarifiers

This process configuration represents a conversion from the existing process to a conventional nutrient removal process. Anaerobic zones are created from volume at the head end of the existing bioreactors for enhanced biological phosphorus removal (EBPR) and anoxic zones are created downstream of the anaerobic zones to accomplish total nitrogen removal. Internal recycle pumps are installed in the bioreactor to recirculate around four times the influent flow back to the anoxic zones for denitrification.

Figure 6-2 shows the simulator schematic for this option and Table 6-4 provides the process sizing and effluent quality results from the simulation. The process sizings reflect incorporation of the BNR zones into the existing process volumes with an increased bioreactor water depth of 19 feet and three additional 180-foot diameter secondary clarifiers. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C. As can be seen in Table 6-4, EBPR results in compliance with the effluent total phosphorus permit requirements without the need to add coagulant chemicals and the process results in a lower effluent total nitrogen than the existing system.

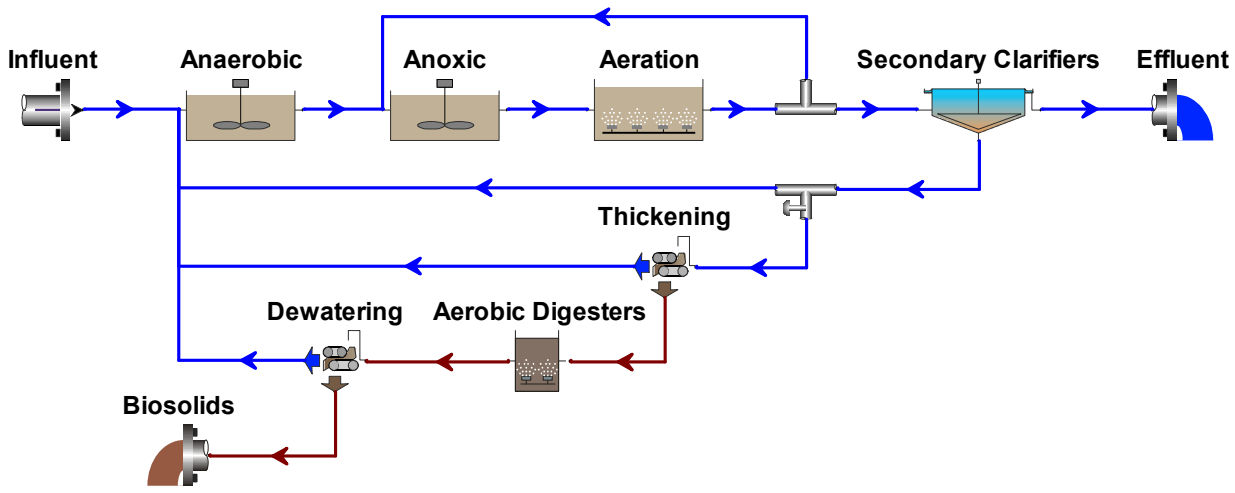

Figure 6-2
A2O Process Simulator Schematic

Table 6-4 Process Sizing and Results of A^2O Process Simulator

Element	Model Input/Results
Anaerobic	2 MG
Anoxic	4 MG
Aeration	19.48 MG
Secondary Clarifiers	153,300 ft2
Aerobic Digesters	4.58 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	3 mg/L
Effluent TSS	7 mg/L
Effluent Total Nitrogen	7.2 mg/L
Effluent Total Phosphorus	2 mg/L

6.4.2 VertiCel™ Process with Additional Secondary Clarifiers

This process configuration represents a conversion from the existing process to a proprietary oxidation ditch technology marketed by Evoqua referred to as the VertiCel™ process. It would require construction of large horizontal slabs/dividers in the existing bioreactors to create the "over/under" recirculation flow pattern of the VertiCel™ process. The process is operated at low DO concentration and relies heavily on SND in the bioreactor for nitrogen removal.

Figure 6-3 shows the simulator schematic for this option and Table 6-5 provides the process sizing and effluent quality results from the simulation. The process sizings reflect the incorporation of the VertiCel™ process into the existing bioreactor volume and three additional 180-foot diameter secondary clarifiers. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C. As can be seen in Table 6-5,

insufficient EBPR was achieved with this model indicating the need to add coagulant chemicals to meet the effluent total phosphorus limit and the process results in a higher effluent total nitrogen than either the existing process or the A2O process, but is in compliance with permit limits. It is noted that a 17 foot water depth was used for this analysis. A 19 foot water depth would provide better results; i.e., more nitrogen removal.

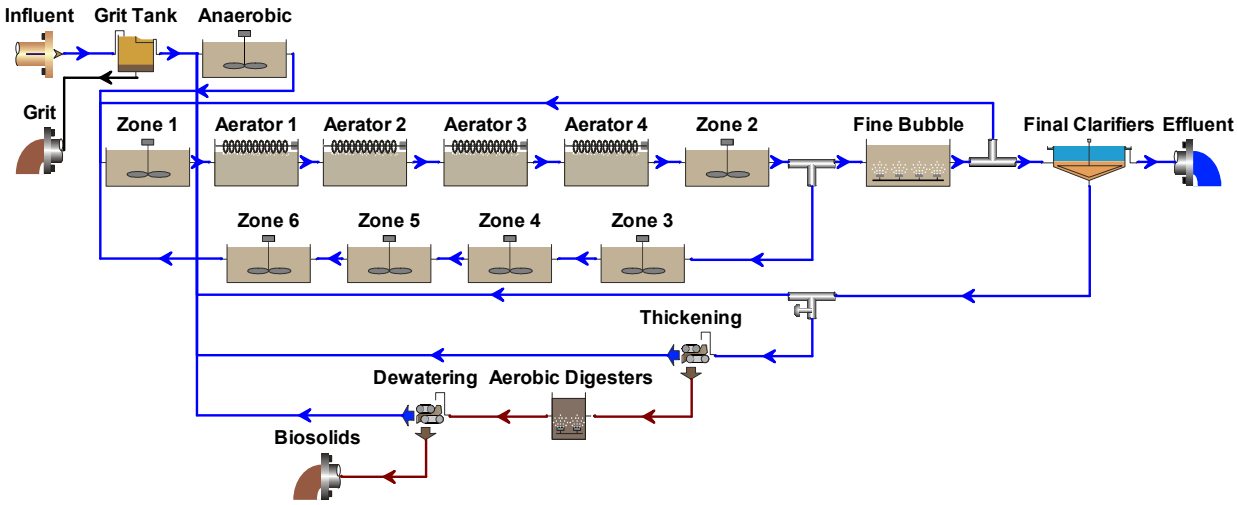

Figure 6-3
VertiCel™ Process Simulator Schematic

Table 6-5 Process Sizing and Results of VertiCel™ Process Simulator

Element	Model Input/Results
Anaerobic	1.95 MG
Zones 1 and 2 and Surface Aerator Zones 1-4	0.81 MG each
Zones 3-6	1.22 MG each
Fine Bubble Aeration Zone	11.4 MG
Secondary Clarifiers	153,300 ft2
Aerobic Digesters	4.58 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	4 mg/L
Effluent TSS	13 mg/L
Effluent Total Nitrogen	12 mg/L
Effluent Total Phosphorus	3.6 mg/L

6.4.3 A²O Process, Primary Clarifiers and Anaerobic Digestion

This process configuration represents a conversion from the existing process to the conventional A²O BNR process and the addition of primary clarifiers and anaerobic digestion. When primary clarifiers are added to a WWTP, it is necessary to also add anaerobic digestion due to the need to stabilize primary sludge in an anaerobic process to take advantage of the energy savings of BOD removal in the primary clarifiers.

Figure 6-4 shows the simulator schematic for this option and Table 6-6 provides the process sizing and effluent quality results from the simulation. The process sizings reflect the addition of primary clarifiers, incorporation of the A²O process into the existing bioreactor volume and the addition of anaerobic digesters. There would be no need for additional secondary clarifiers. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C.

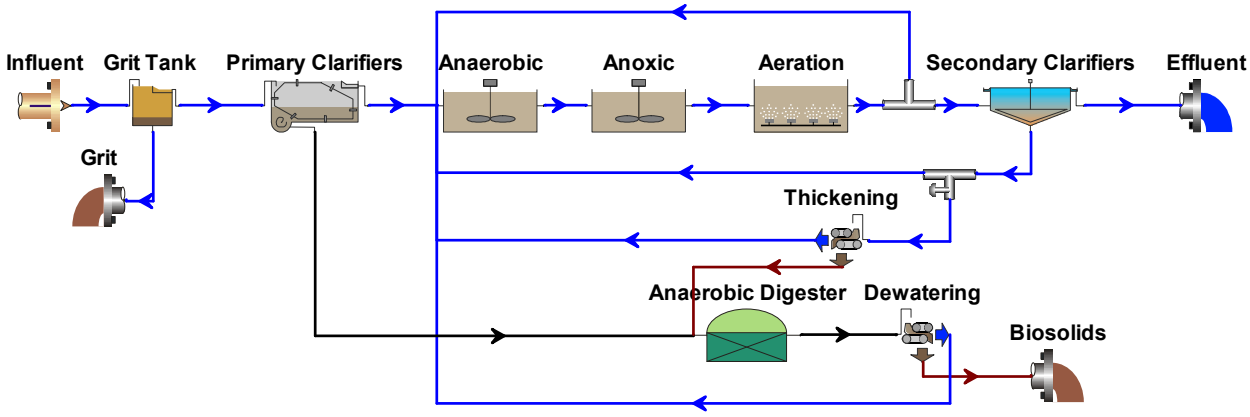

Figure 6-4
A²O with Primary Clarifiers Process Simulator Schematic

Table 6-6 Process Sizing and Results of A²O with Primary Clarifiers Process Simulator

Element	Model Input/Results
Primary Clarifiers	55,000 ft2
Anaerobic	4 MG
Anoxic	6 MG
Aeration	15 MG
Secondary Clarifiers	77,000 ft2
Anaerobic Digesters	12 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	6 mg/L
Effluent TSS	15 mg/L
Effluent Total Nitrogen	9 mg/L
Effluent Total Phosphorus	4 mg/L

As can be seen in Table 6-6, insufficient EPBR was achieved with this model indicating the need to add coagulant chemicals to meet the effluent total phosphorus limit and the process results in a higher effluent total nitrogen than the existing process or the A^2O /no primaries process simulation but is in compliance with permit limits.

6.4.4 Decision Not to Select a Single Process Alternative

The four processes evaluated as part of the CCP report are viable process alternatives. At this time, a single process alternative is not being selected. The primary reason for this is that load sharing between the Savanna Street WWTP, The Trahon WWTP, and the O.B. Curtis WTP is being discussed between the City and MDEQ. As this comes to fruition, the Permit nutrient removal levels will be changed for Savanna Street. These new levels should be modeled by the detailed design engineer, and a decision should be made based on the results of the treatment analysis and a life-cycle cost evaluation of the alternatives, which is beyond the scope of the CCP report.

6.4.5 Other Potential Process Alternatives (Proprietary Systems)

In addition to the above processes, other options that could be considered during detailed design are the proprietary Captivator, BioMag™ and Actiflo™ processes. These processes would reduce and possibly eliminate the need for additional secondary clarifiers. The detailed designer and the City would have to weigh the potential benefits of these treatment processes against the fact that these are proprietary systems, which limits flexibility in implementing the process and places a premium on negotiating a guaranteed level of performance from the process manufacturer.

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Section 7
Disinfection System

The disinfection system is currently a gas chlorine/gas sulfur dioxide chlorination/dechlorination system. The equipment was installed in the early 1980s and the majority of the equipment has been in use since that time.

7.1 CPE Summary

Table 7-1 lists the following process limiting factors for the disinfection system.

Table 7-1 Performance Limiting Factors for Savanna Street WWTP Disinfection System

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Cl2 Contact Time	A	Type 3
CL2 Feed Rate Control	A	Type 2
SO2 Feed Rate Control	A	Type 2
Contact Basin	A	Type 3
Disinfection Buildings	B	Type 2
One Ton Cylinder Storage	C	Type 2
Chemical Feed Equipment	A	Type 2

The nature of the analysis and the process limiting factors listed indicate that the existing chlorination/dechlorination process would remain in place; no consideration was to be given in the CCP for reactivating the existing UV disinfection system or for reviewing other disinfection methods.

7.2 Short-Term Corrective Actions

7.2.1 Improve Chemical Feed Rate Control

To optimize chemical feed rates in the disinfection system, the chlorination and dechlorination feed rates should be set in accordance with the flow, chlorine demand (based on target water quality parameters) and on the chlorine residual just prior to the dechlorination system feed/ mixing location. A compound loop system with chlorine analyzers, flow meters, and feedback loops, all SCADA adjustable, should be provided. The system specifics will be designed by the detailed design engineer, but in general the system can be expected to have the following components (all analyzers are redundant; 2 per location):

- Initial chlorine dosage is based on flow rate from the effluent flow meter.
- Chlorine analyzers at the exit of the contact tank are used to control both the chlorine feed rate and the sulfur dioxide feed rate.

- A key assumption is that the effluent flow meter is adequate to work in conjunction with the system's instrumentation to regulate chemical feed.

7.2.2 Evaluate Chemical Feed Equipment during Detailed Design

The chemical feed system equipment (chlorinators, sulfonators, regulators, injectors, hoses, etc.) is greater than 15 years old, but may be able to remain in service and should not automatically be earmarked for replacement. The equipment should be evaluated during detailed design for potential replacement, keeping in mind that the equipment must be capable of meeting the design chemical feed demands and be SCADA compatible.

7.2.3 Upgrade the Disinfection System Buildings

The disinfection system buildings require upgrades to meet current codes. A description of improvements is provided below.

7.2.3.1 Chlorine Gas Storage Building and Sulfur Dioxide Gas Storage Building

The buildings require replacement with structures that can contain a gas leak and a scrubber system that can treat the leaking and contained gas. Details of the building will be provided during detailed design.

7.2.3.2 Chlorine and Sulfur Dioxide Equipment Buildings

The chlorinator and sulfonator equipment buildings will be reviewed for Code violations and brought up to Code standards. The room structures are anticipated to be acceptable for continued use, based on the visual inspections performed, but the HVAC systems may require upgrade. Details will be determined during detailed design.

7.3 Long-Term Corrective Action – Addition of Chlorine Contact Basin

A chlorine contact basin is needed to provide the required minimum chlorine contact time of 15 minutes at the peak flow rate of the WWTP (138 mgd). The tank size ranges from about 235,000 to 275,000 cubic feet, depending on whether or not the full allowance for the time in the existing discharge pipes is given as CT credit. A baffled, serpentine tank would be provided to minimize short circuiting potential and minimize footprint.

7.4 Alternative Disinfection Systems investigation

The existing chlorination / dechlorination system is a viable alternative for future plant use. With the danger of chlorine gas, and potential future restrictions on chlorine gas use, it may be prudent to review alternate disinfection technologies during detailed design. UV disinfection, sodium hypochlorite and paracetic acid are three disinfection alternatives that could be reviewed and may be beneficial to the City. In particular, if clarifier effluent can stay below the MDEQ-mandated limits for suspended solids, UV may be an attractive alternative. Sodium bisulfite is a dechlorination chemical that can be considered as an alternative to sulfur dioxide, as well.

Section 8

Biosolids Processes (Thickening, Digestion, Pumping, and Dewatering)

The existing biosolids process is in need of upgrade and replacement. The existing sludge thickening system is not effective in providing a properly thickened sludge and the process is also located in the wrong place in the process train (it should be before digestion, not after). Dewatering equipment owned by the City does not work properly or is out of service, and remaining equipment is rented; true redundancy is not available due to its lack of reliability. The building is not weathertight and has nets to collect solids that may drop from the roof. There is no cover over the stored solids, which exposes the solids to the weather, which may encourage pathogen regrowth.

The biosolids process includes thickening, digestion, dewatering and storage functions. Intermediate pumping is required, as well; the process train upgrades cannot be constructed as a 100% gravity flow system.

8.1 CPE Summary

Table 8-1 lists the following process limiting factors for the biosolids system.

Table 8-1 Performance Limiting Factors of Savanna Street WWTP's Sludge Handling Capability

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Thickening	A	Type 2
Sludge Dewatering	A	Type 2
Dewatering Building	B	Type 2
Dewatered Sludge Storage	B	Type 2
Sludge Disposal	C	None

As can be seen, the CPE has indicated replacement of the entire biosolids dewatering system and improvements to the thickening system.

8.2 Existing Facilities

A description of the existing facilities is included in the Biosolids TM. Because the system is being replaced, this description has not been moved forward. Please refer to Appendix I for information regarding the existing equipment and systems.

8.3 Overview of Alternatives Reviewed

The CPE report clearly indicates that replacement of equipment and upgrade/replacement of systems is required. As such, the CCP method used to address the CPE process limiting factors is

to present alternative evaluations and determine viability for replacing or upgrading the equipment and systems. It is noted that equipment recommendations are not made as part of the presentation. Please see Section 8.6 for information regarding this decision.

8.3.1 Sludge Thickening

The following alternatives were reviewed for sludge thickening:

1. Gravity Belt Thickeners
2. Rotary Drum Thickeners
3. Screw Thickeners

Thickening tanks were not considered for this project. The space constraints, construction of tanks within the water table, piping difficulties, and the fact that gravity thickening may not consistently meet the 5% solids requirements preferred for aerobic digestion, led to the decision to not evaluate gravity thickening tanks.

A summary of equipment characteristics is provided in Table 8.2.

Table 8-2 Technology Options for Thickening WAS

Technology	Description	Typical Thickened Solids, %	Justification
Gravity Belt Thickening (GBT)	Water is drained from flocculated solids on a fabric mesh belt; belt wash cleans belt before return to the influent end of equipment.	4% to 6%	Proven equipment with successful operating history. Long successful track record.
Rotary Drum Thickening (RDT)	Rotating drum conveys flocculated feed through basket; basket allows drainage of water with flocculated solids being retained.	4% to 6%	Enclosed process with operating history of similarly sized equipment.
Screw Thickening	Rotating screw conveys flocculated feed through inclined basket; mesh on basket allows drainage of water with flocculated solids being retained.	4% to 5%	No known U.S. installations for municipal WAS thickening in the size required.

All three processes were determined to be viable processes, but there are few screw thickener installations in the United States and none approach the size of the Savanna Street WWTP; the thickened sludge throughput is much smaller in other US installations.

8.3.2 Thickened Sludge Pumping

Pumping for any pump application in the thickening / digestion process will be by positive displacement pumps. Progressing cavity pumps and rotary lobe pumps should be considered.

8.3.3 Sludge Dewatering

The following alternatives were reviewed for sludge dewatering:

1. Belt Filter Presses
2. Centrifuges
3. Screw Presses

Design Criteria for dewatering are provided in Table 8.3 Advantages and disadvantages are summarized in Table 8-4.

Table 8-3 Dewatering Equipment Design Parameters

Parameter	Value
Design Average Plant Flow (mgd)	60
Digested Sludge Production (dppd)* Design Max Month Design Avg. Month	 72,500 61,000
Digested Sludge Volume (gpd)* Design Max Month Design Avg. Month	 288,000 238,000
Desired Weekly Operating Period (hrs)	80

Note: *Percent (%) assumed for digested sludge prior to dewatering.

Table 8-4 Dewatering Technology Advantages and Disadvantages

Alternative	Perceived Advantages	Perceived Disadvantages
Alternative 1: Belt Filter Press	▪ Startup and shutdown relatively quick ▪ Less noise than other alternatives ▪ Relatively low power and polymer consumption	▪ Open source of odor; OC may be required, but determine once ops begin. ▪ Relatively large footprint ▪ More operator attention than other alternatives ▪ More labor-intensive cleanup operations ▪ Significant washwater requirements ▪ Generates aerosols that could be harmful over time.
Alternative 2: Centrifuge	▪ Small footprint with high throughput ▪ Low staffing requirements, well-suited for unattended operation ▪ Small, contained odor source; no required odor control ▪ Relatively easy to clean ▪ Highest cake TS concentration of alternatives	▪ High power consumption ▪ Relatively noisy, higher vibration ▪ Slightly higher polymer use ▪ Expensive spare parts ▪ Major repair work performed by manufacturer

Alternative	Perceived Advantages	Perceived Disadvantages
	▪ Easy startup and shutdown	
Alternative 3: Screw Press	▪ Low staffing requirements, well-suited for unattended operation ▪ Low odor and noise levels ▪ Low power consumption ▪ Easy startup and shutdown ▪ Compact footprint ▪ Requires minimal operator attention ▪ Enclosed process	▪ Relatively new, performance history not as well documented as more established technologies ▪ Slightly lower cake solids ▪ Slightly lower throughput capacity may require more units or longer operation hours

All three equipment types have been determined to be viable alternatives. Further review, and a decision on best-fit technology, will be made as part of the preliminary design of the biosolids improvements.

8.3.4 Buildings

New buildings will be constructed to house the selected thickening and dewatering equipment alternatives.

A location for the thickening structure will be determined during preliminary design of the biosolids improvements project. At a minimum, considerations include footprint required, minimizing required pumping energy, minimizing pipe runs from aeration basins to thickener building, pumping or gravity flow from aeration basins to thickener building, and HVAC/odor control requirements. Installing a structure on top of the aeration basin central walkway can be considered, but structural concerns must be addressed with this alternative. Placing the thickeners in a reconfigured aeration pipe gallery is also a possibility, especially if the idea to route aeration tank feed piping on the outside of the basin, as shown in the biological process TM, Firgure 3-5, is incorporated into detailed design.

It is assumed that space exists directly to the east of the dewatered biosolids storage area for a new biosolids dewatering building. This location should be verified during detailed design.

8.3.5 Disposal

The assumption has been made that sludge disposal via spreading on City-owned property will continue. As such, the same level of processing as used today is acceptable moving forward.

8.4 Short-Term Corrective Actions

It is noted that Table 8-1 identifies the entire biosolids process limiting factor list as a Type 2, or short-term, improvement. As the CCP process evaluations were conducted, it was realized that, while the project could be completed within a two year time frame, the schedule compression of such a large scale project would likely drive the price of the project higher than if the project were to be completed under a "normal" schedule. The scale of this project would also have a negative impact on the City's Consent Decree cashflow.

With this background in mind, the City proposes to commence this project upon approval of the CCP document, but to schedule a three (3) year time frame for the design and construction of the work. This requested variance in the CPE schedule still maintains the high priority of the work but does it in a way that likely provides a lower project capital cost and improves the City's Consent Decree cash flow situation.

A cover over the dewatered biosolids storage area is still proposed to move forward as a short-term corrective action. An architectural fabric cover is proposed to cover the entire 100 x 140 space. Fabric partial sidewalls would be included to minimize windblown rainwater from entering into the facility, but the cover is not meant to be airtight; air circulation is encouraged, especially when wind can help with additional drying of the biosolids.

8.5 Long-Term Corrective Actions

The long-term corrective actions to be implemented are as follows (all decisions to be made during preliminary design of the biosolids improvements project):

1. Complete a life-cycle alternative analysis of sludge thickening and dewatering equipment and select the best-fit equipment for the City.
2. Design the improvements to the biosolids system.
    a. Thickening system and structure
    b. Digester improvements
    c. Dewatering system and structure
3. Construct the improvements to the biosolids system.

8.6 Decision Not to Select a Single Process Alternative

The thickening and dewatering processes evaluated as part of the CCP report are viable process alternatives. At this time, a single process alternative is not being selected. The primary reason why is known that load sharing between the Savanna Street WWTP, The Trahon WWTP, and the O.B. Curtis WTP is being discussed between the City and MDEQ. As this comes to fruition, the Permit nutrient removal levels will be changed for Savanna Street. These new levels may impact the quantity and characteristics of solids generated by the treatment process. A decision on equipment should be made based on the quantity and characteristics of solids and a life-cycle cost evaluation of the alternatives. This type of evaluation is beyond the scope of a CCP report.

1. The intent of the CCP process, as defined in the EPA documents, is NOT to provide a detailed evaluation of treatment alternatives for large capital projects.

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Section 9

Effluent/Stormwater Pump Station

The effluent pump station is a series of screw pumps that are used only when the gravity discharge to the Pearl River is flooded. A review of the system during the CPE phase determined that there were no process limiting factors for this facility. It is noted, however, that electrical system improvements and backup power improvements, which are described in the electrical TM and in Section 10 below, do impact the effluent pump station.

In accordance with the CPE, no work is recommended for the mechanical portions of the effluent pump station. It is recommended, however, that the detailed design engineer perform a review of the station as part of the Basis of Design report to confirm station status.

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Section 10
Plant Electrical System

The majority of the plant electrical system was installed in the early 1980s (or earlier). A review during the CPE phase and a subsequent independent review during the CCP phase reveal that, in essence, the entire electrical system is in need of upgrade or replacement. Numerous Code violations exist, much of the equipment is beyond its useful life, there is no reliable backup power supply, grounding systems are inadequate, and there are safety issues with the current system. While the Scope of the CCP is to address the process limiting factors identified in the CPE, the field review undertaken as part of the CCP revealed electrical system items that posed operational and safety concerns beyond those identified in the CPE. These items are included as part of this analysis.

10.1 CPE Summary

Table 10-1 lists the following performance limiting factors for the plant electrical system.

Table 10-1 Performance Limiting Factors for Savanna Street WWTP Electrical System

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Emergency Generator for Blowers	A	Type 3
Emergency Generator Repair	A	Type 2
Automatic Transfer Switch Repair	B	Type 2
Paralleling Equipment Repair	A	Type 3

In addition, a visual site inspection was conducted in January 2016 to confirm equipment status. The results of this inspection, and potential additional work generated from this inspection, are included in the Electrical TM.

10.2 Code Review

The January 2016 site inspection included a general Code review. Specific Codes include the following:

1. Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability (EPA-430-99-74-001)
2. National Fire Protection Association (NFPA) 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities
3. NFPA 70 - National Electric Code (NEC), Article 500
4. NFPA 70E - Standard for Electrical Safety in the Workplace

The visual inspection identified violations of all the above-referenced Codes. As any electrical work at the WWTP will by definition have to be upgraded to meet current Codes, it is anticipated that these violations will be eliminated as part of the Consent Decree work effort.

10.3 Condition Assessment

10.3.1 Condition Assessment Summary

In January 2016, a visual condition assessment was performed. Results of this inspection are summarized below.

In general, major electrical equipment has a service life of 20-25 years. Older equipment is usually more maintenance intensive and often harder to keep operational due to the lack of available spare parts. As part of the condition assessment, a rating was assigned to equipment inspected. Assessment rankings are as follows:

- "Good" is defined as being in good condition and capable of serving its intended use for over ten years with proper maintenance.
- "Fair" indicates the equipment is in a condition that requires attention to maintain reliable operation, and it should be scheduled for replacement within 5 years.
- "Poor" is defined as being in a condition that needs to be replaced. Equipment defined as "Poor" is at the highest risk for failure and should be replaced within 2-3 years.

Much of the existing distribution equipment is well past its design life and should be scheduled for replacement. The reliability of this equipment is questionable and higher maintenance costs are expected. The cost of maintenance will typically increase as equipment ages due to normal mean-time failures, but these costs can increase dramatically due to a major component, insulation, or equipment failure. These types of catastrophic failures result in operations downtime and higher repair costs.

A summary of condition assessments for the Savanna Street WWTP on a system-by-system basis is provided in Table 10-2, below.

Table 10-2 Summary of Condition Assessments

Equipment	Assessment Value	Comments
Incoming Power Supply	Fair	Only one power feed, not two.
Blower Building	Poor	Previous fire in one cabinet may have impacted other cabinets; multiple safety violations; no main-tie-main redundancy.
IPS	Poor	Multiple safety violations; majority of equipment is not in climate controlled area; fused breakers for backup power; no main-tie-main redundancy.
Preliminary Treatment	Fair	Code and safety violations
Aeration Basin, Digester, Pipe Gallery	Poor	Code violations; some equipment badly corroded
RAS Pumps 1-4	Good to Fair	Minor Code violations

Equipment	Assessment Value	Comments
RAS Pumps 5-6	Good	Minor Code violations
Clarifiers	Fair	Code violations
Biosolids	Poor	Code violations, no environmentally controlled spaces
UV	Poor	Equipment is abandoned
Chlorination	Poor to Good	Transformer and Distribution is good; panels in building are poor.
Effluent Pump Station	Poor	No main-tie-main redundancy
Old Effluent Building	Poor	Code violations
Admin Building	Fair	Only exterior was reviewed.
Backup Power	Poor	Three generators are abandoned. The one that works is not fueled. No reliability in this system.

As is demonstrated in the table, the electrical system is generally in poor shape and significant upgrades are required.

10.4 Overview of Alternatives Reviewed

10.4.1 Incoming Power Supply

Three alternatives were reviewed:

1. Do nothing.
2. Maintain the existing station but add capacity and equipment if needed for new plant loads.
3. Replace the station.

A secondary source of power to feed the substation is recommended if generator improvements are not made.

10.4.2 Major Equipment – MCC's and Motors, VFDs, Internal Power Distribution, Etc.

Four alternatives were reviewed:

1. Do nothing.
2. Rehabilitate equipment that can be rehabilitated and add new equipment to account for new work.
3. Replace equipment that can be replaced and add new equipment to account for new work.
4. Replace all electrical equipment – totally new system.

A system-by-system analysis is recommended during the design phase to confirm need, but the anticipation is that the majority of electrical equipment required replacement. Also, a secondary selective/main-tie-main power distribution system is recommended. The current distribution

system has multiple single point of failure locations throughout the plant. If one of these fail, the result can be cascading power failure through the plant. This is not considered to be a reliable system.

10.4.3 Conduit and Wire

Three alternatives were reviewed:

1. Do nothing.
2. Replace wire as necessary, based on review of system by system analysis.
3. Replace all conduit and wire.

While wire was not visually reviewed and conduit was only spot checked, a recommendation was made that, due to the assumed age of the conduit and wire, replacement of all conduit and wire should occur.

10.4.4 Backup Power System

Three activities were reviewed:

1. Determine the amount of backup power required at the plant
2. Rehabilitate existing generators.
3. Replace existing generators.

A new, centrally located backup power system is recommended.

10.5 Short-Term Corrective Actions

10.5.1 Repair or Replace Generators and ATSs

The field review of the existing generators and ATS devices confirmed that the need for replacement exists. Repair does not appear to be a viable alternative; the equipment is too old and replacement parts may be quite difficult, if not impossible, to find. This project is proposed to include a centralized, plant-wide generator system that covers the PLF of the blower generator, as well.

10.5.2 Electrical Improvements as part of Type 2 Mechanical System Improvements

For any mechanical process system improvements that are included under the Short-Term Corrective Actions activity, the electrical system upgrades required for the system will be included.

10.6 Long-Term Corrective Actions

10.6.1 Prepare Electrical Equipment Replacement Plan

The detailed design engineer should prepare a complete electrical system replacement plan. The plan should include redundancy and Code upgrades as well. This plan should be a priority study item within the Basis of design report.

10.6.2 New Switchgear, MCCs and Paralleling Equipment

Where existing switchgear, MCCs and paralleling equipment are not improved as part of any mechanical process system improvement, replace the equipment under this task. One example is the equipment at the effluent pump station.

10.6.3 Electrical Improvements as part of Type 3 Mechanical System Improvements

For any mechanical process system improvements that are included under the Long-Term Corrective Actions activity, the electrical system upgrades required for the system will be included. Examples of this include the biological process upgrades and electrical upgrades required for the influent pump station.

10.6.4 Incoming Power Supply Improvements

As part of the Type 3 improvements, a review of the incoming power supply will be undertaken. Key topics will be to insure that the substation can meet the ultimate power draw from the station and the need for a secondary source of power. Reliability (i.e. M-T-M) should be included to provide redundancy for critical plant processes.

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Section 11

Administrative, Operations and Maintenance

As noted previously, the Consent Decree mandates that Type 1 and Type 2 improvements are to be completed within 24 months of CCP approval and Type 3 improvements are to be completed within 60 months of CCP approval. The attached schedule proposes a work plan to meet this schedule. This schedule addresses project priority items while balancing cashflow to the extent practicable and providing multiple projects that will allow for maximum participation opportunities for contractors.

11.1 CPE Summary and Conclusions

11.1.1 CPE Summary

As part of the CPE Report, an analysis of SSWWTP Administration, Operations and Maintenance functions was performed. The analysis included a review of Plant Administration, Plant Staff, Maintenance, Operations and the Existing Operating Contract. A summary of these analyses is provided below.

Plant Administration. United Water Services, Mississippi LLC (UWS-MS) administers plant operations. It was noted that a plant O&M Manual exists, as well as written Standard Operating Procedures (SOPs) for certain pieces of equipment. The SOPs are maintained separately from the O&M Manual.

Dry weather operation was not discussed. In wet weather situations, plant staff monitor video of certain pumps, but have to operate the systems manually and the written procedure is to conduct a visual inspection at the pump stations every 1-2 hours, based on rainfall intensity. Plant staff have the authority to turn pumps on and off.

Plant Staff. UWS-MS's contract calls for a maximum of 48 full-time plant employees for 24/7/365 plant operation. As of May 2014, UWS-MS employed 44 people in full-time positions (including 12 licensed WWTP operators) and had working relationships with local colleges for internships. UWS-MS has a contract with a local company to provide emergency pumping. The staff appear to receive appropriate and ongoing training and can be cross-trained to gain skill sets in multiple areas of the plant.

Financial. UWS-MS's contract is for operations and maintenance only; capital funding is not a part of the contract and must be provided by the City. In recent years, capital project funding has been applied for by UWS-MS but not approved by the City, due to the lack of money. It was noted that major equipment failure prompts the City to seek outside contractors to perform the work; this leaves the damaged equipment unrepaired for long periods of time.

Maintenance. eRPortal is an asset management system used to manage preventive and corrective maintenance activity. UWS-MS uses this system for Jackson's three WWTPs and 98 lift stations.

Operations. The plant has an onsite laboratory for compliance sampling and logs the data in the Wastewater Information Management System (WIMS). Independent laboratories are also used when needed. Flow monitoring is provided daily, with process adjustment made when flow patterns change (dry to wet weather and back, for example).

Existing Operations Contract. The contract's main requirement is to not violate the plant NPDES permit. There are few operational milestones beyond this, and there is nothing in the contract to allow UWS-MS to perform capital repair work without permission from the City.

11.1.2 CPE Conclusions

Plant Administration. Pump control, which is now primarily a manual control function, should be changed to remote control based on flow rate and/or wetwell level.

Plant Staff. The plant appears to be right-sized for effective operation, but is not properly sized for emergency operation. Contracts with local companies are in place for emergency operation.

Financial. Capital improvement funding is generally not available, but is necessary. The majority of the plant mechanical systems are past their anticipated useful life.

Maintenance. Maintenance appears to be executed at a level that keeps the plant running. Preventive maintenance is helping to extend the life of the equipment and corrective maintenance is tracked to help determine when equipment needs to be replaced. UW-MS is performing this work on an "as necessary" basis, but the program is not a "comprehensive" program due to budget limitations on the capital side of the contract that prevents UW-MS from buying larger dollar value equipment and supplies.

Operations. Flow and compliance sampling are executed in-house, but some lab sampling is performed offsite. Plant operation is changed based on flow changes, but is performed manually.

Existing Operations Contract. The existing operations contract is inadequate to address proper maintenance and capital improvement for the WWTP and requires renegotiation or reprocurement by the City.

11.2 Alternative Analysis

11.2.1 IPS Pump Operation

The following alternatives to improve IPS pump control were reviewed.

11.2.1.1 Retain Current Pump Control Procedure (Do Nothing Alternative)

This procedure, which consists of plant operators having to manually control the operation of the pumps at the IPS, is inefficient and potentially dangerous to plant staff and is not recommended.

11.2.1.2 Provide Additional Automatic Pump Control

Providing additional pump controls is a viable alternative at the Savanna Street WWTP. "Additional" is defined as adding the least amount of control infrastructure needed to remotely control and monitor the critical equipment at the IPS. The "critical equipment" is defined as the pumps, the trash racks, and the power supply.

Instrumentation required to meet this alternative include (1) a high level float switch upstream of the trash racks to indicate a high water level and that the racks may need to be cleaned; (2) an ultrasonic level sensor to control pump operation based on wetwell level; (3) instrumentation for each pump to indicate the pump status (on/off) and if the pump has failed; (4) instrumentation to allow for remote start/stop operation of the pump; (5) instruments to monitor the power supply to verify that power is being fed to the screens and the pumps; (6) instruments to monitor that the backup power generators are working or have failed (generator upgrade and replacement is discussed in the Electrical System TM).

11.2.1.3 Provide Full Spectrum of Pump Control

Providing full spectrum pump control is a viable alternative at the Savanna Street WWTP. This alternative provides a SCADA system to monitor and remotely control the pump station from the main control room. It would provide the ability to control pump start/stop, adjust the pump speed if VFDs are used (See the IPS TM), remotely change the lead-lag sequence, monitor the pump motors for temperature and vibration, see the totalized pump run times and the water level in the wetwell and the trash rack channel by use of ultrasonic level sensors, obtain generator operational information, including the amount of fuel in the tank if a diesel generator is used, and remotely perform any and all pump station functions through the SCADA system. Float switches as described in 3.1.2 would be installed as backup systems in the event that the ultrasonic level sensors fail.

11.2.2 Capital Improvements

The current funding procedure for WWTP improvements is not meeting the needs of the SSWWTP. If the current lack of funding for capital improvements continues, eventually the WWTP will suffer an equipment or system failure that will result in a prohibitive discharge from the plant. This is a violation of the Consent Decree and is subject to penalty.

The following alternatives to improve the capital funding situation were reviewed.

11.2.2.1 Review Need Annually and Fund in City's Budget (Do Nothing Alternative)

As noted above, the current funding procedure is not meeting the needs of the SSWWTP. Capital funding is approved, but this funding is often diverted to resolve emergency operating and maintenance needs at the WWTPs or in the collection system. Continuing this procedure is not recommended.

11.2.2.2 Modify Funding Categories in the City's Budget to Fund Capital and Operations Expenses

An alternative to include a line item for capital funding and a line item for operating expenses that includes a contingency fund for emergency operations was reviewed. It was noted that there must be a commitment to keeping the contingency fund whole during a budget year, or this alternative likely would not be effective.

11.2.2.3 Delegate Capital Spending Authority to Contract Operator, with a City-Approved Cap

An alternative that delegates control over the capital spending of Savanna Street WWTP infrastructure to the contract operator was reviewed. The amount of capital expenditures would

be agreed to, and capped at this value, by the City and the operator. The operator then has flexibility to spend these at their discretion as needs arise in the plant. This is a viable alternative if the money is placed in an escrow account, or other secured form of account, to guarantee that the money is available to the operator. If the operator does not use it in the prescribed time period, the money reverts back to the City.

11.2.2.4 Note on Near-Future Capital Expenditures

It was noted that, over the next ten year period, capital expenditures outside of the Consent Decree program should be minimal. This should allow the City to develop an effective capital spending procedure that can be used beyond this ten year period, when capital expenditures are expected to increase.

11.2.3 Plant Operations, Maintenance and Capital Alternatives

The current operations and maintenance agreement with UWS-MS has not been executed and administered to achieve best results at the WWTP. Alternatives are described below that may provide more positive results for the City and future contract operators. It is noted that, as of the date of this document, a Request for Proposal is being advertised for a new Operations and Maintenance Contract.

11.2.3.1 Expand the Scope of an O&M Agreement and add Performance Goals

Expanding the scope of the O&M contract to add more plant responsibility – more control over predictive and corrective maintenance and control of the capital budget are two examples – but tie the operator's work to Key Performance Indicators (KPIs) that reward or penalize the operator based on performance is viable. It is noted that if these items are not included in the current RFP, the City could choose to add them as part of negotiations with the successful proposer.

11.2.3.2 Contract Operator Assumes Full Control of the System, but the City Retains Ownership of the Assets

Allowing the operator to assume full control of the operation, maintenance, and capital expenditures of the system, but tying them to KPIs as above, is viable. The operator would accept a higher level of responsibility, and liability, for plant results, but would expect more financial compensation, and may want control of sewer rates as part of the contract.

11.2.3.3. Sell the Wastewater System Assets to a Private Owner or Authority

Selling all or part of the system assets to a private owner or an authority is possible, but may have to wait until after some or all of the Consent Decree work is completed. There are multiple forms this sale could take – three examples are to sell just the WWTPs, to sell all physical plant (WWTPs and Sewage Lift Stations) or to sell all sewer system assets (physical plant and pipelines). This alternative may take City Council action, a vote of the City's population, and/or EPA approval. Further research is required, but a review of some advantages and disadvantages is provided below.

Advantages:

1. The City would be paid for selling the assets. This would provide a short-term boost to the City's economic ledger, or the payments could be annuitized to spread the economic impact out over a longer period of time.

2. The City delegates all financial responsibility and, if the contract is worded right, liability (or at least a portion thereof), for the portion of the system being sold.

3. Any financial expenditure associated with staff dedicated to the wastewater system (salaries, fringe benefits, pensions and the like) is eliminated.

4. Responsibility for meeting regulatory compliance, including NPDES permit compliance, would be assumed by the buyer.

Disadvantages:

1. The revenue stream from sewage bills would be eliminated.

2. The assets of the system that are sold would be removed from the city's property asset ledger and may be subject to taxation, as the sale is a source of revenue for the City.

3. While liability against lawsuits can be negotiated in the contract, it is possible that in the event of personnel accidents, permit violations, or mechanical failures that cause sewer overflows, the City could still be drawn into the litigation process.

4. While the system is now owned by a different entity and this entity would be responsible for meeting all regulatory requirements, the City does not "control" the owner to the extent that it "controls" their own staff or a contract operator. If the owner does not conscientiously execute the operation of the plant, the City can suffer a negative impact because the City sold the system to an owner who could not meet compliance requirements.

5. The City would no longer control rates. If the owner requested to significantly raise rates, there could be a backlash against the City for selling to an owner who is trying to gouge the population.

11.2.3.4 City of Jackson Resumes Operation of the Plan – No Contract Operator

The City would need to perform an analysis to determine if this alternative is viable for the City. Factors to consider are how the City would meet the staffing requirements of the system; if the City is ready to accept full responsibility for meeting all regulatory requirements of the existing NPDES and the requirements of the new NPDES, which will be issued in 2017; and the impacts and implications of making this change while under a Consent Decree.

11.2.3.5 Design-Build-Operate Alternatives to Administer the Consent Decree Work and Subsequently Operate the Plant

Design-build-operate (DBO) and design-build-operate-finance (DBOF) are alternative methods of plant operation that combine the execution of Consent Decree work with plant operation. The

City retains responsibility for financing of the improvements in DBO. In DBOF, the contracted firm is responsible not only for making the improvements and operating the plant after the improvements are made, they are also responsible for financing the work. Operation of the plant during construction can also be performed by the City's selected contract operator under the currently advertised RFP, if the City desires, but typically the BDO entity is the plant operator. These alternatives are attractive for the primary reason that it places total responsibility for constructing, operating and maintaining the plant for the present and the future in the hands of one contracted firm.

A full analysis of these alternatives is beyond the Scope of this report. The City would need to analyze these alternatives in much greater detail to determine if these are viable long-term alternatives that serve the City's best interests.

11.3 Conclusions and Recommendations

11.3.1 Conclusions

11.3.1.1 IPS Pump Operations

- The "do nothing" alternative is not an acceptable method of operating the IPS.
- Providing additional controls is a viable alternative; the station can be operated safely under this alternative and costs are minimized to the extent practicable.
- Providing full controls is a viable alternative; station performance can be optimized and the station can be operated safely, but costs are higher and some of the functionality may never be used, which would minimize any long-term financial benefit of paying for the functionality.

11.3.1.2 Capital Improvements

- The "do nothing" alternative is not meeting the needs of the City.
- Creating separate capital and operation funds, with an emergency operation expense contingency line item within the operating fund, is a viable alternative, but the commitment to funding the contingency line item must remain firm through a budget year for this to work.
- Delegating capital spending flexibility to the contract operator, with a spending cap agreed to by the City, is viable if the City approves an operations contract that includes contract operator capital spending authority and a spending cap.

11.3.1.3 Operations, Maintenance and Capital Alternatives

- Modifying the operating contract to expand operator authority and responsibility, but holding them to meeting KPIs, is viable. These conditions could be negotiated with the successful responder to the current contract operations RFP, if the City desires.
- Having a contract operator assume full operational control of the system, while the City retains the wastewater system assets, is viable. These conditions could be negotiated with the successful responder to the current contract operations RFP, if the City desires.

- Selling all or part of the City's wastewater infrastructure to a private owner or an authority is viable, but will may take approval from City council, a vote of the City's populace, and EPA approval. This may be a more attractive alternative in the future.
- Resumption of Wastewater System operation by the City requires further study by the City to determine if this is a viable alternative.
- Design-Build-Operate and Design-Build-Operate-Finance alternatives were mentioned as possible methods to combine the Consent Decree work with contract operations, but further analysis is required to determine if these alternatives are viable long-term alternatives that serve the City's best interests.

11.3.2 Recommendations

11.3.2.1 IPS Pump Control

It is recommended that "additional" pump system controls be added to allow for remote operation of the station, in accordance with paragraph 2.1.2.

11.3.2.2 Capital Improvements

It is recommended that the City develop a capital funding plan that can be executed more effectively than the existing procedure, preferably by setting up an emergency fund that provides a buffer to the capital fund, with the knowledge that capital improvements over the next ten years will likely be relatively small and an effective procedure can be developed.

11.3.2.3 Operations and Maintenance Contract

As of the date of this document, the City has an RFP advertised for contract operations. It is recommended that the City complete this process, but review the alternatives noted above and determine if there are benefits that can be gained by incorporating any of these alternatives into the RFP selection process

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Section 12

Proposed Project Schedule

As noted previously, the Consent Decree mandates that Type 1 and Type 2 improvements are to be completed within 24 months of CCP approval and Type 3 improvements are to be completed within 60 months of CCP approval. The attached schedule proposes a work plan to meet this schedule. This schedule addresses project priority items while balancing cashflow to the extent practicable and providing multiple projects that will allow for maximum participation opportunities for contractors.

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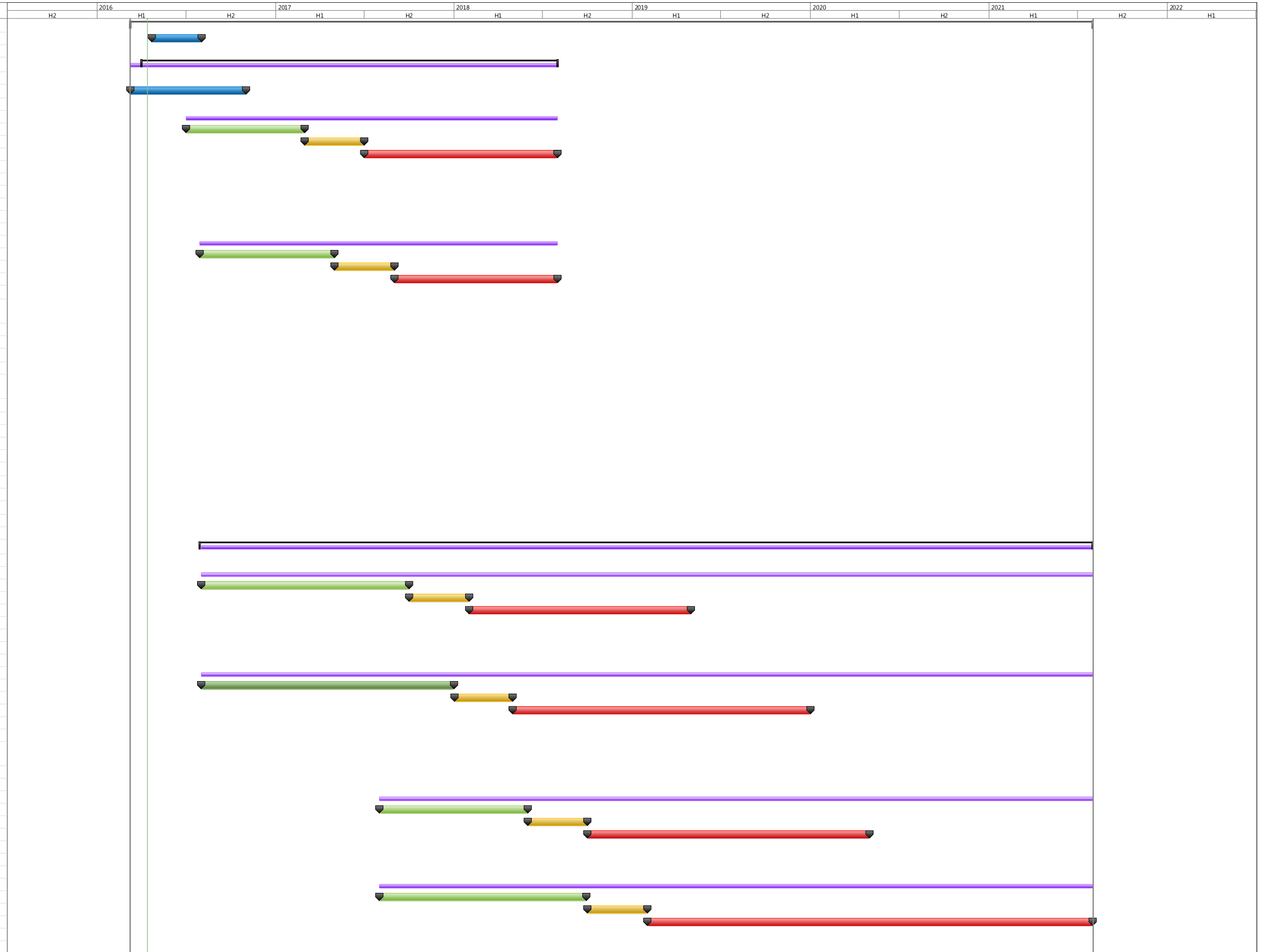
ID	Task Name	Calendar Days	Start	Finish
0	**Savanna WWTP CCP Schedule (4.11.16)**	**1971 days**	**Wed 3/9/16**	**Sat 7/31/21**
1	**EPA/MDEQ Approval**	102 days	Fri 4/22/16	Mon 8/1/16
2				
3	**Short-Term Corrective Actions**	**852 days**	**Fri 4/1/16**	**Tue 7/31/18**
4				
5	**Negotiate New O&M contract**	237 days	Wed 3/9/16	Mon 10/31/16
6				
7	**Project No. 1 Biological Process Improvements**			
8	**Design**	243 days	Fri 7/1/16	Tue 2/28/17
9	**Bidding and Award**	122 days	Wed 3/1/17	Fri 6/30/17
10	**Construction**	**396 days**	**Sat 7/1/17**	**Tue 7/31/18**
11	New Clarifier No. 6			
12	Clarifier mechanism replacement 1, 2 and 3			
13	Clarifier Splitter box modifications			
14	RAS flow meters			
15	RAS pump			
16				
17	**Project No. 2 Miscellaneous Plant Improvements**			
18	**Design**	276 days	Fri 7/29/16	Sun 4/30/17
19	**Bidding and Award**	123 days	Mon 5/1/17	Thu 8/31/17
20	**Construction**	**334 days**	**Fri 9/1/17**	**Tue 7/31/18**
21	**Influent Pump Station**			
22	Repairs to ex. Station (pumps, trash racks, structure) to maintain operation until new station is online			
23	Replace 84" line to EQ basin w/60" DIP			
24	Add remote/auto control to IPS pumps			
25	**Preliminary Treatment**			
26	Screen and grit chamber rehab			
27	Concrete modifications to improve hydraulics to anoxic basin effluent channel			
28	**Disinfection System**			
29	New chlorine feed equipment			
30	Feed Control Improvements			
31	New gas storage building			
32	Disinfection Equipment Building upgrades			
33	**Electrical**			
34	Repair/Replace existing generators & ATSs			
35	Distribution System Upgrades			
36	**Biosolids**			
37	Cover the Storage Area			
38				
39	**Long-Term Corrective Actions**	**1829 days**	**Fri 7/29/16**	**Sat 7/31/21**
40				
41	**Project No. 1 Biosolids Improvements**			
42	**Design**	426 days	Mon 8/1/16	Sat 9/30/17
43	**Bidding and Award**	123 days	Sun 10/1/17	Wed 1/31/18
44	**Construction**	**454 days**	**Thu 2/1/18**	**Tue 4/30/19**
45	New thickening process			
46	New dewatering equipment			
47	New dewatering building			
48				
49	**Project No. 2 Electrical Work**			
50	**Design**	518 days	Mon 8/1/16	Sun 12/31/17
51	**Bidding and Award**	119 days	Tue 1/2/18	Mon 4/30/18
52	**Construction**	**610 days**	**Tue 5/1/18**	**Tue 12/31/19**
53	Study-Recommended Improvements			
54	Install blower generator			
55	Replace MCCs, Switchgear and Paralleling Equipment			
56	Incoming Power Supply Modifications			
57				
58	**Project No. 3 - IPS and Preliminary Treatment**			
59	**Design**	304 days	Tue 8/1/17	Thu 5/31/18
60	**Bidding and Award**	122 days	Fri 6/1/18	Sun 9/30/18
61	**Construction**	**578 days**	**Mon 10/1/18**	**Thu 4/30/20**
62	New Influent Pump Station			
63	Preliminary Treatment Facility			
64				
65	**Project No. 4 - Biological Process and Disinfection**			
66	**Design**	424 days	Tue 8/1/17	Fri 9/28/18
67	**Bidding and Award**	123 days	Mon 10/1/18	Thu 1/31/19
68	**Construction**	**912 days**	**Fri 2/1/19**	**Sat 7/31/21**
69	New Biological Process			
70	New Chlorine Contact Tank			



Project: Savanna WWTP CCP S
Date: Wed 4/13/16

Task, Split, Milestone, Summary, Project Summary, Inactive Task, Inactive Milestone, Inactive Summary, Manual Task, Duration-only, Manual Summary Rollup, Manual Summary, Start-only, Finish-only, External Tasks, External Milestone, Deadline, Critical, Critical Split, Baseline, Baseline Milestone, Baseline Summary, Progress, Manual Progress, Slippage

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Appendix A

Comprehensive Performance Evaluation (CPE)

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Department of Public Works

200 South President Street
Post Office Box 17
Jackson, Mississippi 39205-0017

Tony Yarber
Mayor of the City of Jackson

May 30, 2014

Chief, Environmental Enforcement Section
Environment and National Resources Division
U. S. Department of Justice
Box 7611 Ben Franklin Station
Washington, DC 20044-7611
Re: DOJ No. 90-5-1-1-09841

Brad Ammons
Environmental Engineer
Clean Water Enforcement Branch
Municipal & Industrial Enforcement Section
U. S. EPA Region 4
61 Forsyth St., S. W.
Atlanta, GA 30303

Karl Fingerhood
Environmental Enforcement Section
U. S. Department of Justice
Box 7611 Ben Franklin Station
Washington, DC 20044-7611

RE: City of Jackson
EPA Consent Decree
Comprehensive Performance Evaluation - Savanna Street Wastewater Treatment Plant

Dear Gentlemen:

Enclosed, please find the Savanna Street Wastewater Treatment Plant Comprehensive Performance Evaluation. The evaluation was developed and submitted by the City of Jackson in accordance with EPA Consent Decree dated March 1, 2013. Paragraph 29 of the Consent Decree requires the City to submit to EPA for review and approval a comprehensive performance evaluation of the Savanna Street Wastewater Treatment Plant.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Tony T. Yarber, Mayor
City of Jackson Mississippi

Cc: Les Herrington, P.E., Mississippi Department of Environmental Quality
Gus McCoy, Chief Administrative Officer, City of Jackson
Monica Joiner, City Attorney, City of Jackson
Charles Williams, PhD., P.E., Interim Director, Department of Public Works, City of Jackson
Mary Carter, Deputy Director of Public Works, City of Jackson
Terry Williamson, Legal Counsel, City of Jackson
Public Depository, Eudora Welty Public Library

Department of
Public Works

Savanna Street Wastewater Treatment Plant

Comprehensive Performance Evaluation

May 2014

Final Report

CDM Smith

City of Jackson, Mississippi
Savanna Street Wastewater Treatment Plant
Comprehensive Performance Evaluation

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Charles Williams, Jr., Ph.D., P.E., Interim Director
Department of Public Works

5/28/14

Date

Savanna Street Wastewater Treatment Plant

Comprehensive Performance Evaluation

May 2014

Prepared for:

City of Jackson
Department of Public Works
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Prepared by:

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Appendix A Neel-Schaffer's Structural Analysis of IPS

Section 1
Introduction to the Savanna Street WWTP Comprehensive Performance Evaluation

On March 01, 2013, the City of Jackson, Mississippi (City) entered into a Consent Decree with the United States Environmental Protection Agency (EPA) and the Mississippi Department of Environmental Quality (MDEQ). As required by the Consent Decree, the City must develop, complete, and submit a Comprehensive Performance Evaluation (CPE) prior to June 1, 2014 for the Savanna Street Wastewater Treatment Plant (plant). This CPE report is a summary of the evaluation conducted on the plant to identify performance-limiting factors (flow and/or loading rate restricted treatment process units) within the plant. The following sections will review and assess the existing condition of the plant's unit processes and operations by quantifying their performance as described in the EPA's two guidance manuals, *Improving POTW Performance Using the Composite Correction Approach* and *Retrofitting POTW's*. Upon the approval of the CPE by EPA, a Composite Correction Plan (CCP) will be developed to identify rehabilitation and/or upgrades to the plant to address the issues (deficiencies) identified within the CPE. Submittal of the CCP is scheduled to take place no later than 12 months following the approval of the CPE. The CDM Smith team responsible the CPE development is comprised of CDM Smith, Gibson Engineering, Neel-Schaffer, Crown Engineering, and MAC and Associates.

The objective of this section is to provide an overview of the purposes and objectives of the CPE report as well as the evaluation process used by the CDM Smith team to develop this report.

1.1 Objectives of the CPE Report

As defined within the Consent Decree, the CPE will consist of an "in-depth diagnostic evaluation of the capacity and operation of the Savanna Street Wastewater Treatment Plant (WWTP) and its ability to comply with the National Pollutant Discharge Elimination System (NPDES) Permit including eliminating Prohibited Bypasses. Based on this evaluation, the CCP shall identify rehabilitative needs and corrective actions to address problems identified in the CPE which shall be completed on or before sixty (60) months after EPA's approval of the CCP." The objectives of the CPE are "to identify flow and/or loading rate restricted treatment process units at the Savanna Street WWTP" and will include the following:

a) Evaluation of the plant's capacity and operations as well as its ability to provide secondary treatment to all dry and wet weather flow and meet all terms of the NPDES permit

b) Major unit process evaluation

c) Identification of performance-limiting factors

d) Projected impact of a CCP to address issues identified within this report

The CPE uses a point system to evaluate the basic unit processes and compares the points against EPA's criteria in the publications cited above to assess whether the WWTP is rated Type 1, Type 2, or Type 3 as defined below:

Type 1 WWTP – CPE indicates performance problems (or potential performance problems) are not a result of unit process capacities, but are related to operation, maintenance, administration, or to facility problems that can be corrected with minor modifications.

Type 2 WWTP – CPE indicates performance problems may be related to marginal capacity or one or more major unit processes; major facility modifications are likely required.

Type 3 WWTP – CPE indicates one or more major unit processes does not have sufficient capacity; major modifications or facility replacement are required.

As required by the Consent Decree, Type 1 and Type 2 remedial measure for the plant shall be completed no later than 24 months after EPA's approval of the CCP. Type 3 remedial measures are required to be executed no later than 60 months after the CCP's approval.

Contained herein is the assessment for each of the major unit processes which received a remedial measure type designation as described above. For each unit process, performance limiting factors were identified and assigned factor rating as follows:

A Rating – CPE indicates major performance effect on long-term, repetitive basis

B Rating – CPE indicates minimum performance effect on routine basis, or major effect on a periodic basis

C Rating – CPE indicates minor performance effect

1.2 The Evaluation Process

The CDM Smith team began the evaluation process with data collection as described within the EPA handbook, *Improving POTW Performance Using Composite Correction Program Approach*. This process was initiated with a kickoff meeting held on December 18, 2012. Following the kickoff meeting, the team conducted its first official plant tour on January 24, 2013 in which the entire team had an opportunity to inspect the different unit processes beginning with the influent pump station (IPS) to the solids handling area. Once the preliminary activities were completed, the data assessment process commenced

Development of the peak design flows for the plant are included as part of Section 2.

1.3 Savanna Street WWTP Plant and Process Description

The plant was originally constructed as a lagoon treatment system with three stabilization ponds and three smaller polishing ponds. Following the construction of the mechanical treatment plant in the early 1970s, the three lagoons were converted into equalization (EQ) basins and the three polishing ponds were abandoned.

The mechanical portion of the treatment plant is a conventional activated sludge facility without primary clarifiers. Single-stage ammonia removal was added in 2000 and was the last addition to the

plant's configuration. Flow into the plant is received through the 50-ft deep West Bank interceptor. The West Rankin force main and several smaller interceptors also discharge to the West Bank interceptor upstream of the IPS. Figure 1-1 is a schematic which illustrates the plant's major unit processes beginning with the IPS (excluding solids handling). Figure 1-2 is a schematic of the plant's solids handling.

As currently designed, the plant has an average daily capacity of 46 MGD and a peak hour design capacity of 90 MGD. During wet weather, the plant experiences significant inflow/infiltration (I/I) and has received flows as high as 163 MGD, requiring high bypass rates to prevent treatment unit upsets such as solids washout within the mechanical portion of the plant. Flows entering the plant from the IPS first pass through the plant's headworks structure which includes bar screening and grit removal. The flow then enters the anoxic selector to reduce the growth of filamentous bacteria before arriving at the plug flow rectangular aeration basins. From the aeration basins, the flow moves to the final clarifiers via a central splitter box. Flow then progresses through the disinfection process before being discharged into the Pearl River via gravity flow or the effluent pump station. During incidences of elevated flows above the mechanical plant's capacity, a portion of the flow is diverted to the EQ basins for temporary storage until a time when the mechanical plant can process the flow. Solids generated from the operation of mechanical plant are sent to solids processing as described in Section 8.

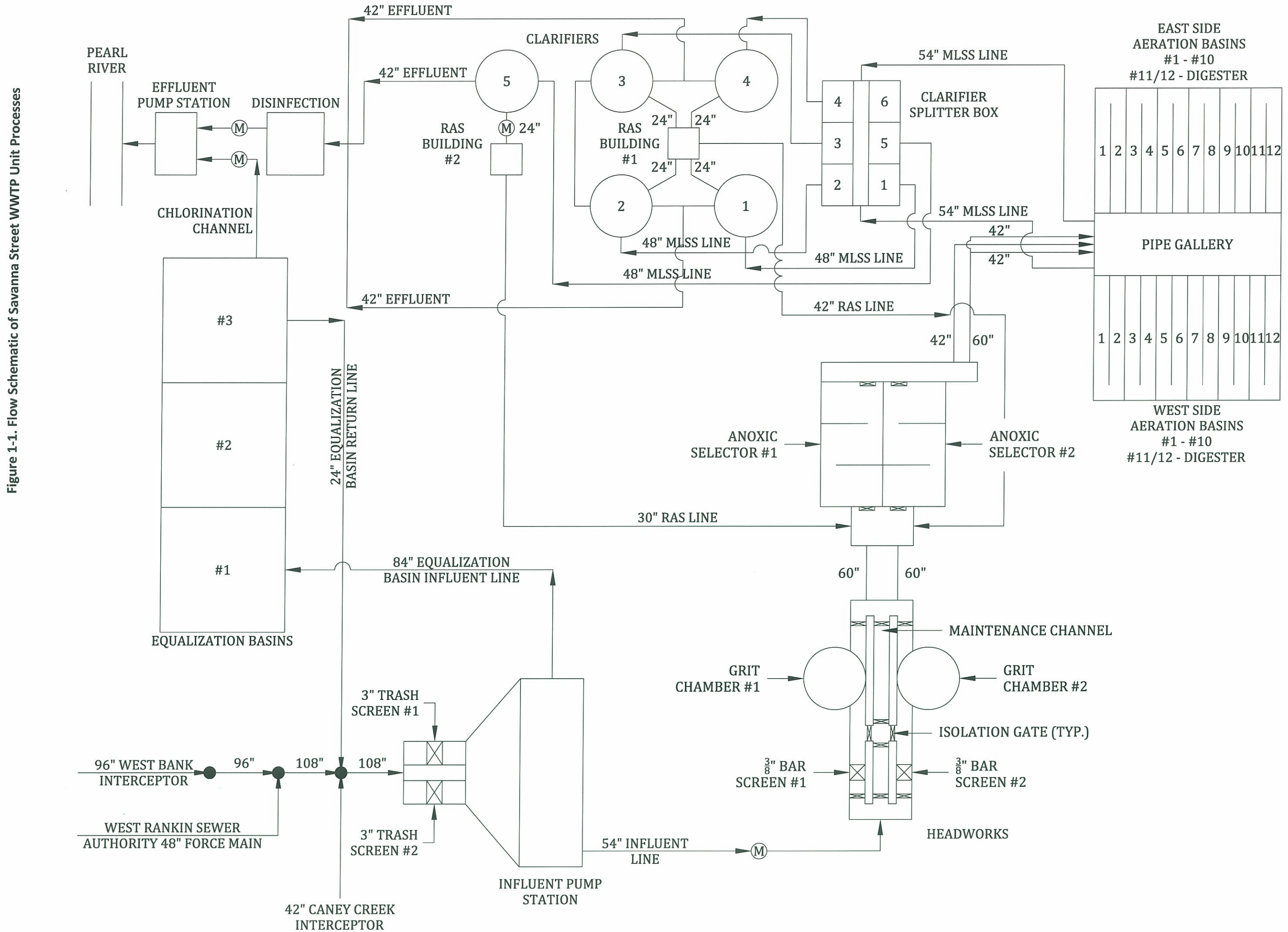
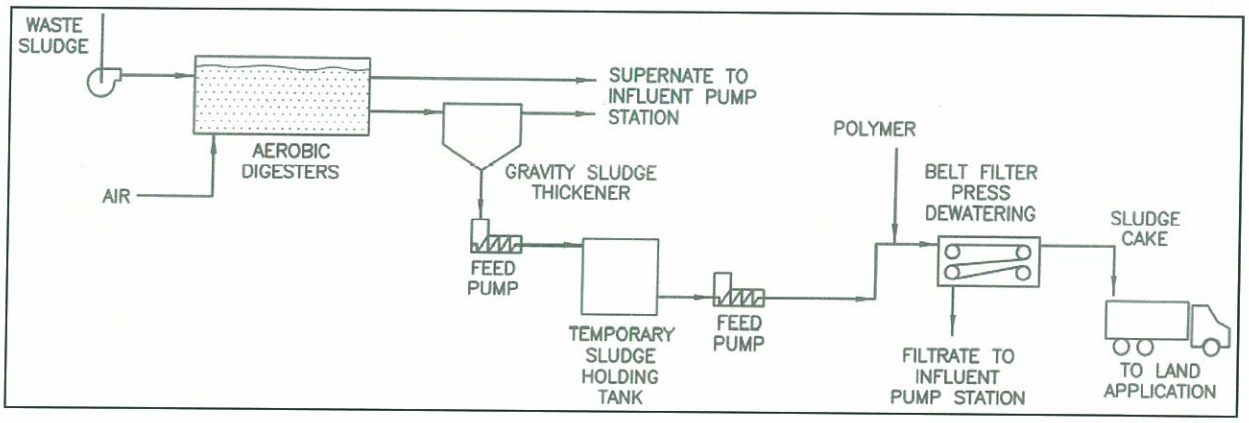


Figure 1-1. Flow Schematic of Savanna Street WWTP Unit Processes

Figure 1-2. Flow schematic of Savanna Street WWTP Solids Handling Facilities



Section 2
Development of Peak Design Flow

The objective of this section is to summarize the approach utilized in determining the peak design flow for the plant which meets the requirements as described in the Consent Decree, as well as, provide the WWTP a maximum capacity necessary to achieve current and anticipated future regulatory compliance. The plant's historical data will also be assessed to identify critical events in the wastewater collection and transmission system (WCTS) and determine the most representative span of flow data for the determination of peak design flow.

2.1 Flow Data

For use in development of the CPE, the CDM Smith team was provided historical flow data for the plant from January 2005 through September 2013 by United Water Services Mississippi, LLC (UWS-MS), the City's contract operator. This flow data was assessed for accuracy including any anomalies/outliers, which could potentially skew the final peak design flow. Additionally, the CDM Smith team used the flow data to identify any major events within the WCTS system (i.e. line breaks, toppled manholes, etc.) that would be remediated as part of the Consent Decree. The Consent Decree allows for a peak design flow to include the anticipated wet weather flow following the execution of I/I reduction efforts in the WCTS. Once the most representative segment of the data was identified, it was utilized for generation of the design flows which shall be referenced throughout the entirety of the CPE and CCP.

Additional influent metering stations are to be installed in December 2013 or early 2014 on the West Bank Interceptor, the Caney Creek Interceptor, and the West Rankin Utility Authority's Force Main. CDM Smith will continue to monitor readings from these stations to ensure proper peak design flows are utilized for the duration of the CPE and CCP. If an updated trend is observed from the new metering stations, the peak design flow will be revised as necessary to accommodate the plant's influent data. The new metering stations will capture the 2013-2014 winter wet season and will provide updated data as to the contributions from the City's West Bank Interceptor, Caney Creek Interceptor, and West Rankin Utility Authority's Force Main.

All flow analysis is based upon daily flow rates as recorded by the plant's existing effluent flow parshall flumes. Using the 105 months of daily flow data, the peak flows entering the plant for both the 30 and seven day events (highest 30 and seven days of successive influent) were calculated and used to develop the peak design flows.

2.2 Flow Data Analysis

Per the entire flow data set, the maximum 30 day average for total effluent leaving plant, 101 MGD, occurred beginning December 28, 2012 until January 26, 2013. The maximum seven day average total effluent was calculated at 140 MGD which occurred from January 15, 2013 to January 21, 2013. The peak day effluent flow was 163 MGD and occurred on 1/16/2013. However, the 105 months of data indicate a critical event on December 10, 2008 in which the daily influent entering the plant increases sharply. This trend of increased daily influent flow continues until August 2013. The CDM Smith team isolated the 2008 event and hypothesized it as being the result of a partial toppling of a 48-in manhole

stack on the 48-in Lynch Creek Interceptor. The partially toppled manhole is located within the flood levees and was found and repaired in summer of 2013. The highest elevation of the 48-in manhole riser after toppling was estimated to be approximately 261. The Pearl River level was above elevation 261 for 11 days between January 1, 2005 and December 10, 2008 and for 81 days between December 11, 2008 and September 30, 2013. During the span of data analyzed, the Pearl River reached an elevation of 265. As a result of these high river elevations, inflows as high as 45 to 50 MGD could have been entering the system through the partially toppled manhole riser. A determination was made that all data following December 2008 would not be used for this IPS assessment. Therefore, the January 2005 through December 10, 2008 data was determined to be the most representative span of flow data for the determination of the IPS capacity.

Per the January 2005 through December 10, 2008 flow data set, the maximum 30 day average for total effluent leaving plant, 66 MGD, occurred between February 23, 2006 until March 24, 2006. The maximum seven day average total effluent was calculated at 105 MGD which occurred from February 25, 2006 to March 3, 2006. The peak day effluent flow was 124 MGD and occurred on February 25, 2006 during a 2.7 inch rain event.

Using the 30 day and seven day average peak flow events, an interactive Excel model was developed for assessment of the flows to illustrate the maximum required influent treatment capacity of the mechanical plant versus the EQ basin storage capacity (constant value). The purpose of running simulations on the model was to better estimate (and support) the peak influent flows entering the plant, which could be sufficiently treated by the mechanical portion of plant without incurring a prohibited bypass. For purposes of this CPE, a "prohibited bypass", as defined by the Consent Decree, may include occurrences of raw wastewater being intentionally diverted to the EQ basins, chlorinated in chlorination channel, and subsequently discharged without receiving biological treatment from the mechanical portion of the plant. For the EQ basin storage capacity, the original design storage volume shown in the set of 1970 record drawings is approximately 150 million gallons (MG); however, for this assessment, a more conservative storage value of 140 MG was used as the set storage volume to account for periodic solids buildup. From the simulations run using the flow data of both the peak 30 and seven day events, the required capacity of the mechanical portion of the plant must be equal to approximately 90 MGD as illustrated in Tables 2-1 and 2-2. Consequently, based on the analysis of the data and this interactive model, the mechanical portion of the plant must be able to treat an influent flow of 90 MGD for the modeled peak 30 and seven day flow events to avoid a prohibited bypass. Upgrades to the mechanical plant will be assessed in further detail in the CPE.

As required by Consent Decree (""one (1) hour peak flow" shall mean the greatest flow in a sewer averaged over a sixty (60) minute period at a specific location expected to occur as a result of a representative 2 year-24 hour storm event"), the flow data was compared to the area's two year frequency storm event to ensure a sufficient confidence interval for the peak design flow selected (i.e., the area's rainfall data was examined to ensure that the peak design flow value was comparable to the influent flow generated by the two year confidence interval storm event). Using intermittent rainfall data from January 2008 to May of 2013, there has only been one 24-hour event observed which equals and/or exceeds the area's two year, 24-hour duration rainfall event of 4.5". The 4.7" event occurred on December 11, 2008 and the corresponding 24-hour average peak flow of 130 MGD at the plant was recorded during the following 24-hour period on December 12, 2008. Furthermore, it should be noted that due to the system's suspected I/I issue upstream of the plant, the analysis of plant flow data

required strict consideration of not only the area's storm events, but also the Pearl River stages as described in the following section.

2.3 Effects of I/I on Flow Entering Plant

An indication of high I/I within the system is demonstrated within Graphs 2-1 and 2-2, which compares the plots of the area's rainfall versus the plant's flows. As a result of this apparent correlation, storm events are a critical variable in determining the peak design flow as noted in previous Section 1.1. Another variable which required consideration in the development of a peak design flow was the stages of the Pearl River as illustrated in Graph 2-3. Because there is a natural connection between the river stages and wet weather events, both variables are included as part of this assessment. As shown in the three graphs, the influent flow into the plant tracks relatively closely with both the area rainfall and the daily average Pearl River stages; however, the most apparent relationship observed from the graph is the exceptionally high influent flow entering the plant during the river stage peaks. When the river elevation exceeds approximately 261 (27.3 ft stage), there is a corresponding hike in the influent flow into the plant. The NOAA website lists the "action" and "flood" elevations of the Pearl River below Ross Barnett Reservoir at 257.7 and 261.7, respectively. From the data, it can be assumed the two plots do not track as closely at the lower river elevations because the river is flowing well below levels where bank overtopping occurs. The graph makes a strong case for the hypothesis that when the river is flowing outside the banks (as was case for majority of the first quarter of 2013), the high flow into plant may very well be influenced/increased from river water entering through one or more point sources such as a missing manhole cover and/or toppled manhole stack(s). During development of this CPE, one incident of a toppled manhole was identified on the Lynch Creek Interceptor. The data indicates the manhole may have toppled as early as December 2008. Inflow/infiltration from this particular 48-in toppled manhole has the potential for adding 40 to 50 MGD to the plant's influent flow.

Based upon the observations above the rehabilitation of the West Bank Interceptor, which is also part of the Consent Decree, may have a significant impact on I&I related flows into the plant. However, until the project is under construction, it is not possible to quantify the precise value of I/I contributing to flows into the plant.

2.4 Determination of Peak Design Flow

From the analysis provided in the previous paragraphs, a peak design flow of 120 MGD was derived for this CPE. This 120 MGD flow captures daily average flows from peak wet weather events occurring between January 1, 2005 and December 10, 2010 while meeting the criteria required by Consent Decree. Ninety MGD of the 120 MGD is the quantified peak capacity of the mechanical portion of the plant following the completion of upgrades/modifications as required by the Consent Decree. The remaining 30 MGD of the peak design flow is to be pumped into the EQ basins and subsequently returned to the West Bank Interceptor. The flow from the West Rankin Utility Authority can be directly diverted to the equalization basin during peak flow periods giving a total plant influent flow of 150 MGD. With the average daily effluent from the data set equal to approximately 40 MGD, the 150 MGD peak design flow provides an hourly peaking factor of approximately 3.75. Furthermore, the 150 MGD peak design flow provides capacity for future growth in area contributing wastewater to the plant.

Table 2-1.

Savanna Street WWTP

Equalization Basin/Treatment Capacity Matrix

Maximum Influent Treatment Capacity =	90.0	MGD	Flow through mechanical plant
Current Savanna St. EQ Basin Volume =	140.0	MG	

30 Day Max Flow Event*		Max Qin (MGD)				Qout	EQ Basin Volume	
Date	Day	Total Qin (MGD)	QRin, Return Flow Included** (MGD)	Max Influent Treatment Capacity (MGD)	Additional Influent Q (MGD)	Total Treated Effluent, Qout, (MGD)	Volume Diverted to EQ Basin (MG)	Cumalitive Volume (MG)
12/28/2012	0	71.9	71.9	90.0	0	90.0	0	0.0
12/29/2012	1	47.7	47.7	90.0	0	90.0	0	0
12/30/2012	2	124.4	124.4	90.0	34.4	90.0	34.4	34.4
12/31/2012	3	100.8	100.8	90.0	10.8	90.0	10.8	45.2
1/1/2013	4	92.6	92.6	90.0	2.6	90.0	2.6	47.8
1/2/2013	5	109.0	109.0	90.0	19.0	90.0	19.0	66.8
1/3/2013	6	105.9	105.9	90.0	15.9	90.0	15.9	82.7
1/4/2013	7	105.8	105.8	90.0	15.8	90.0	15.8	98.5
1/5/2013	8	93.8	93.8	90.0	3.8	90.0	3.8	102.3
1/6/2013	9	84.1	186.4	90.0	96.4	90.0	96.4	96.4
1/7/2013	10	71.4	167.8	90.0	77.8	90.0	77.8	77.8
1/8/2013	11	45.2	123.0	90.0	33.0	90.0	33.0	33.0
1/9/2013	12	39.2	72.2	90.0	0	90.0	0	0
1/10/2013	13	36.0	36.0	90.0	0	90.0	0	0
1/11/2013	14	59.8	59.8	90.0	0	90.0	0	0
1/12/2013	15	59.2	59.2	90.0	0	90.0	0	0
1/13/2013	16	44.1	44.1	90.0	0	90.0	0	0
1/14/2013	17	38.3	38.3	90.0	0	90.0	0	0
1/15/2013	18	37.6	37.6	90.0	0	90.0	0	0
1/16/2013	19	36.9	36.9	90.0	0	90.0	0	0
1/17/2013	20	38.5	38.5	90.0	0	90.0	0	0
1/18/2013	21	34.9	34.9	90.0	0	90.0	0	0
1/19/2013	22	34.9	34.9	90.0	0	90.0	0	0
1/20/2013	23	40.2	40.2	90.0	0	90.0	0	0
1/21/2013	24	61.8	61.8	90.0	0	90.0	0	0
1/22/2013	25	103.9	103.9	90.0	13.9	90.0	13.9	13.9
1/23/2013	26	87.7	101.6	90.0	11.6	90.0	11.6	11.6
1/24/2013	27	57.7	69.3	90.0	0	90.0	0	0
1/25/2013	28	55.3	55.3	90.0	0	90.0	0	0
1/26/2013	29	58.5	58.5	90.0	0	90.0	0	0
	AVG =	***65.9***	***MGD***					

* Based on 7 year flow record from Savanna Street WWTP

** Stored wastewater returned from EQ Basins to head of Plant (occurs when "Total Qin"<"Maximum Influent Treatment Capacity")

Excess Volume Over Current EQ Basin Capacity =	-37.7	MG

Table 2-2.

Savanna Street WWTP

Required Influent Treatment Capacity/Equalization Basin Matrix

Maximum Influent Treatment Capacity =	90.0	MGD	Flow through mechanical plant
Current Savanna St. EQ Basin Volume =	140.0	MG	

7 Day Max Flow Event*		Max Qin (MGD)				Qout	EQ Basin Volume	
Date	Day	Total Qin (MGD)	QRin, Return Flow Included** (MGD)	Max Influent Treatment Capacity (MGD)	Additional Influent Q (MGD)	Total Treated Effluent, Qout, (MGD)	Volume Diverted to EQ Basin (MG)	Cumalitive Volume (MG)
02/25/06	0	124.4	124.4	90.0	34.4	90.0	34.4	34.4
02/26/06	1	100.8	100.8	90.0	10.8	90.0	10.8	45.2
02/27/06	2	92.6	92.6	90.0	2.6	90.0	2.6	47.8
02/28/06	3	109.0	109.0	90.0	19.0	90.0	19.0	66.8
03/01/06	4	105.9	105.9	90.0	15.9	90.0	15.9	82.7
03/02/06	5	105.8	105.8	90.0	15.8	90.0	15.8	98.5
03/03/06	6	93.8	93.8	90.0	3.8	90.0	3.8	102.3
	AVG=	*104.6*	*MGD*					

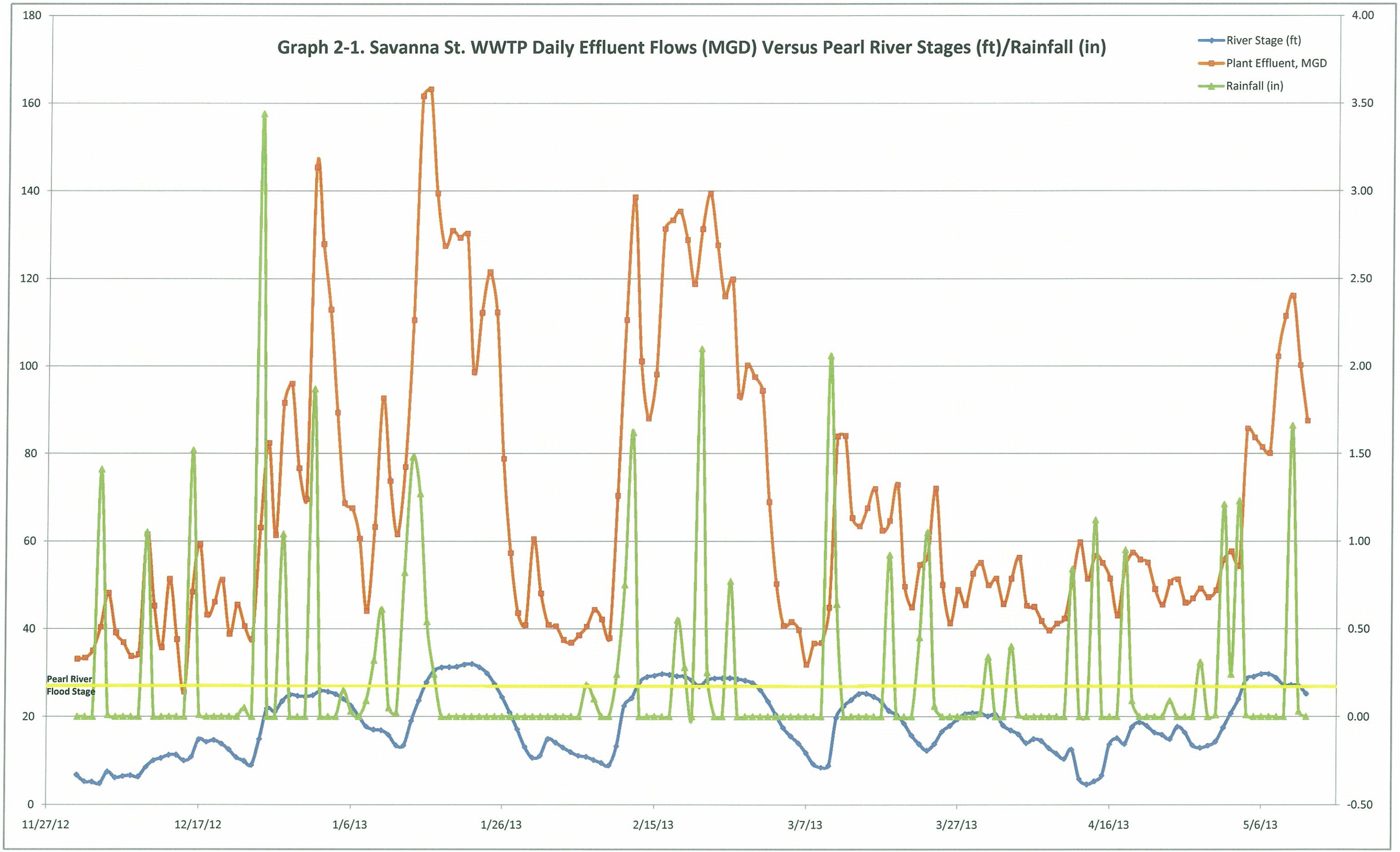
* Based on 7 year flow record from Savanna Street WWTP

** Stored wastewater returned from EQ Basins to head of Plant (occurs when "Total Qin"<"Maximum Influent Treatment Capacity")

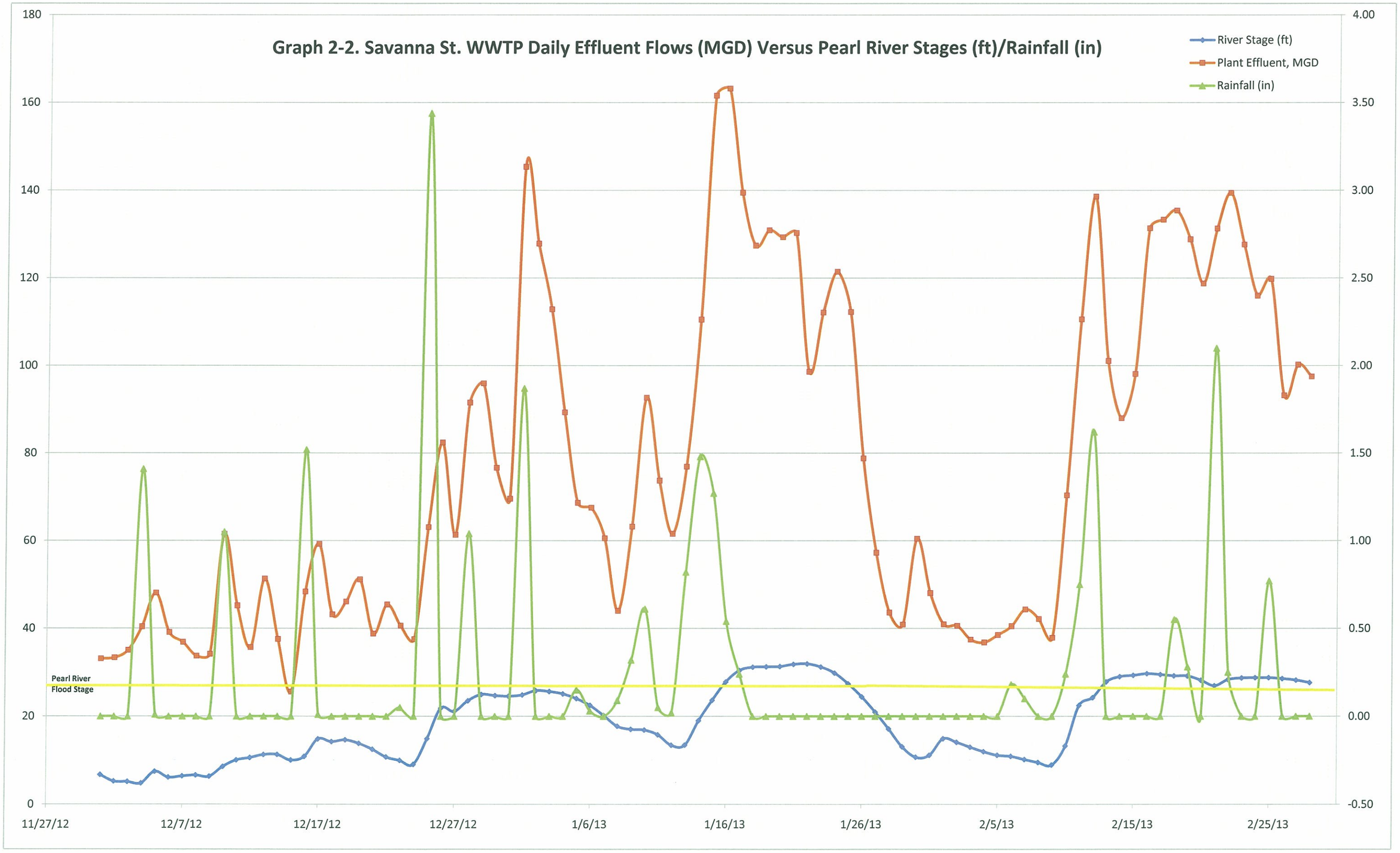
Excess Volume Over Current EQ Basin Capacity =	-37.7	MG

CDM Smith

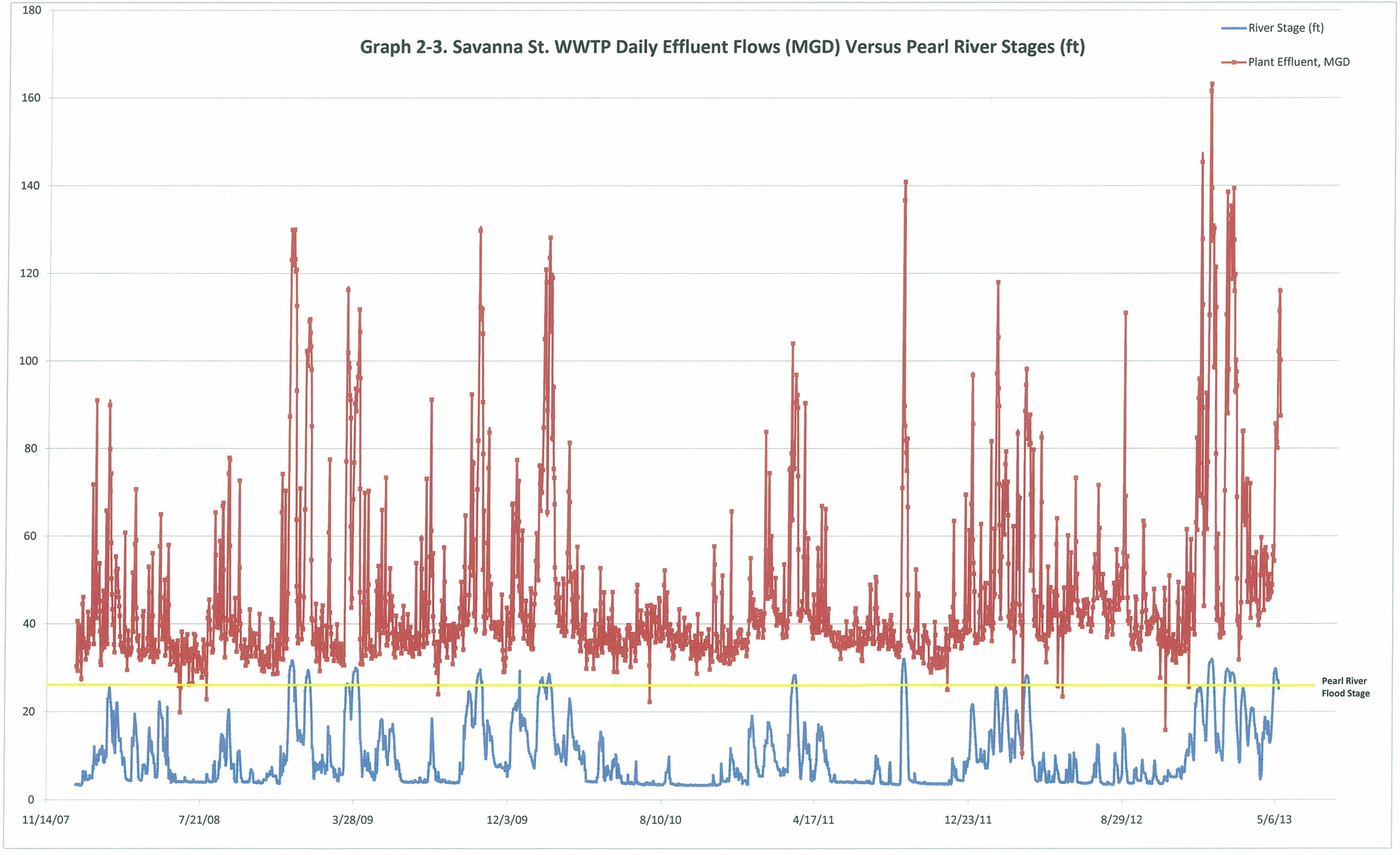
Graph 2-1. Savanna St. WWTP Daily Effluent Flows (MGD) Versus Pearl River Stages (ft)/Rainfall (in)



Graph 2-2. Savanna St. WWTP Daily Effluent Flows (MGD) Versus Pearl River Stages (ft)/Rainfall (in)



Graph 2-3. Savanna St. WWTP Daily Effluent Flows (MGD) Versus Pearl River Stages (ft)



Section 3

Assessment of Savanna Street WWTP Hydraulics

Part of the CPE evaluation process includes assessment of the plant's hydraulics. Poor plant hydraulics can severely affect a treatment facility's performance and its ability to meet design flows, thus resulting in excessive plant bypassing.

For this report, the hydraulics for the piping, which connect the basins of each individual process unit, was modeled and assessed using WaterCAD software. Additionally, hydraulic issues, within specified basins, as reported by the United Water Services Mississippi, LLC (UWS-MS) personnel have been included as part of the overall hydraulic analysis. The following sections will detail the results of these hydraulic assessments and identify areas as possible "bottlenecks" or limiting zones within the plant.

3.1 Existing Plant Hydraulics

From the point where the influent flow enters the influent chamber of the headworks to the plant outfall point, the flow is conveyed through each treatment unit via gravity flow. The plant is currently sized to treat an average daily flow of 46 MGD and a peak flow of 90 MGD. Assuming the continued flow monitoring does not require an increase in the plant's peak design flow, the hydraulics for this report will be assessed for peak design flow of 90 MGD. As discussed in Section 2, a peak design flow of 90 MGD was verified for the mechanical plant in order to sufficiently meet the plant's current and future treatment needs and stay within compliance of the City's NPDES permit.

The existing plant hydraulics were assessed to identify possible hydraulic restrictions and to determine the maximum hydraulic capacity of the treatment units without overtopping the walls of the existing structures. Once the maximum hydraulic capacity of the plant is assessed, recommendations for improvements pertaining to both the capacities of the unit processes and how they are operated will be made as part of the CCP.

The first step in the hydraulic assessment was the determination of hydraulic boundaries or elevation controls. The final model of the plant's hydraulics was broken into three separate models, which encompassed the piping between the separate treatment units. The first model was developed beginning at the outlet of the anoxic basin and ending at the aeration basins. The second model began from the effluent piping from the aeration basins to the clarifier splitter box. The final model included boundaries beginning at the clarifier splitter box and captured piping to the secondary clarifiers. From the analysis of the hydraulic modeling results in addition to the inspection conducted during multiple site visits, the most apparent points of hydraulic restriction are the headworks and the clarifier splitter box.

Based on known occurrences of overtopping within the mechanical portion of the plant at flows below the 90 MGD peak, it is apparent that the plant struggles to treat a sustained 90 MGD flow. This inability to treat the peak design flow is due partly to inadequate freeboard at the headworks and clarifier splitter box. Additionally, improper operation of gates as well as a lack of hydraulic controls may also be contributing to overflow issues within mechanical plant.

As discussed in **Section 6** of the CPE, the plant's headworks experiences overtopping of the basin walls during periods of high flow. The hydraulic capacity of the headworks basin is adversely affected in cases where mechanical headworks equipment, such as the bar screens and/or grit chambers, malfunction and must be taken offline for repairs, thus resulting in a hydraulic bottleneck.

The clarifier splitter box is another point of restriction in the plant's hydraulic capacity. The box was designed to distribute flows to the secondary clarifiers. With the existing conditions, weirs within the splitter box have to be adjusted to maintain an even flow between the clarifiers. With the current flows, a portion of the top rim of the splitter box required a retrofitted raised lip to reduce instances of overtopping.

The aeration basin system, with its high freeboard, is the only unit process that can, with minimal modifications, adequately treat the peak design flow of 90 MGD.

3.2 Performance Limiting Factors for Plant Hydraulics

Following the EPA CCP approach, the plant's hydraulics have been assessed using a scoring system. Table 3-1 shows the performance limiting factors ranking of the plant's hydraulics.

Due to tendency of both the headworks and the clarifier splitter box to overflow during instances of high flow, each of these structures is rated as inadequate and should be modified or expanded to facilitate the peak design capacity requirements. The approach will be discussed in detail in the subsequent CCP.

Table 3-1. Performance Limiting Factors for Savanna Street WWTP Hydraulics

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Overflowing of Headworks	B	Type 2
Anoxic Basin Effluent Channel Restriction	B	Type 2
Overflowing of Clarifier Splitter Box (During Wet Weather)	A	Type 2

3.3 Summary

In summary, the Savanna Street WWTP hydraulic deficiencies that would be classified as Type 2 remedial measures:

- Overflowing of headworks basin.
- Anoxic basin effluent channel restriction.
- Overflowing of clarifier splitter box.

Section 4
Influent Pump Station Assessment

The existing Savanna Street WWTP IPS is the first system in the plant's line of treatment processes that is limiting the plant's ability to effectively operate within its current NPDES permit. Specifically, the current IPS's performance affects the plant's ability to meet design flows and results in higher than required bypasses through the EQ basins, ultimately being discharged from the lagoons.

4.1 Influent Pump Station Overview

The existing IPS, shown in Figures 4-1 and 4-2, was designed and constructed in the early 1970s as part of the plant's conversion from the original lagoon treatment system to the current activated sludge style mechanical treatment plant. The IPS, which is located in the northwestern section of the plant facilities, is a wet well/dry pit configuration that includes a screenings system with two manual trash screens at the head of the wet well. Within the structure, the pumping system is comprised of four dry pit pumps, three-22,000 gallons per minute (gpm) (31.7 MGD) @ 60' TDH rated pumps and one-69,500 gpm (100 MGD) @ 52' TDH rated pump. Assuming all pumps and associated appurtenances are operational and functioning at specified performance, the total rated capacity of the IPS is 195 MGD; however, the firm capacity of the station is 95 MGD.

Figures 4-1 & 4-2. Aerial view indicating location of existing IPS and photograph taken at head of IPS

4.2 Current Condition of Influent Pump Station

Over the forty year life span of the IPS and due to the normal wear associated with wastewater operations, the pumps have continued to deteriorate to the point at which the IPS can no longer be considered reliable to consistently convey influent flows, specifically during periods of high flow events. Regarding the structural condition of the station, it has suffered degradation to the concrete over the 40 years of operation, specifically to the intermediate slab and the vertical walls of the wetwell in the area of the trash racks. At the time of this report, the structure was deemed as "sufficient to provide support to the wet well structure without catastrophic failure" in the near term.

A complete structural analysis report (conducted by Neel-Schaffer) on the IPS is included as Appendix A.

The mechanical equipment has been rebuilt and repaired on numerous occasions as a result of the station's equipment far exceeding the design life and has now reached a juncture where continuous overhauling of failing pumps and appurtenances is an operational liability to the City.

Aside from the 40 year age of the equipment, another issue plaguing the Savanna St. WWTP is the relatively large disparity between the peak design capacity and the firm capacity of the station. This disproportion between the peak and the firm capacity is due to the original design of the station with the single 100 MGD pump designated for stormwater pumping. With one pump carrying such a large portion of the station's capacity (53%), it severely affects the flexibility of the station and limit's its ability to continue conveying the necessary flow capacity in the case of a single pump failure. The Mississippi Department of Environmental Quality (MDEQ) regulations for pump station design state that "units should be designed to fit actual flow conditions and shall be of such capacity that with any one unit out of service the remaining units will have capacity to handle maximum anticipated sewage flows."

At the time of this report, the station is experiencing major electrical issues with two of the stations four pumps; one of the three 22,000 gpm raw water pumps and the 100 MGD stormwater pump. The 100 MGD pump, which failed on 02/13/2013, is in the process of a rebuild of the 1,250 HP motor. This type of lengthy repair is not only costly but it also results in the need for expensive temporary bypass pumping. In response to failure of three of the station's four pumps in October 2013, a temporary bypassing system was installed onsite under emergency conditions. Additionally, a system of temporary bypass pumps (see Figures 2-3 & 2-4) have remained onsite for more than 15 months to provide adequate pumping capacity for influent flows into plant in order to prevent wastewater from backing up in the system, potentially resulting in SSOs. During the last ten years, there have been multiple occasions where temporary pumps have been installed onsite for extended periods of time to supplement for malfunctioning influent pumps. The cost of such a system of continuous bypass pumps being maintained onsite is a constant burden to the plant's annual O&M budget. Aside from the direct costs of the system, the City is providing a circumstance for potential regulatory sanctions by allowing the temporary bypass pumping system to remain onsite for lengths of time in which a regulatory agency could consider a permanent installation.

Figures 4-3 & 4-4. Photographs of onsite temporary bypass pumps located at box chamber

The IPS pumps are not the only equipment being plagued with age-related mechanical/electrical issues. The bars of the two manual bar screens show signs of severe rust and deterioration, thus making them essentially non-operational and ineffective in protecting the pumps from large, floatable debris. Additionally, the station's entire header system (the suction and discharge piping), including the piping appurtenances, has surpassed its useful life and is in need of replacement. The isolation valves, used to shut off flow to the pumps in instances of mechanical failures, are no longer reliable. The majority of the electrical system of the IPS is the originally installed system when the station was constructed over 40 years ago. This system, specifically the original VFD system for the 100 MGD pump, is considered obsolete technology and is in need of replacement to prevent a pump stoppage due to electrical malfunctions. All pump VFDs are being improperly housed in an environment in which there is no working HVAC system; thus there is no means to control the ambient temperature and is not ideal for the protection of the equipment. The station's HVAC system has been non-operational for many years. A pump station's HVAC system is necessary for providing protection from heat and humidity for both the mechanical and electrical equipment. Because the IPS has been without an HVAC system for such a long period of time, there is a high likelihood that the mechanical and electrical equipment has sustained damage from the unregulated heat and humidity within the station. The VFDs for the 22,000 gpm pumps were replaced approximately 13 years ago, but have since been operating in an area void of air conditioning and have likely reached the end of their operational life. To facilitate proper operating temperatures, either the location of the VFD system must be modified so that they may be housed in a separate air conditioned building or a new HVAC system must be installed within the existing IPS structure. Either of these options should provide an environment where the life expectancy of the electrical equipment can be extended. It should also be noted the obsolete electrical system could potentially be affecting the efficiency of the pumps, causing additional capital to be lost on the operation of the pumping system. Outside of the footprint of the station's structure, both the line coming into the station and the discharge line (force main) which conveys flows to the headworks station of plant have required point repairs within the last 10 years.

Taking into consideration all of the issues detailed in this Section, it is evident that the IPS has surpassed its operational life and that improvements are necessary to provide for the continued ability of the plant to receive and treat the region's wastewater. Specific options for the improvement of the IPS system will be discussed as part of the CCP. Table 4-1 shows the performance limiting factors ranking of the IPS components. As illustrated in the table, the mechanical equipment and the IPS building are inadequate and have long-term effect on plant performance and must be addressed.

Onsite evaluation of the existing IPS was conducted in order to identify performance limiting factors and to classify the type of remedial measures required. Remedial measures are classified into three categories based on the severity of the identified needs. The most pressing are the Type 1 and Type 2 needs which must be addressed within two years of completing the CCP. The Type 3 needs, while severe, require a major plant upgrade to correct. For the plant, the IPS facilities are classified as Remedial Measures 2 because the improvements cannot wait for the five year timeframe allowed to implement Type 3 improvements. Also, the performance of the influent pump station effects all subsequent treatment units of the plant is essential to the plant's ability to collect and treat the City's wastewater.

Table 4-1. Influent Pump Station Performance Limiting Factors for Savanna Street WWTP

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Reliability of Station Pumps	A	Type 2
Reliability of Trash Racks	B	Type 2
Structural Deterioration	A	Type 2
Reliability of 84" Line to EQ Basins	B	Type 2
Reliability of Station's Electrical System	B	Type 3
Lack of HVAC/Odor Control System	B	Type 3
Lack of Hydraulic Control and Ability to Isolate Station	B	Type 3

4.3 Summary

In summary, the Savanna Street WWTP IPS deficiencies that would be classified as Type 2 remedial measures:

- Reliability of influent pumps for the conveyance of influent flow to mechanical plant (elimination of need for temporary onsite bypass pumping).
- Lack of reliability of existing trash tracks for protection of the influent pumping system.
- Structural deterioration of station's wetwell
- Reliability of 84" line to the EQ basins

In summary, the Savanna Street WWTP IPS deficiencies that would be classified as a Type 3 remedial measures:

- Reliability of station's electrical system/ need for new electrical building
- Lack of HVAC/odor control system for the protection of the station's electrical equipment
- Lack of hydraulic control within station including ability to isolate station
- Additional wet weather screens and pump stations as required

Section 5

Assessment of Savanna Street WWTP Preliminary Treatment

The Savanna Street WWTP's preliminary treatment unit, referred to herein as the headworks, is the next major unit process in the series of the plant's unit processes and was evaluated using the composite correction program approach to identify limitations resulting from the existing headworks' equipment/configuration.

5.1 Existing Headworks Facilities

The plant's headworks unit consists of mechanical bar screening and grit removal systems. The physical configuration of the plant's preliminary treatment is designed to handle a firm capacity of 50 MGD and a maximum capacity of 100 MGD if both screens and grit chambers are operating. The plant's headworks is comprised of a three-train basin that begins with the influent chamber where raw wastewater is pumped from the IPS and enters the headworks basin through a 60 inch pipe. The flow, via gravity, then enters one of three trains; the north (Train #1) and south (Train #2) trains are equipped with mechanical climber screens and the grit removal system while the center train is a bypass or maintenance channel to the anoxic selector for use in cases where either Train #1 or Train #2 are down for maintenance. The headworks process is initiated with flow passing through one of the two IDI climber bar screens which are equipped with a rake and screenings press system. The mechanical screening systems, which has 3/8" bar spacing, provide removal of the course/stringy solids and deposits them into a waste dumpster, located adjacent to the headworks basin. Once the flow passes through screening, it enters the grit removal portion of the headworks. The grit system is comprised of two 50 MGD rated Smith & Loveless Pista Grit Chambers, one chamber located in each Train #1 and Train #2. The removed grit is classified and deposited into the solids dumpster for landfill disposal. The screened and degritted flow exits the headworks from the final chamber via two 60 inch concrete pipes to the anoxic bioselector basin.

5.2 Deficiencies in Plant's Headworks

Currently, under high flow conditions, the raw wastewater entering the influent end of the headworks rises to a height where it overflows the basin wall and escapes through the walkway-grating on top of the headworks. The high water level at the upstream end of the headworks likely has multiple causes such as insufficient freeboard in the influent chamber and/or intermittent mechanical issues with the headworks' equipment. However, the key contributor of the headworks overflows has not yet been confirmed and will be addressed as part of the CCP report.

In recent years, the mechanical bar screens, which were installed in 2000, have experienced increased mechanical malfunctions. In many cases, when the screens have a mechanical malfunction, it results in the screens being taken offline for repairs, thus requiring all influent flow to be routed through the bypass screening channel. In cases where both screens are offline for repairs (as was the case during the 2013 initial CPE site visit), there is minimal removal of coarse/stringy solids material from the raw wastewater at the headworks resulting in a larger than normal amount of coarse/stringy material being transported into the secondary treatment portion of the plant. The existing headworks structure

operated with at least one mechanical bar screen out of service from July 2012 to March 2014. Due to the age and deteriorating condition of the mechanical bar screens, both units require rehabilitation or replacement in order to improve their reliability and treatment capability.

Another issue currently impacting the headworks performance is the aging grit removal system. At the time of the initial CPE site visit, both grit pumps and classifiers were temporarily out of service. When the grit removal equipment is malfunctioning, it results in an increased amount of grit being allowed into the downstream anoxic basin. In instances where the unit(s) are out of service, the hydraulics within the headworks are negatively impacted, resulting in an exacerbation of the high water level issues discussed in the previous paragraphs. Additionally, a buildup or accumulation of the grit within the system over time can create a hydraulic bottleneck that impacts the mechanical Plant's overall treatment capacity.

Given the hydraulic issues experienced at the existing headworks during high flows, as part of the CCP report, it will be necessary to evaluate the hydraulic profile within the headworks and resulting freeboard within the structure using the peak flow conditions identified within this CPE.

5.3 Performance Limiting Factors of Headworks

Following the EPA CCP approach, the headworks' deficiencies identified as part of the CPE must be assessed using the scoring system. Included in this section's scoring are the headworks basin, screening, and grit removal systems.

Due to the operating capacity of the existing headworks basin and its tendency to overflow during higher influent flows, the entire headworks unit would be rated as inadequate and should be modified/expanded to facilitate the peak design capacity of 90 MGD. The approach will be discussed in detail in the subsequent CCP.

Onsite evaluation of the existing headworks equipment was conducted in order to identify performance limiting factors and to classify the type of remedial measures required. Table 5-1 shows the performance limiting factors ranking of the headworks components. As illustrated in the table, the screening and grit removal capacities are inadequate and have a moderate long-term effect on plant performance and need to be addressed.

Table 5-1. Performance Limiting Factors for Savanna Street WWTP Headworks

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Age/condition of Mechanical Bar Screens	B	Type 2
Age/condition of Grit Removal System	B	Type 2
Redundant Screen Capacity	A	Type 3

5.4 Summary

In summary, the Savanna Street WWTP headworks deficiencies that would be classified as Type 2 remedial measures:

- Rehabilitation of mechanical bar screens
- Rehabilitation of grit removal system

In summary, the plant's headworks' needs that should be addressed as Type 3 remedial measures as part of the CCP are as follows:

- Redundant screen capacity
- Structural expansion as needed to meet hydraulics of the peak design flow

Section 6
Process Performance Evaluation

The purpose of this section of the CPE is to summarize the process performance of the existing wastewater treatment facilities at the plant and compare the capacity of each treatment process to MDEQ Design Standards. The existing secondary treatment facilities were evaluated to determine if the design was in accordance with the EPA publications, *Improving POTW Performance Using the Composite Correction Approach*, EPA CERI, October 1984, and *Retrofitting POTWs*, EPA CERI, July 1989, to the extent applicable. Additionally, this evaluation describes the performance of each major process, including removal efficiencies for various pollutants and currently applicable NPDES permit compliance.

The analysis consisted of a detailed evaluation of the plant operational data, including flow data for January 1, 2005 to September 30, 2013 and influent and effluent parameter data for November 1, 2010 through September 30, 2013.

6.1 Process Description

The plant is an advanced wastewater treatment facility that was originally constructed in the 1970's to serve residential, commercial and industrial customers. The plant underwent an upgrade in the early 1990's when the process was changed to single sludge carbon oxidation and nitrification system. The plant is designed to provide treatment to a permitted average daily flow of 46 MGD for the months of May through October, a permitted daily flow of 60 MGD for the months of November through April, and a maximum daily flow of 90 MGD.

The plant includes an anoxic selector, carbon oxidation and nitrification aeration basins, final clarifiers, and disinfection. Carbon oxidation and nitrification is accomplished by a single activated sludge system which consists of 10 – 600 feet long by 30 feet wide aeration basins, five – 140 feet diameter final clarifiers, two return activated sludge (RAS) buildings/stations and two waste activated sludge (WAS) pumps. A schematic of the plant is shown in Section 1.

6.2 Operational Description

Flows up to 90 MGD are directed to the headworks which discharge into the anoxic selector influent box where the raw wastewater is combined with the RAS. As influent flow increase above 90 MGD, flow is diverted to the equalization basin. Discharges from the equalization basins are chlorinated and dechlorinated.

The biological system consists of 10 – 600 feet long by 30 feet wide aeration basins with fine bubble EPDM diffusers. Effluent is distributed to the five final clarifiers through a splitter box to control flow to each clarifier including the future 6th clarifier. Sludge in each clarifier is collected by a rotating hydraulic removal system. All of the sludge flows within pipes to the RAS pump stations where it is returned to the anoxic basin influent box.

Process control of the biological system is influenced by the hydraulics of the clarifier splitter box which makes it difficult to achieve uniform flow and solids loadings to each clarifier. As a result, the weirs must be set at different levels to maintain similar flow to each clarifier. This aspect of the system

makes it difficult to adjust flow rates as flows change. Unequal flow splitting can result in a washout under sustained high flow conditions.

6.3 Treatment Requirements and Effluent Limitations

The plant was designed to treat an average daily flow of 46 MGD for the months of May through October, an average daily flow of 60 MGD for the months of November through April, and a peak hydraulic flow of 90 MGD. The plant is permitted to meet the following maximum monthly average, maximum weekly average and daily maximum effluent requirements as imposed under NPDES Permit No. MS0024295-001 (issued on May 4, 2012). The permit limits for conventional pollutants are shown in Table 6-1.

Table 6-1: NPDES Effluent Limits for the Savanna Street WWTP

	Monthly Average	Max Weekly Average
Flow Effluent		
May 1 to October 31	46 MGD	------
November 1 to April 30	60 MGD	------
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)[1]		
May 1 to October 31	7 mg/L - 2,687 lb/day	10.5 mg/L - 4,031 lb/day
November 1 to April 30	20 mg/L - 10,014 lb/day	30 mg/L - 15,021 lb/day
Total Suspended Solids (TSS)[(1)]		
May 1 to October 31	30 mg/L - 11,516 lb/day	45 mg/L - 17,274 lb/day
November 1 to April 30	30 mg/L - 15,021 lb/day	45 mg/L - 22,532 lb/day
Ammonia as Nitrogen (NH_3-N)		
May 1 to October 31	2 mg/L - 768 lb/day	3 mg/L - 1,152 lb/day
November 1 to April 30	3.3 mg/L - 1,652 lb/day	5.0 mg/L - 2,503 lb/day
Fecal Coliforms	200 colonies per 100 ml	400 colonies per 100 ml
Total Residual Chlorine	0.056 mg/L	0.096 mg/L
Dissolved Oxygen	6.0 minimum mg/L	------

[(1)] 85 percent monthly average removal also required.

Additionally, the daily effluent pH shall not be less than 6.0 or greater than 9.0 standard units.

The permit sampling requirements for the equalization basins (storm lagoons) outfall are shown in Table 6-2.

Table 6-2: NPDES Effluent Limits for the Savanna Street WWTP Equalization Basin Outfall

	Monthly Average	Weekly Average
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	Report	Report
Total Suspended Solids (TSS)	Report	Report
Ammonia as Nitrogen (NH_3-N)	Report	Report
Flow	Report	Report
pH	Report Minimum (Daily)	Report Minimum (Daily)
Mercury	Report	Report

6.4 Treatment Process and Equipment Descriptions

The following paragraphs give a brief description of the treatment processes and corresponding equipment. Comparisons to MDEQ design standards (*Guidance for the Design of Publicly Owned Wastewater Facilities*) are provided where appropriate. The evaluation addresses average design flow of 46 MGD for May – October, average design flow of 60 MGD for November - April, and a peak hydraulic flow of 90 MGD.

Anoxic Selector

The anoxic selector basin is a compartmentalized biological reactor used to control the growth of filamentous bacteria to reduce/prevent sludge bulking in the final clarifiers. The return activated sludge (RAS) is combined with the raw wastewater in the 24.5 feet wide by 9 feet long influent chamber with a maximum side water depth of 13.5 feet. The anoxic selector is a two train serpentine baffled basin with each basin having the dimensions of 67.5 feet long by 29 feet 9 inches wide with a side water depth of 13.0 feet. At raw wastewater flow of 46 MGD and 28 MGD of RAS flow, the detention time is 8.00 minutes. At peak raw wastewater flow of 90 MGD and 28 MGD of RAS flow, the detention time is 4.75 minutes. The anoxic basin is working to control filamentous growth. MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities* has no guidelines for an anoxic selector. The anoxic selector is properly sized for its intended use of preventing sludge bulking.

Flow from the anoxic selector flows by gravity to the aeration basins by one 60-in pipe and one 42-in pipe. The 60-in pipe splits into two 42-in pipes as it enters into the aeration basin pipe gallery.

Aeration Basins

Savanna Street WWTP treatment consists of 10 carbon oxidation and nitrification aeration basins and five final clarifiers. Flow is distributed to the 10 aeration basins by three 42 inch influent pipes located in the aeration basin pipe gallery. The influent valves and sluice gates are not automated to evenly distribute the flow to each aeration basin. Automation of the influent valves and sluice gates should be done to maximize treatment efficiency. Each aeration basin is 600 feet long by 30 feet wide with the current side water depth of 14.3 feet. Tankage will allow the side water depth to be increased by 3.2 feet for a total depth of 17.5 feet. Each basin has 456 3.75 foot diameter by one meter long EPDM fine bubble diffusers (4,560 total) installed two feet off the floor of the basin. The aeration basin diffusers were installed in 1996 and are currently operating at over one and one half times the normal design life of EPDM diffusers. The basins are not taken down yearly to inspect and clean the diffuser and to remove debris as recommended by WEF MOP 11 nor has an inspection/cleaning been conducted since diffuser replacement in 1996.

Field observations showed approximately 2 percent of the diffusers were either burst or connection failure at air header. Air leaks were observed on basins 3W/4W, 5W/6W, 7W/8W, and 9E/10E air headers. Upon inspection, the fifth header from end of basin 3W was not flowing air, even though the butterfly valve appeared to be in the open position. Additionally, none of the DO meters at the end of each basin are operable and the ventilation system in the aeration basin pipe gallery is not currently operational.

The aeration basins (treatment trains) are not currently configured for biological nutrient removal as required to meet the permit limits for Total Nitrogen and Total Phosphorus.

Table 6-3 provides a summary of the aeration basin design information.

Table 6-3: Savanna Street WWTP Aeration Basin Design Information and MDEQ Design Standards

	May – Oct. Permit. Flow (46 MGD)	Nov. – Apr. Permit Flow (60 MGD)	Peak Flow (90 MGD)	MDEQ Design Standards
Hydraulic Detention Time, Hours	10.0	7.7	5.1	NA
Organic Loading, lbs BOD_5/1000 ft^3 $CBOD_5$ – 196 mg/l and NH_3_N – 13.2 mg/l (Average 11/2010 -9/2013 for May – Oct.)	38.3	NA	NA	40 (max)
Organic Loading, lbs BOD_5/1000 ft^3 $CBOD_5$ – 160 mg/l and NH_3_N – 11.5 mg/l (Average 11/2010 -9/2013 for Nov. – Apr.)	NA	41.4	NA	40 (max)
F/M Ratio (MLVSS – 2,558 and MLSS – 4,320) May – Oct.	0.24	NA	NA	0.1-0.3
F/M Ratio (MLVSS – 2,468 and MLSS – 4,310) Nov. – Apr.	NA	0.27	NA	0.1-0.3

Air is supplied to the carbon oxidation and nitrification aeration basins by four single stage centrifugal compressors (3 duty and one standby), each rated at 30,100 inlet cubic feet per minute (icfm) (27,660 standard cubic feet per minute (scfm)) at 8.2 pounds per square inch (psi) discharge pressure. At the time of this CPE, three blowers are operational. The non-functional blower is off-line due to an electrical fire that occurred on August 5, 2013 while swapping on-line blower. A request has been developed to get this blower back operational. Another issue with the system identified during the assessment is that the air mains feeding each basin are not equipped with flow meters, thus preventing any type of real-time monitoring of air distribution between the basins. The aeration basins diffuser replacement project minimum design airflow is 32,284 scfm, normal design airflow is 48,427 scfm, and maximum design airflow is 64,524 scfm. Table 6-4 provides a summary of the blower design information.

Table 6-4: Savanna Street WWTP Blower Design Information and MDEQ Design Standards

	Minimum Design Airflow	Normal Design Airflow	Maximum Design Airflow
Air Supplied, SCFM	32,284	48,427	64,524
Oxygen Supplied(1) May – October lbs O_2/day	80,966	116,516	151,557
Oxygen Availability May – October lb O_2/lb BOD_5	0.82	1.18	1.53
Oxygen Supplied(1) November – April lbs O_2/day	98,539	141,793	184,434
Oxygen Availability November - April lb O_2/lb BOD_5	0.92	1.32	1.72

(1) – Oxygen supplied based on new membranes

Although blowers are supplying adequate air to the basin for mixing and maintaining the minimum target DO level of 2 mg/l, the actual DO levels vary between 2 and 6 mg/l. The DO level in the aeration basin are monitored throughout each operator shift using a portable DO meter and blowers are adjusted accordingly based on reading.

Final Clarifiers

Effluent from the carbon removal and nitrification aeration basins flows by gravity to five final clarifiers. Features have been incorporated to facilitate installation of a sixth clarifier. Each clarifier is circular with an inside diameter of 140 feet and a side water depth of 15.1 feet for clarifiers 1 – 4 and 16.1 feet for clarifier 5. MDEQ design standard for side water depth is 12.0 feet. Clarifiers 1 – 3 include the original mechanical equipment from 1974, clarifier 4 had a new mechanism installed in 1998, and clarifier 5 was constructed in 1998. Clarifier 1 failed scraper arm was temporarily patched in late 2013 to make operational. Clarifier 1 – 3 steel is severely corroded and has exceeded the normal design life by 14 years. The effluent weir length for clarifier 1 – 3 is 766 feet and for clarifier 4 and 5 is 420 feet. Table 6-5 provides a summary of the clarifier design information.

Table 6-5: Savanna Street WWTP Clarifier Design Information and MDEQ Design Standards

	May – Oct. Permit. Flow (46 mgd)	Nov. – Apr. Permit Flow (60 mgd)	Peak Flow (90 MGD)	MDEQ Design Standards
Surface Overflow Rate, gpd/ft^2	597	780	1,169	800 design/1,200 peak
Solids Loading(1), lbs/ft^2	32.3	42.2	63.2	20 design/50 peak
Weir Loading(2), gpd/ft	1, 2, & 3 – 12,010 4 & 5 – 21,905	1, 2, & 3 – 15,665 4 & 5 – 28,572	1, 2, & 3 – 23,498 4 & 5 – 42,857	10,000 design/40,000 peak

(1) At average MLSS of 4, 320 mg/l and 50% RAS rate. (2) With 5 clarifiers in service and equal flow split

Following clarification, the flow moves to the disinfection stage of treatment.

RAS Pumps

Sludge collected within the clarifiers flow via pressure pipes to suction headers of the RAS pumps. Clarifiers 1, 2, 3, and 4 have four RAS pumps located in the RAS Building Number 1. Each RAS pump is rated at 8,100 gpm at 19.5 feet and is operated by a variable frequency drive. As of this CPE, three RAS pumps in the RAS Building Number 1 are operating. RAS pump 3, the current non-operational pump, is to be replaced by a dry pit submersible pump by mid 2014. Clarifier 5 has two RAS pumps located in the adjacent RAS Building Number 2. Each RAS pump is rated at 8,100 gpm at 28.8 feet and is operated by a variable frequency drive. At the time of this CPE, both of these RAS pumps were operational. Overall, there are six RAS pumps (4 duty and 2 standby). RAS is returned to the influent box of the anoxic selector where it is combined with the raw wastewater. RAS Building Number 2 has an additional RAS pump slot for when clarifier 6 is constructed.

For a single stage carbon oxidation/nitrification activated sludge plant, the RAS rate should be between 100 percent and 150 percent of the raw wastewater flow. With four operating RAS pumps, the RAS flow is 46 mgd which is 100 percent of the May – October permit flow, 76 percent of the November to April permit flow, and 51 percent of the plant peak flow. The plant has no flow measurement device on the RAS lines before discharging in the anoxic selector.

Waste Activated Sludge (WAS) Pumps

WAS pumps consist of two 500 gpm pumps on variable frequency drives. Each pump has its own corresponding flow meter. At the time of this CPE, both WAS pumps and flow meters were operational.

6.5 Data Analysis and Performance Summary

The data included in this analysis was obtained from UWS-MS for the time period of November 1, 2010 through September 30, 2013 for plant performance and January 1, 2005 to September 30, 2013 for plant flows. The current NPDES permit was issued on May 4, 2012 and expires on April 30, 2017.

Influent Flows

For the years 2005-1013, the average daily influent flow rate to the plant was 44.1 MGD, the average daily maximum influent flow rate was 163.2 MGD, and the average daily minimum influent flow rate was 10.5 MGD. The plant's influent flow has been below the permitted flows greater than 91 percent for the years 2005-2013.

Table 6-6 shows the average daily flow rate, maximum daily flow rate, and maximum monthly flow rate for the years 2005 through 2013. The NPDES permit effluent flow is broken into two timeframes May through October and November through April. Table 6-6 presents this data for the entire period, broken down by calendar year.

Table 6-6: Summary of Savanna Street WWTP Flow Rates

Data Period (year)	May- Oct. Average Daily Flow (MGD)	Jan – Apr. & Nov. – Dec. Average Daily Flow (MGD)	May- Oct. Maximum Daily Flow (MGD)	Jan – Apr. & Nov. – Dec. Maximum Daily Flow (MGD)	May- Oct. Maximum Monthly Flow (MGD)	Jan. – Apr. & Nov. – Dec. Maximum Monthly Flow (MGD)
2005	32.7	45.2	88.1	110.2	35.7	57.9
2006	37.4	46.5	79.8	124.4	42.1	60.5
2007	38.6	41.4	72.6	113.7	45.1	58.5
2008	37.8	46.2	77.9	130.0	44.0	73.0
2009	45.6	50.3	129.8	116.3	69.9	63.5
2010	37.2	47.8	52.7	128.2	39.1	71.5
2011	40.2	46.9	140.9	104.0	55.7	63.0
2012	44.6	50.0	111.0	118.0	48.1	65.2
2013(1)	43.5	72.6	116.0	163.2	61.3	95.2
2005-2013(1)	39.7	48.8	129.8	163.2	69.9	95.2

(1) 2013 data includes January through September

Influent Pollutants Loading – Total Suspended Solids (TSS)

From November 1, 2010 through September 30, 2013, the daily average influent TSS concentration at the plant was 536 mg/l, the daily maximum influent TSS concentration was 4,126 mg/l, and the daily minimum influent TSS concentration was 42 mg/l. As part of this CPE, it was identified that the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data. Influent samplers and flow meters are being installed on the West Bank Interceptor,

Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data and design loadings will be reevaluated as part of the CCP when this new data is available.

Table 6-7 shows the minimum and maximum average daily TSS concentration, the minimum and maximum daily TSS concentration, and minimum and maximum monthly TSS concentration for the time period of November 1, 2010 through September 30, 2013. Table 6-8 presents the TSS loading data in units of pounds per day.

Table 6-7: Summary of Savanna Street WWTP Influent TSS Concentrations

Data Period (year)	Minimum Daily TSS Conc. (mg/l)	Maximum Daily TSS Conc. (mg/l)	Minimum Average Weekly TSS Conc. (mg/l)	Maximum Average Weekly TSS Conc. (mg/l)	Minimum Average Monthly TSS Conc. (mg/l)	Maximum Average Monthly TSS Conc. (mg/l)
2010(1)	391	768	476	589	534	561
2011	180	1342	369	884	508	697
2012	106	4126	189	1181	189	1031
2013(2)	42	1490	122	589	177	313

Table 6-8: Summary of Savanna Street WWTP Influent TSS Loadings

Data Period (year)	Minimum Daily TSS Loadings (lbs/d)	Maximum Daily TSS Loadings (lbs/d)	Minimum Average Weekly TSS Loadings (lbs/d)	Maximum Average Weekly TSS Longings (lbs/d)	Minimum Average Monthly TSS Loadings (lbs/d)	Maximum Average Monthly TSS Loadings (lbs/d)
2010(1)	111,361	313,235	142,535	227,806	170,834	172,917
2011	54,449	709,077	98,113	4009,001	152,851	279,988
2012	24,525	1,054,700	64,536	596,637	76,092	442,495
2013(2)	28,536	384,230	57,325	198,576	75,536	141,448

(1) 2010 data includes November through December (2) 2013 data includes through September

Influent Pollutants Loading – Five Day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)

From November 1, 2010 through September 30, 2013, the daily average influent $CBOD_5$ concentration at the plant was 184.0 mg/l, the daily maximum influent $CBOD_5$ concentration was 700.0 mg/l, and the daily minimum influent $CBOD_5$ concentration was 42.5 mg/l. As part of this CPE, it was identified that the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data. Influent samplers and flow meters are being installed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data and design loadings will be reevaluated as part of the CCP when this new data is available.

Table 6-9 shows the minimum and maximum average daily $CBOD_5$ concentration, the minimum and maximum daily $CBOD_5$ concentration, and minimum and maximum monthly $CBOD_5$ concentration for

the time period of November 1, 2010 through September 30, 2013.Table 6-10 presents the $CBOD_5$ loading data in units of pounds per day.

Table 6-9: Summary of Savanna Street WWTP Influent $CBOD_5$ Concentrations

Data Period (year)	Minimum Daily $CBOD_5$ Conc. (mg/l)	Maximum Daily $CBOD_5$ Conc. (mg/l)	Minimum Average Weekly $CBOD_5$ Conc. (mg/l)	Maximum Average Weekly $CBOD_5$ Conc. (mg/l)	Minimum Average Monthly $CBOD_5$ Conc. (mg/l)	Maximum Average Monthly $CBOD_5$ Conc. (mg/l)
2010(1)	70	230	102	163	132	154
2011	45	700	58	401	130	266
2012	43	520	122	348	170	256
2013(2)	53	378	89	266	133	215

(1) 2010 data includes November through December (2) 2013 data includes through September

Table 6-10: Summary of Savanna Street WWTP Influent $CBOD_5$ Loadings

Data Period (year)	Minimum Daily $CBOD_5$ Loadings (lbs/d)	Maximum Daily $CBOD_5$ Loadings (lbs/d)	Minimum Average Weekly $CBOD_5$ Loadings (lbs/d)	Maximum Average Weekly $CBOD_5$ Loadings (lbs/d)	Minimum Average Monthly $CBOD_5$ Loadings (lbs/d)	Maximum Average Monthly $CBOD_5$ Loadings (lbs/d)
2010(1)	22,400	82,128	31,586	47,296	41,949	46,097
2011	20,675	225,931	29,379	126,861	45,206	81,001
2012	13,834	185,497	50,868	123,652	57,815	91,707
2013(2)	18,261	225,797	37,235	155,327	50,764	109,563

(1) 2010 data includes November through December (2) 2013 data includes through September

Influent Pollutants Loading – Ammonia as Nitrogen (NH_3-N)

From November 1, 2010 through September 30, 2013, the daily average influent NH_3-N concentration at the plant was 12.3 mg/l, the daily maximum influent NH_3-N concentration was 24.9 mg/l, and the daily minimum influent NH_3-N concentration was 0.8 mg/l. As part of this CPE, it was identified that the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data. Influent samplers and flow meters are being installed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data and design loadings will be reevaluated as part of the CCP when this new data is available.

Table 6-11 shows the minimum and maximum average daily NH_3-N concentration, the minimum and maximum weekly NH_3-N concentration, and minimum and maximum monthly NH_3-N concentration for the time period of November 1, 2010 through September 30, 2013. Table 6-12 presents the NH_3-N loading data in units of pounds per day.

Table 6-11: Summary of Savanna Street WWTP Influent NH_3-N Concentrations

Data Period (year)	Minimum Daily NH_3-N Conc. (mg/l)	Maximum Daily NH_3-N Conc. (mg/l)	Minimum Average Weekly NH_3-N Conc. (mg/l)	Maximum Average Weekly NH_3-N Conc. (mg/l)	Minimum Average Monthly NH_3-N Conc. (mg/l)	Maximum Average Monthly NH_3-N Conc. (mg/l)
2010(1)	6.9	22.8	13.3	18.9	15.0	17.1
2011	1.8	24.9	3.0	19.4	9.3	14.7
2012	3.8	18.4	6.8	15.3	8.9	13.6
2013(2)	0.8	21.2	2.6	17.0	5.3	15.6

(1) 2010 data includes November through December (2) 2013 data includes through September

Table 6-12: Summary of Savanna Street WWTP Influent NH_3-N Loadings

Data Period (year)	Minimum Daily NH_3-N Loadings (lbs/d)	Maximum Daily NH_3-N Loadings (lbs/d)	Minimum Average Weekly NH_3-N Loadings (lbs/d)	Maximum Average Weekly NH_3-N Loadings (lbs/d)	Minimum Average Monthly NH_3-N Loadings (lbs/d)	Maximum Average Monthly NH_3-N Loadings (lbs/d)
2010(1)	2,865	8,661	4,204	5,940	4,792	5,160
2011	1,202	7,908	2,219	5,856	3,454	5,107
2012	897	8,769	3,402	5,336	3,811	5,009
2013(2)	658	10,576	2,377	6,483	3,369	5,632

(1) 2010 data includes November through December (2) 2013 data includes through September

Influent Pollutants Loading – Total Nitrogen (TN)

From November 1, 2010 through September 30, 2013, the daily average influent TN concentration at the plant was 40.9 mg/l, the daily maximum influent TN concentration was 206.8 mg/l, and the daily minimum influent TN concentration was 1.2 mg/l. As part of this CPE, it was identified that the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data. Influent samplers and flow meters are being installed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data and design loadings will be reevaluated as part of the CCP when this new data is available.

Table 6-13 shows the minimum and maximum average daily TN concentration, the minimum and maximum weekly TN concentration, and minimum and maximum monthly TN concentration for the time period of November 1, 2010 through September 30, 2013. Table 6-14 presents the TN loading data in units of pounds per day.

Table 6-13: Summary of Savanna Street WWTP Influent TN Concentrations

Data Period (year)	Minimum Daily TN Conc. (mg/l)	Maximum Daily TN Conc. (mg/l)	Minimum Average Weekly TN Conc. (mg/l)	Maximum Average Weekly TN Conc. (mg/l)	Minimum Average Monthly TN Conc. (mg/l)	Maximum Average Monthly TN Conc. (mg/l)
2010(1)	28.0	83.6	45.8	62.9	50.1	54.0
2011	1.2	106.0	22.9	62.9	33.2	54.4
2012	8.0	206.8	19.5	101.7	23.4	71.0
2013(2)	3.0	62.9	6.9	35.2	12.6	29.6

(1) 2010 data includes November through December (2) 2013 data includes through September

Table 6-14: Summary of Savanna Street WWTP Influent TN Loadings

Data Period (year)	Minimum Daily TN Loadings (lbs/d)	Maximum Daily TN Loadings (lbs/d)	Minimum Average Weekly TN Loadings (lbs/d)	Maximum Average Weekly TN Loadings (lbs/d)	Minimum Average Monthly TN Loadings (lbs/d)	Maximum Average Monthly TN Loadings (lbs/d)
2010(1)	9,821	29,292	13,983	18,619	15,993	16,222
2011	362	41,942	9,498	24,724	12,053	19,088
2012	4,053	152,740	7,699	62,646	9,003	35,816
2013(2)	2,104	22,599	5,893	13,329	7,639	12,167

(1) 2010 data includes November through December (2) 2013 data includes through September

Influent Pollutants Loading – Total Phosphorous (TP)

From November 1, 2010 through September 30, 2013, the daily average influent TP concentration at the plant was 18.2 mg/l, the daily maximum influent TP concentration was 93.6 mg/l, and the daily minimum influent TP concentration was 0.2 mg/l. As part of this CPE, it was identified that the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data. Influent samplers and flow meters are being installed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data and design loadings will be reevaluated as part of the CCP when this new data is available.

Table 6-15 shows the minimum and maximum average daily TP concentration, the minimum and maximum weekly TP concentration, and minimum and maximum monthly TP concentration for the time period of November 1, 2010 through September 30, 2013. Table 6-16 presents the TP loading data in units of pounds per day.

Table 6-15: Summary of Savanna Street WWTP Influent TP Concentrations

Data Period (year)	Minimum Daily TP Conc. (mg/l)	Maximum Daily TP Conc. (mg/l)	Minimum Average Weekly TP Conc. (mg/l)	Maximum Average Weekly TP Conc. (mg/l)	Minimum Average Monthly TP Conc. (mg/l)	Maximum Average Monthly TP Conc. (mg/l)
2010(1)	2.4	29.6	17.8	26.9	19.8	22.3
2011	0.2	58.8	10.6	33.9	17.1	29.3
2012	0.9	93.6	4.0	38.9	4.4	33.5
2013(2)	0.3	25.0	1.1	10.5	206	7.0

(1) 2010 data includes November through December (2) 2013 data includes through September

Table 6-16: Summary of Savanna Street WWTP Influent TP Loadings

Data Period (year)	Minimum Daily TP Loadings (lbs/d)	Maximum Daily TP Loadings (lbs/d)	Minimum Average Weekly TP Loadings (lbs/d)	Maximum Average Weekly TP Loadings (lbs/d)	Minimum Average Monthly TP Loadings (lbs/d)	Maximum Average Monthly TP Loadings (lbs/d)
2010(1)	641	13,521	5,034	9,316	6,473	6,690
2011	60	26,787	3,309	13,043	6,192	9,932
2012	268	69,132	1,436	20,914	1,713	16,012
2013(2)	98	7,471	1,21	3,911	1,499	2,779

(1) 2010 data includes November through December (2) 2013 data includes through September

6.6 Effluent Flow Rates and Effluent Loadings

The data included in this analysis was obtained from UWS-MS for the time period of November 1, 2010 through September 30, 2013. The following analysis is based on the current permit limits for the entire time period accessed.

Effluent Flow

These occurrences would have exceeded the current permit:

Monthly Average Effluent Flow was exceeded for the month of 3/2011 by 3.0 mgd.

Monthly Average Effluent Flow was exceeded for the month of 9/2011 by 9.7 mgd.

Monthly Average Effluent Flow was exceeded for the month of 2/2012 by 5.2 mgd.

Monthly Average Effluent Flow was exceeded for the month of 3/2012 by 0.4 mgd.

These occurrences exceeded the current permit:

Monthly Average Effluent Flow was exceeded for the month of 7/2012 by 1.6 mgd.

Monthly Average Effluent Flow was exceeded for the month of 8/2012 by 2.1 mgd.

Monthly Average Effluent Flow was exceeded for the month of 1/2013 by 35.2 mgd.

Monthly Average Effluent Flow was exceeded for the month of 2/2013 by 30.6 mgd.

Monthly Average Effluent Flow was exceeded for the month of 5/2013 by 15.3 mgd.

Effluent Pollutants Loading and Percent Removal – TSS

These occurrences would have exceeded the current permit:

Maximum Weekly Average TSS was exceeded the week ending 9/10/2011.

These occurrences exceeded the current permit:

Maximum Weekly Average TSS was exceeded the week ending 1/19/2013.

Maximum Weekly Average TSS was exceeded the week ending 1/26/2013.

Monthly Average TSS was exceeded for the month of 1/2013.

Maximum Weekly Average TSS was exceeded the week ending 2/23/2013.

Monthly Average TSS was exceeded for the month of 2/2013.

The percent removal cannot be accurately calculated because the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data.

Effluent Pollutants Loading – $CBOD_5$

These occurrences would have exceeded the current permit:

Maximum Weekly Average $CBOD_5$ concentration and pounds was exceeded the week ending 9/10/2011.

Maximum Weekly Average $CBOD_5$ concentration was exceeded the week ending 9/17/2011.

Monthly Average $CBOD_5$ concentration and pounds were exceeded the month of 9/2011.

These occurrences exceeded the current permit:

Maximum Weekly Average $CBOD_5$ pounds were exceeded the week ending 1/19/2013.

Monthly Average $CBOD_5$ pounds were exceeded the month of 1/2013.

Maximum Weekly Average $CBOD_5$ concentration was exceeded the week ending 5/11/2013.

Monthly Average $CBOD_5$ pounds were exceeded the month of 5/2013.

The percent removal cannot be accurately calculated because the influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data.

Effluent Pollutants Loading – NH_3-N

These occurrences would have exceeded the current permit:

Maximum Weekly Average NH_3-N concentration and pounds were exceeded the week ending 5/7/2011.

Maximum Weekly Average NH_3-N concentration was exceeded the week ending 5/4/2011.

Monthly Average NH_3-N concentration was exceeded the month of 5/2011.

Effluent Pollutants Loading – Total Nitrogen (TN)

These occurrences would have exceeded the current permit:

Monthly Average TN pounds were exceeded the month of 5/2011.

Maximum Weekly Average TN pounds were exceeded the week ending 1/19/2013.

These occurrences exceeded the current permit:

Monthly Average TN pounds were exceeded the month of 1/2013.

Maximum Weekly Average TN pounds were exceeded the week ending 2/16/2013.

Monthly Average TN pounds were exceeded the month of 2/2013.

Effluent Pollutants Loading – Total Phosphorous (TP)

These occurrences would have exceeded the current permit:

Maximum Weekly Average TP pounds were exceeded the week ending 2/17/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 3/12/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 3/19/2011.

Monthly Average TP pounds were exceeded the month of 3/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 5/21/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 8/27/2011.

Monthly Average TP pounds were exceeded the month of 8/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 9/10/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 9/17/2011.

Monthly Average TP pounds were exceeded the month of 9/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 12/31/2011.

Monthly Average TP pounds were exceeded the month of 12/2011.

Maximum Weekly Average TP pounds were exceeded the week ending 2/4/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 2/11/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 2/18/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 2/25/2012.

Monthly Average TP pounds were exceeded the month of 2/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 3/24/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 3/31/2012.

Monthly Average TP pounds were exceeded the month of 3/2012.

Monthly Average TP pounds were exceeded the month of 4/2012.

These occurrences exceeded the current permit:

Maximum Weekly Average TP pounds were exceeded the week ending 8/4/2012.

Monthly Average TP pounds were exceeded the month of 8/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 9/1/2012.

Maximum Weekly Average TP pounds were exceeded the week ending 1/19/2013.

Monthly Average TP pounds were exceeded the month of 1/2013.

6.7 Aeration Basin and Final Clarifiers Scoring and Performance Limiting Factors

Following Section 3.4 of the EPA Handbook *Improving POTW Performance using the Composite Correction Approach*, the aeration basins and final clarifiers were scored using Table 3-2 for the aeration basins and Table 3-4 for the final clarifiers.

Aeration Basins

Hydraulic Detention Time:

May –October Flow (46 MGD)	10.0 hours	Score = 6
November – April Flow (60 MGD)	7.7 hours	Score = 3

Organic Loading:

May –October Flow (46 MGD)	38.3 lbs BOD_5/1000 ft^3	Score = 3
November – April Flow (60 MGD)	41.4 lbs BOD_5/1000 ft^3	Score = 3

Organic loading rates will need to be reevaluated upon receiving influent data that does not contain the plant's recycle streams.

Oxygen Availability:

May –October Flow (46 MGD)	151,557 lbs O_2	Score = 5
November – April Flow (60 MGD)	184,434 lbs O_2	Score = 5

Oxygen availability will need to be reevaluated upon receiving influent data that does not contain the plant's recycle streams.

Total Score:

May –October Flow (46 MGD)	Score = 14
November – April Flow (60 MGD)	Score = 11

Based on Table 3-11 of the above mentioned EPA Handbook, the aeration basins are Type 1 for May – October Flow and a Type 2 for November –April Flow. These designations may change upon receiving influent data that does not contain the plant's recycle streams.

Upgrades of the aeration basins (treatment trains) for biological nutrient removal are required and would be classified as a Type 3 remedial measure.

Final Clarifiers

Configuration:

Clarifiers 1, 2, and 3	Circular with interior launders	Score = 10
Clarifier 4	Circular with weirs on walls	Score = 7
Clarifier 5	Circular with weirs on walls	Score = 7

Surface Overflow Rate:

November – April (60 MGD)

Clarifiers 1, 2, and 3	780 gpd/ft^2	Score = 0
Clarifier 4	780 gpd/ft^2	Score = 0
Clarifier 5	780 gpd/ft^2	Score = 0

Depth at Weirs:

Clarifiers 1, 2, and 3	15.1 feet	Score = 10
Clarifier 4	15.1 feet	Score = 10
Clarifier 5	16.1 feet	Score = 10

Return Sludge Removal:

Clarifiers 1, 2, 3, 4 and 5	Circular, rapid withdrawal	Score = 10

Return Sludge Control:

Clarifiers 1, 2, 3, 4, and 5	50% of recommended RAS Flow Covered by actual RAS flow range; No capability to measure RAS flow	Score = 0

Total Score:

Clarifiers 1, 2, and 3	Score = 30
Clarifier 4	Score = 27
Clarifier 5	Score = 27

Based on Table 3-11 of the above mentioned EPA Handbook, clarifiers 1, 2 3, 4 and 5 are Type 1. The age and physical conditions of the clarifier's mechanism requires replacement which rolls the into the Type 2 category.

Clarifiers 1, 2, and 3 are original equipment from 1974 and have exceeded their normal operating life. Replacement of the mechanism of these clarifiers should be completed during the time frame for Type 1 and Type 2 corrections.

Table 6-17 contains the performance-limiting factor for the aeration basins and final clarifiers.

Table 6-17. Plant's Process Performance-Limiting Factors

Performance-Limiting Factors	Performance-Limiting Factor Rating	Remedial Measures
Influent Samplers	A	Type 2
Aeration basin process/flow configuration	A	Type 3
Non-automated aeration basin influent valves	B	Type 3
Non-operational dissolved oxygen meters	B	Type 3
Non-operational pH meters	B	Type 3
No aeration basins air flow meters	B	Type 3
Non-operational standby blower	B	Type 3
Clarifiers 1, 2, and 3 mechanism age	A	Type 2
Clarifier splitter box overflowing during wet weather	B	Type 2
Non-operational RAS pump	A	Type 2
No RAS flow meters	A	Type 2
Additional of 6th clarifier	A	Type 3

6.8 Summary

In summary, the Savanna Street WWTP aeration basins and final clarifiers' deficiencies that would be classified as a Type 1 and Type 2 remedial measures:

- Influent samplers and flow meters are being installed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data and design loadings will be reevaluated as part of the CCP when this new data is available.
- Replace clarifiers 1, 2, and 3 mechanisms and walkways.
- Clarifier Splitter Box – Correct hydraulic deficiencies.
- Returned Sludge - Installation of new RAS pumps in RAS Building Number 1 and installation of flow meter on RAS Building Number 1 discharge line and RAS Building Number 2 discharge line for control of RAS pumps.

In summary, the plant aeration basins and final clarifiers' needs that should be addressed as Type 3 remedial measures as part of the CCP are as follows:

- Basin process and flow configuration changes for biological removal of nitrogen and phosphorus including replacing diffusers.
- Automation of influent valves to evenly distribute flow and maximize treatment efficiency.
- Installation on dissolved oxygen meters, ORP meters, pH, and possibly ammonia meters for each basin to maximize treatment efficiency and control power consumption.
- Installation of air flow meters for each basin to maximize treatment efficiency and control power consumption.

- Replace two blowers and electrical components for reliability and salvage parts to keep remaining existing two blowers operational.
- Addition of clarifier 6 and third RAS pump in RAS Building Number 2.
- Make operational or replace aeration basin pipe gallery ventilation system.
- Additional aeration basins if required to meet lower NPDES permit limits.

Section 7
Disinfection System Evaluation

The plant disinfection facilities were reviewed using the CPE approach to: evaluate the process; identify performance limitations; prioritize performance-limiting factors; assess the ability to improve performance; and report the CPE results. Results of the evaluation are provided in this section.

7.1 Existing Facilities

The disinfection system consists of separate chlorination and dechlorination processes. The specific components of each are:

A. Chlorination System

- Two 4,000 pounds per day (ppd) wall mounted chlorinators.
- A feed water booster pumping system.
- Chlorine storage building.
- One 3 inch injector for high plant flow rates.
- One vacuum induction unit for normal plant flow rates.
- Four 8-ton cylinder headers with 500 ppd vacuum regulators and a one-ton cylinder scale per header.

B. Dechlorination System

- Two wall mounted sulfonators. One rated at 100 ppd capacity for normal plant flows and one rated at 250 ppd capacity for wet weather flows.
- Two vacuum induction units.
- Two 4-ton cylinder headers with 500 ppd vacuum regulators and a one ton cylinder scale per header.
- One wall mounted auto-switch over unit.

The current chlorine dose for normal flow conditions is approximately 5.0 mg/l. During wet weather flow events the dose can be as high as 8.0 mg/l.

A schematic of the plant disinfection facilities is shown in Figure 7-1.

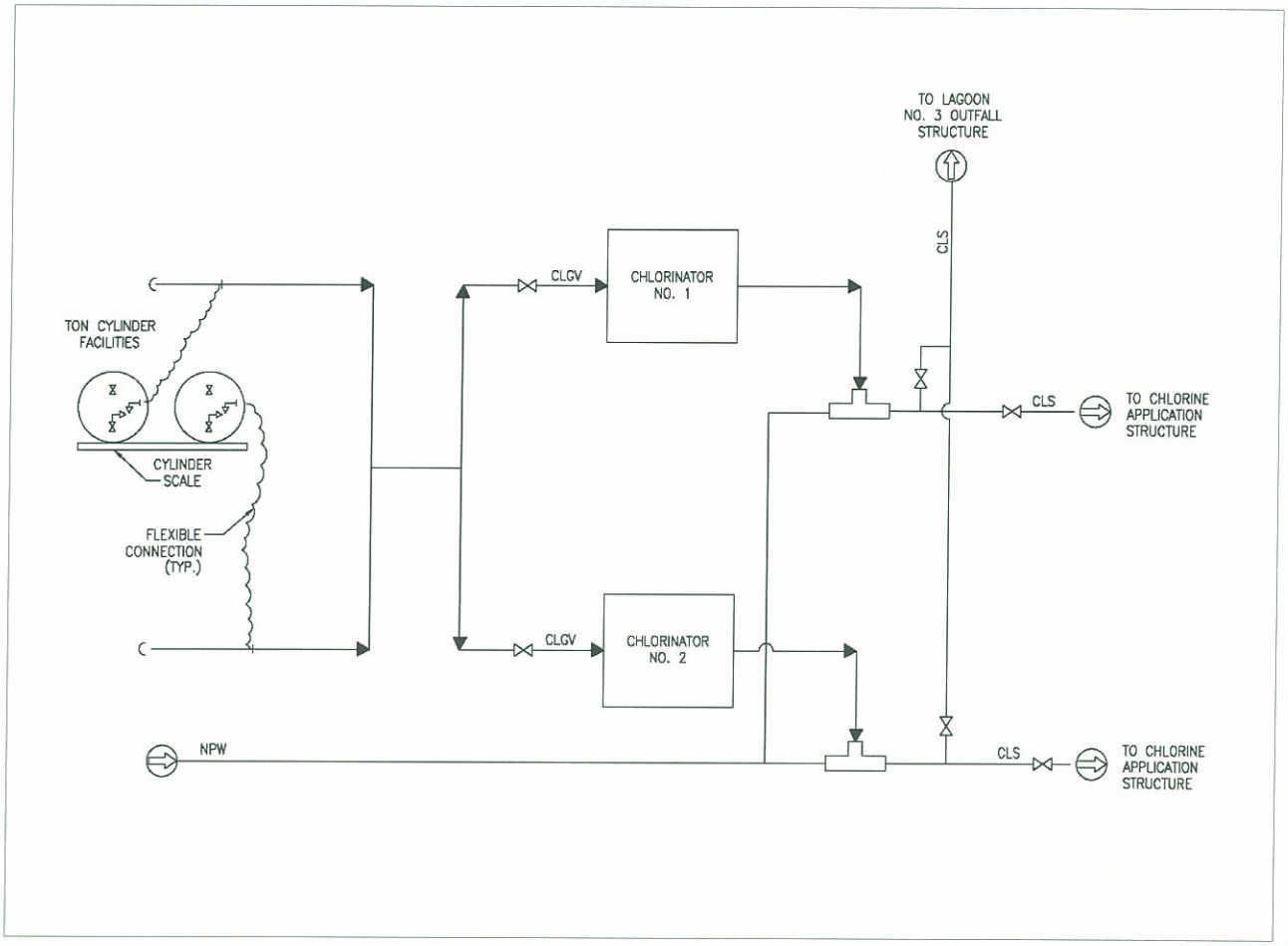


Figure 7-1. Savanna Street WWTP Disinfection Facilities

UV System

A 1999 upgrade to the plant included the installation of a two channel ultraviolet (UV) disinfection system. At the time, only one UV system was installed with the second channel for a future installation.

UV disinfection uses radiation to penetrate the cell wall of an organism. The genetic DNA of the organism is then limited in its ability to reproduce. High concentrations of TSS can absorb UV radiation and shield embedded bacteria.

The UV system was designed for the original Total Suspended Solids permit conditions.

Current permitted TSS parameters for the SSWWTP are presented in Table 7-1.

Operations staff reported the UV system is no longer utilized.

Table 7-1. Savanna Street Wastewater Treatment Plant Permitted Solids Limitations

	Discharge Limitations				
Parameter	Quantity/ Loading Average (lbs/day)	Quantity/ Loading Maximum (lbs/day)	Quality/ Concentration Minimum (%)	Quality/ Concentration Average (mg/l)	Quality/ Concentration Maximum (mg/l)
Solids (Total Suspended) Effluent **May-Oct**	11516 Monthly Average	17274 Maximum Weekly Average	******	30 Monthly Average	45 Maximum Weekly Average
Solids (Total Suspended) Effluent **Nov-Apr**	15021 Monthly Average	22532 Maximum Weekly Average	******	30 Monthly Average	45 Maximum Weekly Average
Solids (Total Suspended) Percent Removal **Jan-Dec**	******	******	85 Minimum	******	******

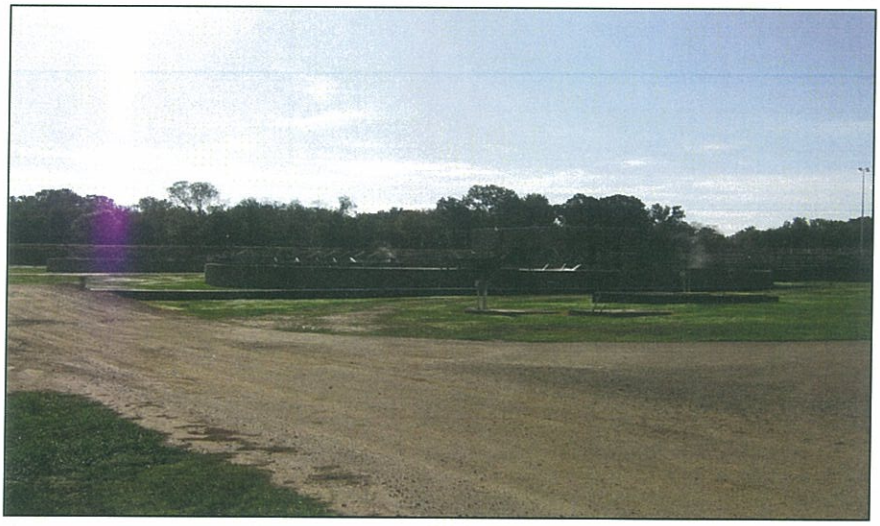


Figure 7-2. Savanna Street WWTP Clarifiers and Return Sludge Building

7.2 Process Evaluation

An evaluation of each of the major processes in the disinfection system is provided in the following paragraphs.

Chlorination

The plant chlorine point of application is through a submersible vacuum chemical induction unit within the chlorine application structure. The chlorine application structure is the junction chamber that combines all clarifier effluents prior to discharge. Chlorine contact is achieved through approximately 135 feet of 60 inch pipe and 770 feet of 96 inch pipe. The disinfected effluent also passes through the previously constructed UV channel approximately 300 feet from the chlorine point of application (POA).

Figure 7-3. Savanna Street WWTP UV System (Not in Use)

The Mississippi Department of Environmental Quality – Guidance for the Design of Publicly Owned Wastewater Facilities recommends the following:

> *For a chlorination system, a minimum contact period of 15 minutes at peak hourly flow or maximum rate of pumpage shall be provided after thorough mixing.*

Assuming the pipe flowing full, the volume of the 60 inch pipe is 19,830 gallons and the volume of the 96 inch pipe is 289,547 gallons. Therefore,

$$Q(Peak\ Hourly\ Flow) = \frac{(19{,}830\ \text{gal} + 289{,}547\ \text{gal})\ Volume}{15\ \text{min}(Detention\ Time)}$$

Or, Q (Peak Hourly Flow) is 29.7 MGD. Using a peak design flow of 120 MGD, the Detention Time is not adequate.

As indicated above, the detention time is quite short. Despite the short detention time, the Discharge Monitoring Reports (DMR) indicated very few times the fecal coliform count was exceeded. The plant DMR also indicated the total residual chlorine to be "Below Detection Limit/No Detection" and no Dissolved Oxygen (DO) values lower than the permitted value (6.0 mg/l). However, the short detention for chlorine contact time is inadequate, and increases the risk of failing the standard for removal of fecal coliform from the permitted discharge. Provision of adequate disinfection should be addressed as part of the CCP.

Chlorination Equipment

The two chlorine feeders were installed in October 1997. Each chlorinator is a model wx4145c3 wc, 8000 ppd sized for 4000 ppd with vacuum gauge, 4-20 ma flow and residual input. No major problems with the equipment were reported.

The chemical induction unit was also installed within the clarifier effluent collection box in October 1997.

Figure 7-4. Savanna Street WWTP Chlorine Feed System

Chlorination feed is flow paced by manually setting the controls by operations staff. The equipment at the plant was originally controlled through a chlorine residual analyzer connected to the chlorinators. The analyzer is no longer in operation.

The two existing chlorinators are not considered to be at the end of their useful life. However, the equipment should be continually monitored and considered for replacement with enough redundancy to insure adequate reliability. Provision for the appropriate disinfection should be addressed in the CCP.

Chlorination Building

The chlorination equipment is housed in a building constructed of precast concrete panels, interior concrete masonry unit walls and a flat built up roof system. The building is almost 40 years old but is in fair condition. An emergency exhaust duct is located in the northeast corner of the Cl_2 feed room and emits directly to the atmosphere. The chlorine ton cylinders are housed in a separate "job-built" steel-framed structure. The structure is not air tight and only provides shaded cover over the ton cylinders.

Figure 7-5. Savanna Street WWTP Chlorine Building on Left/Ton Cylinder Storage on Right

Figure 7-6. Savanna Street WWTP Chlorine Ton Cylinder Storage

Figure 7-7. Savanna Street WWTP Chlorine Ton Cylinder Storage

Dechlorination

The plant dechlorination consists of a building with two sulfur dioxide feed units and ton cylinder storage. The condition of these facilities is provided below.

Sulfur Dioxide Feed

The existing dechlorination system consists of the following components:

- Two wall mounted sulfonators. One 100 ppd capacity for normal flow and one 250 ppd capacity for wet weather bypass flow
- Two vacuum induction units.
- Two – 4 ton cylinder headers with 500 ppd vacuum regulators and a one ton cylinder scale per header.
- One wall mounted automatic switchover unit.

The point of application is within the effluent flow measurement structure. The structure is divided into normal flow and bypass flow. Each channel has a vacuum induction unit.

Figure 7-8. Savanna Street WWTP Sulfur Dioxide Feed at Effluent Metering Structure

Dechlorination Equipment

The two existing sulfur dioxide feeders were installed in 1997. No major problems with the equipment were reported.

The sulfur dioxide feed system (dechlorination) was not initially installed with the means to be automatically flow paced or controlled by residual analyzer. The dechlorination process is controlled by manually setting the feed rate.

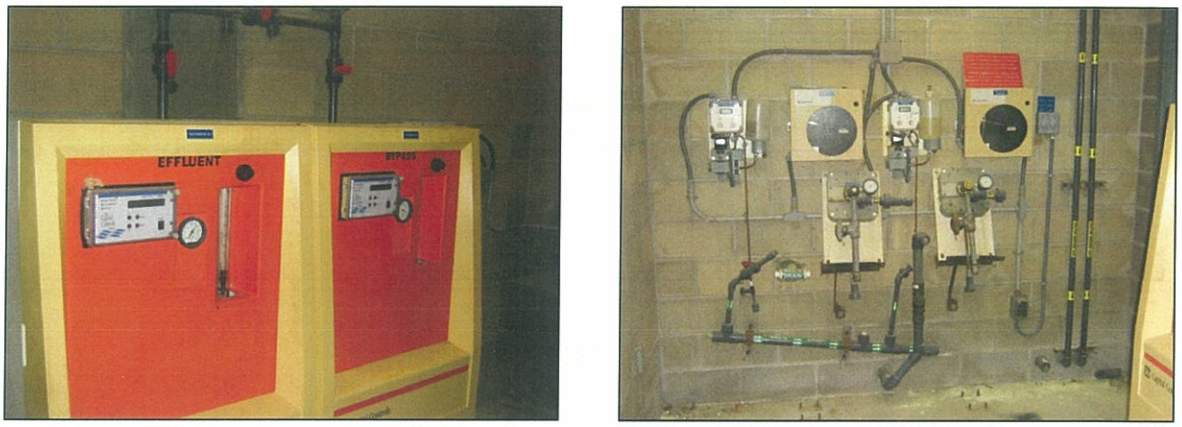


Figure 7-9. Savanna Street WWTP Sulfur Dioxide Feed Equipment

The two existing sulfur dioxide feed units are not considered to be at the end of their useful life. However, the equipment should be continually monitored and considered for replacement with enough redundancy to insure adequate reliability. With the increase in permitted flows through the plant, the chemical feed systems will require further evaluation to determine the need for increasing the feed rate of the equipment. Provision for the appropriate equipment should be addressed in the CCP.

Dechlorination Building

The sulfur dioxide feed (dechlorination) equipment and ton cylinders are housed in a "job-built" steel-framed structure. While the structure is not air tight, it does provide shaded cover and can retain some heat through the spray-on insulation within the cylinder storage area.

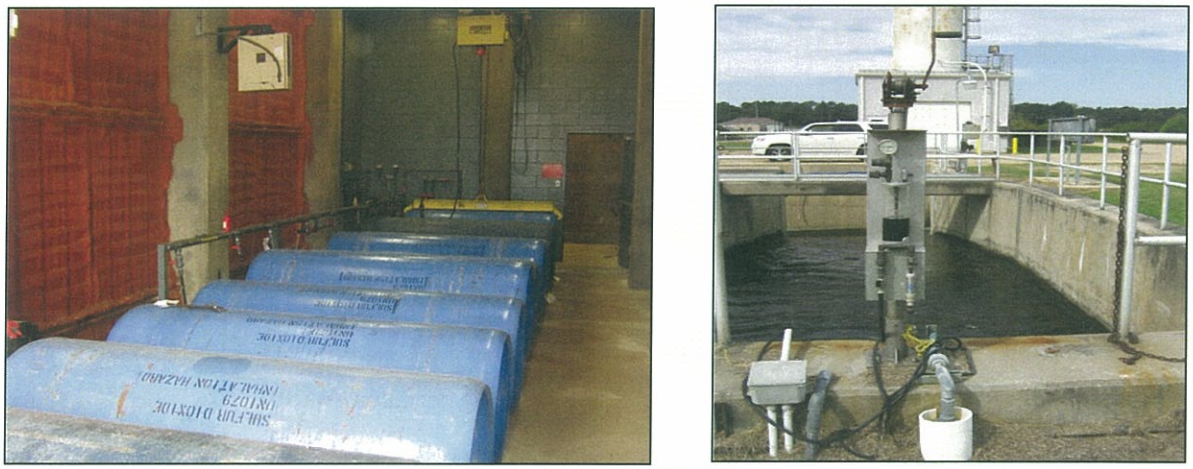


Figure 7-10. Savanna Street WWTP Dechlorination Building and Effluent POA

7.3 Performance Limiting Factors of the Disinfection Facilities

Following the EPA CCP approach, the disinfection system needs are assessed using a scoring system. Included in the scoring is the controllability and capacity of the system. The plant disinfection system has adequate control capability.

The disinfection facilities are also evaluated to identify performance limiting factors and to classify the type of remedial measures required. Table 7-2 shows the performance limiting factors ranking of the various disinfection system components.

Table 7-2. Performance Limiting Factors for Savanna St. WWTP Disinfection System

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Cl2 Contact Time	A	Type 3
Cl2 Feed Rate Control	A	Type 2
SO2 Feed Rate Control	A	Type 2
Contact Basin	A	Type 3
Disinfection Building(s)	B	Type 2
Ton Cylinder Storage	C	Type 2
Chemical Feed Equipment	A	Type 2

In summary, the Savanna Street WWTP disinfection system needs that would be classified as Type 2 remedial measures:

- Chemical Feed Rate Control – The chemical feeders are manually flow paced requiring constant modification and causing excess feeding or inadequate concentrations of chemicals. More effective control of the chemical feed system is required.
- Chemical Feed Equipment – The current chemical feed equipment is 16 years old. While the equipment has not reached the end of its useful life, it will become a problem as more maintenance is required to operate. In addition, as the facility is upgraded to higher design flows, the current equipment may be inadequate to supply higher feed rates.
- Chemical Feed and Storage Buildings – Both chemical feed and storage structures are unlikely to meet current International Fire Code requirements for containment of a high hazard chemical such as chlorine.

In summary, the plant disinfection system needs that should be addressed as Type 3 remedial measures as part of the CCP are as follows:

- Chlorine Contact Basin – The detention time is inadequate to achieve the minimum contact period of 15 minutes at peak hourly flow. Either sufficient provision of contact time is required or replacement and upgrades of the existing UV system.

Section 8
Solids Handling Evaluation

The plant solids handling facilities were evaluated using the composite correction program approach to identify limitations in the existing solids processes and sludge handling equipment. The basis of the evaluation was the expected long-term quantity of sludge that the plant is required to handle. Results of the evaluation are provided in this section.

8.1 Existing Facilities

The solids handling facilities consist of sludge pumping, sludge digestion, and sludge dewatering processes. The specific components are:

- Two WAS pumps.
- Two aerobic digesters.
- Two gravity sludge thickeners.
- Two thickened sludge pumps.
- Thickened sludge holding tank.
- Belt press/centrifuge feed pumps.
- Three permanent two meter width belt filter presses and currently two rental machines for sludge dewatering.

The plant produces sludge that meets Class B pathogen stabilization criteria. After dewatering, sludge cake is hauled, by a private contractor, to agricultural land application sites owned by the City. A schematic of the plant solids handling facilities is shown in Figure 8-1.

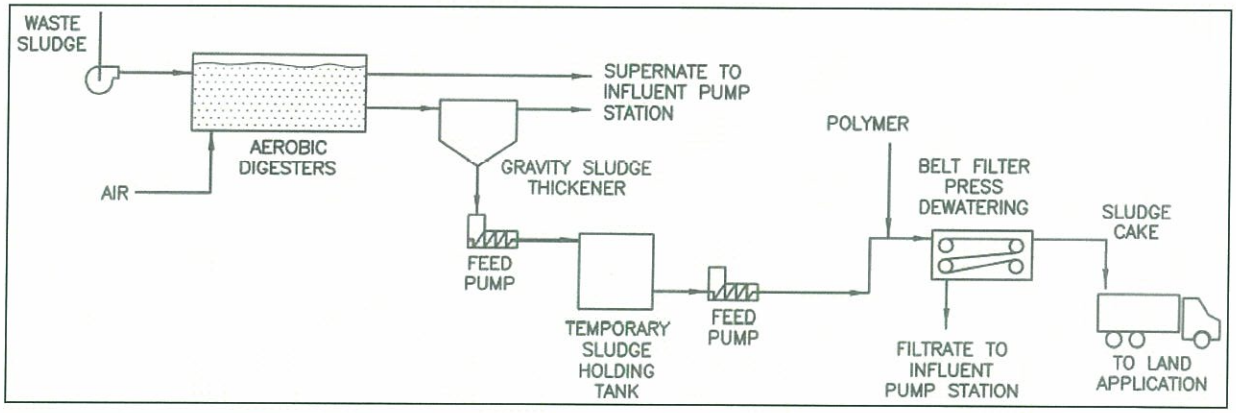


Figure 8-1. Savanna Street WWTP Solids Handling Facilities

8.2 Sludge Production

The long-term average sludge production from the plant is shown on Table 8-1. These sludge parameters represent the quantity of sludge the plant should be capable of processing, assuming the liquid treatment train is enlarged to meet its required capacity and that biological nutrient removal is implemented. The table also assumes that the digesters continue to perform as they have in the past, which represents the worst case sludge production. The 2010-2012 plant operating records were examined and used in the analysis.

Table 8-1. Projected Long Term Sludge Production at Savanna Street WWTP

Parameter	Units	Value	Remarks
Average Influent Wastewater			
Flow	MGD	60	Required capacity
BOD5	mg/L	200	Estimated
Waste Activated Sludge			
Sludge yield	lb TS/lb BOD5	0.9	@ 8 day SRT±
Savanna WWTP	gpd	790,000	
Trahon WWTP	gpd	12,000	
Total WAS	gpd	802,000	
Average WAS Concentration	% TS	1.4%	
Average WAS Solids	lb/day	92,600	46 DT/day
Aerobic Digestion			
Digested Sludge Volume	gpd	550,000	
Digested Sludge Concentration	% TS	2.0%	With thickening in digester
Digested Sludge Solids	lb/day	91,600	
Sludge Dewatering			
Dewatered Sludge Production	WT/day	243	
Dewatered Sludge Production	DT/day	41	With existing digestion

8.3 Process Evaluation

An evaluation of each of the major processes in the sludge handling train is provided within the following subsections.

Aerobic Digestion

The plant has two aerobic digesters, each with a capacity of 2.56 MG. They are aerated using fine bubble flexible membrane tube diffusers manufactured by Environmental Dynamics, Inc. Aeration air is supplied by the main process air system for the plant which consists of four Roots single-stage blowers.

A summary of the current aerobic digester operation is shown on Table 8-2. A photo of one of the digesters is included as Figure 8-2, illustrating the two longitudinal cells in series that comprise each tank.

Table 8-2. Aerobic Digester Performance at Savanna Street WWTP

Parameter	Units	Value	Remarks
Aerobic digesters	ea	2	
Digester volume, ea	gal	2,560,000	
Total digester volume	gal	5,120,000	
Digester detention time	days	6.4	
Digested sludge solids	lb/day	91,600	To thickening
Digested sludge volume	gpd	550,000	
Digested sludge concentration	%	2.0%	
Volatile solids reduction	%	5.1%	

Figure 8-2. Savanna Street WWTP Aerobic Digester

As indicated in Table 8-2, the digester detention time is relatively short, since typically 20 days or more are provided for aerobic digestion. Despite the short detention time, the digested sludge is achieving Class B pathogen standards according to plant lab tests. It does not achieve the required vector attraction reduction criteria of 38 percent volatile solids reduction. However, in Mississippi, MDEQ regulations require that all land applied sludge be incorporated into the subsoil (plowed in), which in itself is an acceptable vector attraction reduction option. Nonetheless, the short digester detention time is inadequate, and gives the plant a severe risk of failing the Class B pathogen standard for digested sludge. Should this failure occur, the only disposal option would be more expensive landfilling. Provision of more effective sludge stabilization should be addressed as part of the CCP.

Gravity Thickening

Each aerobic digester tank contains an integral, 30-foot square gravity thickener. Digested sludge discharges over a weir into the gravity thickener. Performance of the gravity thickeners is summarized in Table 8-3.

Table 8-3. Gravity Thickener Performance at Savanna Street WWTP

Parameter	Units	Value	Remarks
Digested sludge to thickening	lb/day	91,600	
Digested sludge to thickening	gpd	550,000	
Digested sludge concentration	%	2.0%	
Thickened sludge volume	gpd	350,000	
Thickened sludge concentration	%	3.2%	
Thickened sludge to dewatering	lb/day	75,000	
Supernate volume	gpd	200,000	
Supernate solids	lb/day	16,600	
Supernate concentration	mg/L	10,000	
Solids Capture	%	82%	
Total thickener surface area	sf	1,800	
Gravity thickener solids loading	lb/day/sf	51	Typical: 5-10 lb/day/sf
Gravity thickener hydraulic loading	gpd/sf	306	Typical: 100-200 gpd/sf

Plant operating data for the three year period of 2010 through 2012 were used in the analysis. As illustrated in the table, the gravity thickeners are severely overloaded. As a result, significant solids carryover occurs, resulting in continuous recycle of solids back through the plant (see Figure 8-3). This is evident by the low solids capture rate of the thickeners. A properly sized gravity thickener should produce a dilute supernatant containing relatively little solids.

The solids carryover and recycling of excess solids within the plant requires correction. In order for normal plant operations to be maintained, additional thickening capacity and/or other improvements should be provided to avoid the continuous recycle of excess solids.

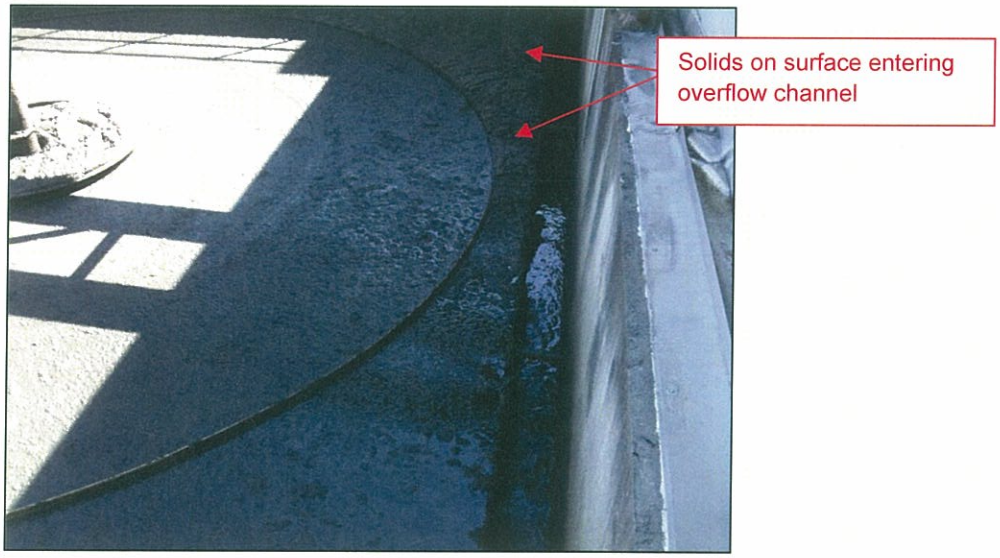


Figure 8-3. Savanna Street WWTP Gravity Thickener

Dewatering

The plant contains a sludge dewatering building with three 2-meter width belt filter presses, sludge feed pumps, and polymer feeding equipment. Adjacent to the reservoir are the transfer pumps which

deliver thickened sludge to gravity thickeners as well as supply sludge to the belt press feed pumps. The condition of these facilities is provided in the following subsection.

Sludge Storage Tank

As shown in Figure 8-4, the portable 20,000 gallon "frac" tank used to store thickened sludge serves the purpose of partially disconnecting the sludge thickening and sludge dewatering operations. Since future sludge thickening and dewatering improvements are anticipated, the need for sludge storage should be re-evaluated based on the expected operating modes and run times of the new thickening and dewatering operations. If liquid sludge storage capability is needed, provision of a conventional, permanent sludge storage tank should be evaluated as part of the CCP.

Figure 8-4. Sludge Storage Tank

Sludge Dewatering Equipment

The three existing belt filter presses are in excess of twenty years old and continue to be problematical to maintain. Although two of the presses were refurbished in 2011 by the manufacturer, frequent breakdowns continue to occur. United Water Services Mississippi, LLC (UWS-MS) estimates that the overall availability of the three machines is 50%. As a result, UWS-MS has rented another 2-meter portable belt press and a 26-in diameter portable centrifuge to supplement the three installed belt filter presses. A summary of the existing dewatering operation is shown on Table 8-4.

Figure 8-5. Belt Filter Presses and Cake Conveyor

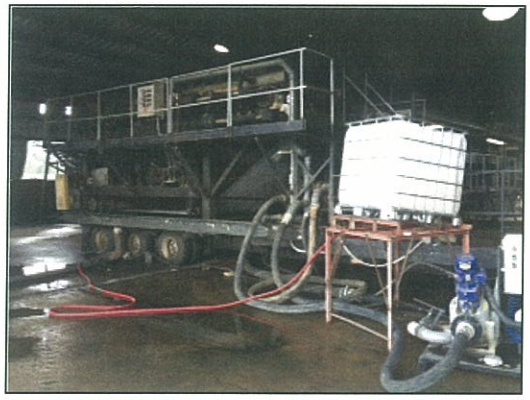


Figure 8-6. Rental Belt Press and Centrifuge

Table 8-4. Sludge Dewatering Performance at Savanna Street WWTP

Parameter	Units	Value	Remarks
Thickened sludge quantity	lb/day	87,000	With improved thickening
Thickened sludge volume	gpd	350,000	
No. belt filter presses	ea	3	
Press width	m	2.0	
Required operating period	hrs/day	18	
Solids loading	lb/hr/m	806	Range: 750-1000 lb/hr/m
Hydraulic loading	gpm/m	54	Range: 100-150 gpm/m
Solids capture	%	98%	Assumed
Solids to disposal	lb/day	85,260	
Dewatered sludge concentration	%	17%	
Solids to disposal	DT/day	43	Dry tons/day
Solids to disposal	WT/day	251	Wet tons/day
Solids to disposal	cy/day	53	

Based on Table 8-4, the three existing belt filter presses could keep up with required sludge production if operated 18 hours per day. However, even with new equipment, a fourth 2-meter press is needed for reliability and redundancy purposes. In practice, due to frequent breakdowns, the plant dewatering operation currently operates 24 hours per day using the three existing presses and the two rental units.

The three existing belt presses have surpassed their useful life span and are no longer candidates for refurbishment. New, permanent, dewatering equipment is required and should include sufficient equipment redundancy to insure adequate reliability. Provision of the appropriate dewatering solution should be addressed in the CCP.

Similarly, the sludge feed pumps, polymer feed units, and cake conveyor system appear to be at the end of their useful life and should be included as part of the CCP investigation.

Dewatering Building

The dewatering equipment is housed in a 34 year old steel-framed building (Figure 8-7) that is in very poor condition. The roof and sides have numerous holes and continue to deteriorate to the point that operators have installed netting under the roof trusses to trap falling debris. There is also damage to

the framing and partial concrete wall from past vehicle impacts. The building is insufficiently sized to house the three existing belt presses and two rental dewatering units. Per the inspection and assessment, the existing dewatering building is in need of complete replacement.

Figure 8-7. Savanna Street Dewatering Building

Dewatered Sludge Storage

Dewatered sludge cake is transferred to trucks using a belt conveyor where it is hauled to land application sites for disposal. During wet weather periods, when access to the fields is not possible, the sludge cake is typically stored on-site as shown in Figure 8-8. Alternatively, it may be applied to the nearby City-owned Byram Landfill farm or disposed in a commercial landfill. However, with no covered storage area and on-site cake storage being a frequent occurrence, the cake is regularly exposed to the weather and is susceptible to re-growth of pathogens. As a result, a paved, covered cake storage area is needed. Provision of covered cake storage should be addressed as part of the CCP.

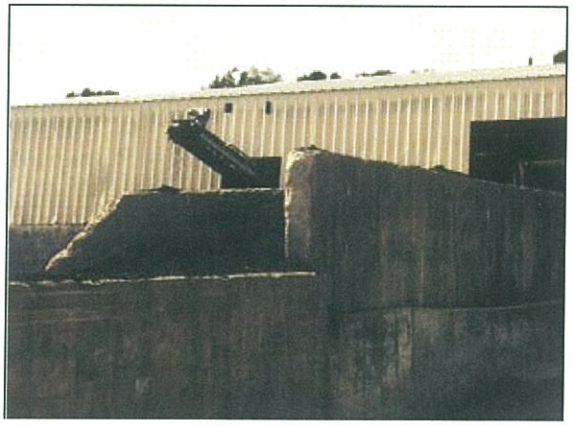


Figure 8-8. Dewatered Cake Storage Area

Sludge Disposal

The plant requires a capacity capable of disposing approximately 43 dry tons perday of sludge. With a dewatered cake at 20 percent solids, this equates to 215 wet tons per day or about 11 truck loads per day. During, and often following, wet weather conditions, when access to the land application sites is

not possible, the dewatered sludge cake must be temporarily stored on-site in the uncovered storage space.

The plant has obtained permits to dispose of sludge on 18 land application sites totaling 4,036 acres. As a general rule, three times the minimum required acreage should be permitted for land application. This additional acreage is necessary to account for buffer zone application restrictions on individual sites, cropping patterns adopted by individual farmers, temporary interruption of sludge applications by individual farmers for various reasons, seasonal restrictions on receiving sludge by individual farmers, and any other unforeseen issue(s) which could arise. The minimum and recommended land application area for the plant is summarized in Table 8-5.

Table 8-5. Land Application Sludge Disposal at Savanna Street WWTP

Parameter	Units	Value	Remarks
Dewatered sludge production	DT/day	43	
Total nitrogen content	%	1.66%	
Plant available nitrogen content	%	1.25%	
Plant available nitrogen content	lb/DT	25	
Allowable application	lb PAN/acre	300	For one crop/yr bermuda grass
Minimum application area required	ac	1,297	
Recommended application area	ac	3,890	
Land application area permitted	ac	4,036	

While it appears that the plant has adequate land application area available, some of the tracts are in remote locations and are held in reserve due to the high cost of sludge transportation. Managing daily deliveries of multiple truckloads of sludge to various application sites throughout the year requires careful planning and management. With the application acreages currently permitted, the plant has sufficient land application capability to dispose of the sludge produced.

8.4 Performance Limiting Factors of Solids Handling Facilities

Following the EPA's CCP approach, the identified sludge facility needs have been assessed using a scoring system. Included in the scoring is the controllability of sludge wasting operations (and hence activated sludge process control) and capacity of the sludge handling facilities. The plant has adequate sludge wasting control capability, and waste sludge volumes are tracked daily. No improvements appear needed in sludge wasting control. For capacity, most of the sludge processes cannot handle the long-term sludge production needs which include aerobic digestion, thickening, sludge dewatering, the dewatering building, and dewatered sludge storage. All of these processes have needs that should be addressed as part of the CCP. Additionally, the design loadings do not meet the MDEQ *Guidance for the Design of Publicly Owned Wastewater Facilities.*

The sludge handling facilities are also evaluated to identify performance limiting factors and to classify the type of remedial measures required. Table 8-5 shows the performance limiting factors ranking of the sludge handling components. The aerobic digestion, thickening, and dewatering capacities are inadequate and have a major long-term effect on plant performance. The remaining components have a lesser effect on plant performance but, nonetheless, represent bottlenecks in the sludge operations and need to be addressed. Sludge disposal is the only sludge operation that appears adequate to meet long-term needs.

Table 8-6. Performance Limiting Factors of Savanna Street WWTP's Sludge Handling Capability

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Thickening	A	Type 2
Sludge Dewatering	A	Type 2
Dewatering Building	B	Type 2
Dewatered Sludge Storage	B	Type 2
Sludge Disposal	C	None

In summary, the Savanna Street WWTP sludge handling needs that would be classified as a Type 2 remedial measures:

- Gravity Thickening – The gravity thickeners are severely overloaded and cause excess solids to be continuously recycled within the plant. A more effective sludge thickening is required.
- Sludge Dewatering – The existing belt filter presses have expended their useful life and need to be replaced with new equipment. The associated sludge feed pumps, polymer feeding equipment, and cake conveying systems are also at the end of their useful life and require replacement.
- Dewatering Building – The dewatering building is in very poor condition and requires complete replacement.
- Dewatered Sludge Storage – A covered sludge storage area is needed to provide a dry environment for storing dewatered cake when land application is interrupted.

In regards to sludge disposal, the plant appears to have adequate land application sites to meet the long-term disposal needs of the plant.

Section 9

Effluent/Storm Water Pumping Station Evaluation

The plant effluent/storm water pumping stations were evaluated using the CCP approach for their capacity to adequately pump treated effluent. The effluent/storm water pumping is only used during wet weather events when the receiving stream (Pearl River) is flowing above the gravity outlet invert elevation 239.0 feet. Results of the evaluation are provided in this section.

9.1 Existing Facilities

The effluent/storm water pump stations consist of the following:

- One pump station with four open flight screw pumps for wet weather flows.
- One pump station with two vertical turbine pumps for additional capacity, if needed.

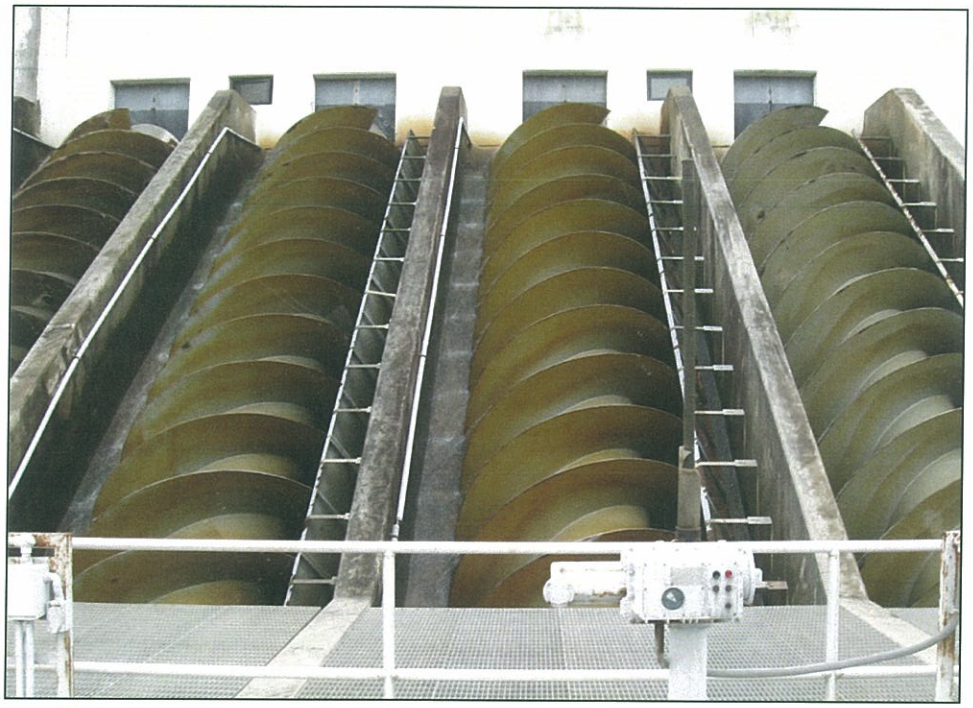


Figure 9-1. Savanna Street WWTP Effluent Screw Pump Station

The pumping characteristics for the four screw pumps are 32,400 gpm each at a head of 25.0 feet. These pumps were installed during the early 1980's improvements to the plant. The pumps serve as the means to pump the effluent from the plant during wet weather events when the river stage is too high to allow the treated effluent to flow by gravity.

Based on information provided by plant personnel, a river stage of 23 feet requires the use of the effluent pump stations.

Figure 9-2. Savanna Street WWTP Effluent Vertical Turbine Pump Station

The vertical turbine pump station was the original effluent pump station constructed in the early 1970's. The pump characteristics for the two vertical turbine pumps are 41,600 gpm each at a head of 21.0 feet. This pump station is used when the screw pump station cannot keep up with the wet weather flow. A slide gate at the screw pump station allows for flow to be diverted to the vertical turbine pump station via an 84-inch pipe.

9.2 Pumping Capacity

The total pumping capacity of the screw pump station is 186 MGD and the total pumping capacity of the vertical turbine pumps is 120 MGD.

Table 9-1. Savanna Street Wastewater Treatment Plant Effluent Pumping Capacity

Flow Stream Pumped		No. Units	Unit Hp	Head	Unit Capacity (gpm)
Wastewater Effluent	Screw Lift	4	300	25	32,400
	Vertical Turbine	2	300	21	41,600

9.3 Process Evaluation

These pumps are used for pumping the effluent from the plant when wet weather conditions result in a flood stage of the Pearl River, approximately 28 feet (gauge height) or elevation 261.7 feet (NGVD 29). The vertical turbine pumps are the original wet weather condition pumps. Each pump has had a motor repair within the last 25 years. The screw pumps were installed during the plant rehabilitation in the late 1980's. Bearings for the screw pumps have been replaced within the last 10 years. At the time of this CPE, screw pump number 2 was in need of a bearing replacement and screw number 4 was inoperable due to a broken motor shaft.

The combined total capacity of the two effluent pump stations is adequate for a peak design flow of 120 MGD and a total future plant capacity of 150 MGD.

Over time, pumps may lose efficiency due to wear on parts and motors. A common issue for open flight screw lift pump stations is wearing between the screw and the concrete trough. Accumulated wear causes the tolerance (or gap) between the screw and the concrete to become greater, thereby losing water as the screw turns. No issues regarding performance were mentioned by operations staff.

9.4 Performance Limiting Factors for Effluent/Storm Water Pump Station Facilities

Following the EPA CCP approach, the identified facility needs are assessed using a scoring system. Included in the scoring is the controllability of operations and capacity of the facilities. The plant effluent/storm water pump stations have adequate control capability, and adequate capacity for a peak design flow of 120 MGD and a total future plant capacity of 150 MGD.

For the plant, no immediate remedial measures were identified.

* During a follow up plant site visit (May 14, 2014), Operations staff noted problems with screws number 2 and 4 as follows:

1. The flights began detaching from the center tube of Screw number 2 requiring re-welding.

2. Screw number 4 is inoperable due to a broken motor shaft.

Section 10

Plant Electrical System

The plant electrical system was evaluated by visual inspection and meeting with the maintenance personnel. The basis of the evaluation was the expected long term power requirement and the reliability of the electrical system.

10.1 Existing Facilities

Electrical service to plant is provided by Entergy Mississippi, which has a dedicated substation at the south end of the facility. The primary voltage at the substation is 115KV and the secondary voltage is 4160 VAC three phase. From the substation, underground services enter the blower building switchgear where power is then distributed to other buildings and facilities on the site.

A overhead service leaves the substation to supply power to the lagoon aerators which have been removed.

The blower room switchgear supplies power to:

- Influent Pump Building
- Administration Building
- Disinfection System
- Effluent Pumps
- Screw Pumps

There are three emergency generators on-site to supply power during power outages; 1-1500kw and 2-900 kw units. These three units are located near the influent pump station and power the following treatment units:

- Influent Pump Station
- Administration Building
- Disinfection System
- Effluent Pump Station

Figure 10-1. Entergy Mississippi Substation With Single Transformer

Figure 10-2. Blower Room Switchgear Powers Blowers and Distributes Power to Rest of Plant

Figure 10-3. Damaged Blower Motor Starter and Enclosure

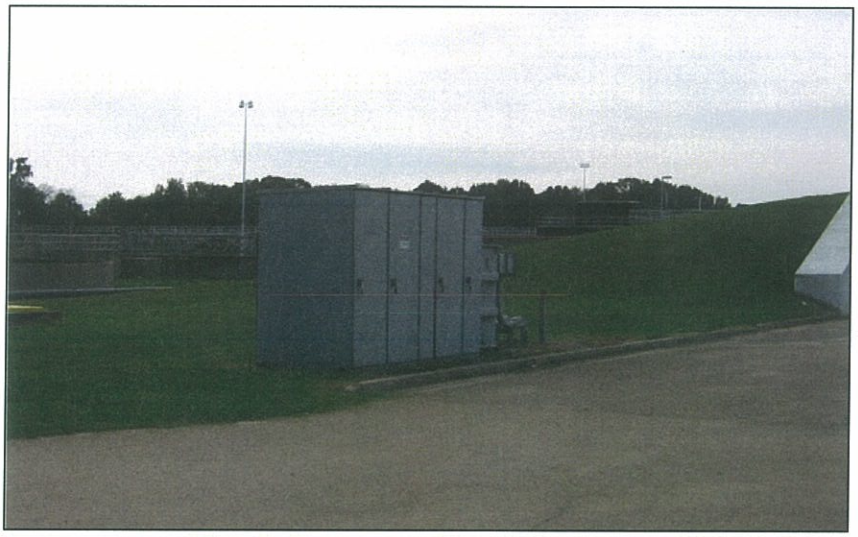


Figure 10-4. Typical Unit Substation Powering Buildings at Plant

Figure 10-5. Two 900 KW Generators Located Near Influent Pump Station

Figure 10-6. 1500 KW Generator Located Near Influent Pump Station

10.2 Performance Limiting Factors for Electrical System

Presently, two of the emergency generators are out of service significantly reducing the available power for emergency operation. Also, compounding the emergency power issue is the automatic transfer switches not functioning correctly in automatic mode. One transfer switch will operate in manual.

The PLC controls for paralleling the generators are also not operating correctly. With only one of the 900 kw units available, the plant can operate two small influent pumps, the administration building, and the disinfection system. There is not adequate capacity in the emergency generator system to operate the effluent pump station in an emergency situation.

The blowers for processing the waste water are not connected to the emergency power system, therefore the waste water would not be treated during power outages.

The existing electrical has been well maintained and has kept up with the existing processes and operation. However, due the age of equipment and availability and timely access of spare parts, the components are reaching the expected lifetime of electrical equipment.

10.3 Electrical System Evaluation

Following the EPA CPP approach, the plant's electrical systems have been assessed using a scoring system.

Table 10-1. Performance Limiting Factors for Savanna Street WWTP Electrical System

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Emergency Generator for Blowers	A	Type 3
Emergency Generator Repair/Replacement	A	Type 2
Automatic Transfer Switch Repair	B	Type 2
Paralleling Equipment Repair	A	Type 3
Replace Plant Switchgear and MCC's	A	Type 3

In summary, the Savanna Street WWTP IPS deficiencies that would be classified as Type 2 remedial measures:

- Repair or replace existing generators and automatic transfer switches for power to the disinfection equipment, influent pump station and administration building during power outages.

In summary, the Savanna Street WWTP IPS deficiencies that would be classified as Type 3 remedial measures:

- Repair or replace the paralleling equipment for power to the disinfection equipment, influent pump station and administration building during power outages.
- Replace Plant Switchgear and Motor Control Center equipment.

Section 11

Administration, Operations, and Maintenance

During the CPE, the plant process-limiting factors in the areas of administration, staffing, finance, maintenance, and operations were identified. These factors are listed below and the most significant ones briefly discussed.

11.1 Plant Administration

The plant's Manager for United Water Services Mississippi, LLC (UWS-MS), the current plant contractor, was interviewed to discuss polices currently in place for plant Operations and Maintenance Procedures in general and specifically during wet weather conditions. It was pointed out that an Operations and Maintenance Procedures Manual is in place, but for quicker reference, some of the equipment have their own Standard Operation Procedures (SOP) and are kept separately from the overall manual. The SOPs for these items are usually grouped by areas such as Raw Sewage, Return Sludge, etc.

In terms of procedures during wet weather conditions, it was found that plant polices allowed staffing to make the necessary decisions to plant controls during the time of wet weather events. Video monitors are currently in place for a visible observance of pumps. However, because they are not controlled electronically, the lead operator on each shift is responsible for making a physical visit to the pumps on a one or two hour interval to make a judgment call on when they are to be turned off. The rainfall intensity mainly determines the frequency of the pump visits during this time.

11.2 Plant Staff

Manpower

UWS-MS (currently employees 43-44 staff personnel that take care of the plant 24 hours a day, seven days a week. The current contract for UWS-MS will allow up to 48 employees. All current employees are full time. At least four employees have tenure of at least 30years. It was found that the staff in general is knowledgeable about their jobs duties and was overall well-trained and familiar with the technologies required to perform their jobs. Newer staff members are trained and in some cases cross-trained to take on areas of responsibilities during the event of a retirement by an older employee. It was noted that with the implementation of equipment that utilized more technology, current staff members could be reassigned to other areas of the plant were preventative maintenance work could be done.

Currently, UWS-MS has a contract in place with a private liquid waste hauler to respond to pump station wet well emergencies. They also have a contract with an equipment rental company to provide portable pumps and generators, if required. Subsequently, during wet weather conditions, additional staffing is not needed.

As a part of their current contract, UWS-MS also reaches out to local colleges to employee interns for meaningful on the job experience in their related course of study. There is currently a rotation

schedule from four colleges (Tougaloo, Millsaps, Jackson State University, and Belhaven) that is used to employee the intern/co-op students.

Staff Qualifications

Currently UWS-MS has 12 licensed wastewater operators certified through the State of Mississippi. There are procedures that are in place to assist other members of the staff that seek to be certified, as well. By the use of a former retired MDEQ employee, tutoring is provided during the course of the month leading up to dates of certification testing. This is done in conjunction with the current week long training course provided by the state. With the implementation of this month long tutoring program, there is a passing rate of approximately 60 percent compared to 25 percent that do not participate in it. The certifications are good for five years; however continuing education hours are required on a yearly basis to maintain this certification.

It was pointed out that other non-certified employees are knowledgeable about plant operations and help to assist in the daily duties to be performed. The current level of certified operators provides sufficient coverage for the Savanna Street WWTP.

Productivity

There are currently no issues with lack of staff productivity. As previously stated, staff members are cross-trained in their areas of work and skill sets are expanded and implemented to assure that current plant needs are met by the existing staff.

11.3 Financial

The current contract for UWS-MS is to mainly operate and maintain the plant with expenditures as specified in their contract. Although a provision is within UWS-MS' contract for allowing them price the cost for needed capital equipment, funding for capital projects are not included as a part of the contract. For example, repairs usually in the $15,000-25,000 range are usually handled by the plant contractor under current contract terms. But during the event of the failure of a major piece of equipment, the City of Jackson currently pursues the use of outside contractors to provide repair or replacement services. This option at times can lead to failed items being offline for prolonged period of time during the procurement process which in turn causes delays in the plant operations.

It was noted that a list of capital improvement items needed for effective plant operations are submitted to the City yearly, but not approved. An annual budget for capital repairs is needed by the City of Jackson to properly fund annual needs as required. The amount of annual funding will be established within the CCP.

11.4 Maintenance

Preventative Maintenance

Preventive maintenance for the plants currently being through an Asset Management System called eRPortal. It was implemented by UWS-MS in February 2013. The management software is currently being used to keep track of assets at Savanna and two other WWTPs and 98 lift stations. This software is also utilized to track all maintenance repairs and costs. The software will provide an alert for routine maintenance cycles for items and will indicate and print reminders for the appropriate time to replace system components.

Corrective Maintenance

Work orders needed for corrective maintenance measures are also done through the eRPortal system. They are produced on an as needed basis and the information entered into the system can be retrieved for review at a later date. This tracking system has helped the plant eliminate a lot of paperwork in writing up work orders and has also helped keep track of the maintenance history of their repairs. Should it be needed, the system can serve as a quick tool for justifying a new purchase of an item versus continued repair for certain items.

11.5 Operations

Sampling and analysis for the plant operations are mainly performed by In-house laboratory personnel. In some cases sampling may be done by an outside lab. On-site sampling data is managed using a program entitled Wastewater Information Management System (WIMS), which is provided through a third party vendor. All flows (influent, sludge, etc.) are monitored through this program. This Information is stored and can be accessed by computer.

Monitoring of the flows are analyzed on a daily basis and is done by the used of patterns of flow on computer screens. When an abnormal pattern is observed for a particular flow, process adjustments are taken by the appropriate personnel.

11.6 Existing Operations Contract

Review of the existing operations contract between the city of Jackson and UWS-MS indicated there are few specific operational performance requirements within the contract. The few parameters provided address only basic permit limits at specified flows. Specific requirements like operational parameters to control the use of storm lagoons, what if any discharges can occur from the storm lagoons, and other critical operational parameters are not addressed. In addition, requirements concerning regular maintenance activities are virtually non-existent.

The current contract also does not address the new permit requirements or any pending changes that will be required by the Consent Decree. It also does not address annual budget needs for capital repair and replacement at the Savanna Street WWTP to assure the facility remains in proper operating condition. To assure proper plant performance and properly protect both the City of Jackson and UWS-MS under the Consent Decree, the terms of the existing agreement need to be comprehensively re-negotiated. Given the level of changes required, re-procurement of the operations contract should also be considered.

11.7 Summary of Process Limiting Factors for Administrative, Operations, and Maintenance

In summary, as part of the CCP, the plant process limiting factors that should be addressed as Type 1 remedial measures are listed below:

- The ability to control pumps remotely should be implemented to prevent controlling them manually during wet weather conditions.

- Addressing capital improvements in a timely fashion at the plant has been a reoccurring issue and has caused significantly delays in some areas of processing. Budget planning needs to occur to properly establish annual repair or replacement budgets for major equipment to assure proper maintenance

- The existing O&M contract needs to be comprehensively re-negotiated or re-procured to include proper operational and maintenance requirements consistent with Consent Decree requirements.

Appendix A

Neel-Schaffer's Structural Analysis of IPS

NEEL-SCHAFFER
Solutions you can build upon

MEMORANDUM

To: Christopher Munson (CDM)

From: Ken McBeath (N-S)

Date: July 10, 2013

Subject: STRUCTURAL ANALYSIS MEMO
INFLUENT PUMP STATION WET WELL
SAVANNAH STREET WWTF
CITY OF JACKSON, MISSISSIPPI

Background

During the Structural Condition Assessment (See Appendix A for Structural Condition Report) of the influent pump station wet well at the Savanna Street WWTF, two unanswered questions concerning the future structural integrity of the wet well were raised.

Structural Analysis

The first question raised during the visual assessment of the wet well was the condition of the concrete in the walls. Visual inspection of the walls did not reveal the severity of the corrosion that was present on the undersides of the interior platforms at El 267.0, El 245.5 and El 236.0. To confirm the condition of the walls, flow was diverted from entering the wet well and core samples were taken at five locations along the walls. The core samples were then tested to determine their compressive strength. According to the existing drawings of the wet well, the minimum compressive strength of the concrete should be 3,750 psi. The results of the tests revealed that the minimum compressive strength of the core samples to be 6,890 psi (See Appendix B for Core Test Results).

In addition to the enhanced strength of the concrete in the walls of the wet well, a visual inspection of the core samples revealed only minimum surface deterioration after 40 plus years of service.

The second question raised during the visual assessment of the wet well was the effect of the deteriorated condition of the interior slabs at El 267.0, El 245.5 and El 236.0 on the structural integrity of the walls.

Since no original calculations on the wet well were available, an analysis of the wet well was performed using the wall dimensions and wall reinforcement from the original drawings.

Parameters including soil loading and groundwater elevation were estimated. Analysis with and without support from the interior slabs were performed.

Results of the analysis indicate that the interior slabs are necessary to provide stability for the walls. Additional explanation is necessary to explain the difference between the interior slabs providing stability to the walls and the slabs ability to carry vertical load. As mentioned in the assessment report, the vertical load carrying of the slabs has been compromised due to the corrosion of the concrete and reinforcing steel in the bottom face of the slabs. However, because of size and thickness of the slabs and tie beams, they are still able, at this time, to provide the necessary support for the wet well walls.

Summary

The concrete in the wet well exterior walls has adequate strength and shows only minor surface corrosion.

The interior slabs are necessary for the structural stability of the walls to resist the applied soil and groundwater loads. At the present time, the slabs are adequate to provide stability to the walls but are not adequate to support vertical loads on their surface. The vertical load carrying capacity of the interior concrete slabs and beams has been severely limited by the corrosion of the reinforcement in the bottom regions of the slabs and beams. The adequacy of the slabs to provide support to the walls will continue to decrease as they corrode due to their exposure to corrosive gases and moisture. To remove all risks of the slabs and beams collapsing into the wet well, a repair plan should be initiated to support the interior slabs and beams.

However, in the near term (2 years or less), we believe that the existing condition of the interior slabs and beams should be sufficient to provide support to the wet well structure without catastrophic failure. No live load should be placed on the slabs and any debris accumulation should be removed using a crane supported bucket to avoid any additional load on the interior slabs.

We understand that a new pump station is being considered to replace the existing Influent Pump Station and Wet Well. If any time frame greater than 2 years is anticipated before either a new pump station is constructed or the existing pump station is rehabilitated, then a repair plan for strengthening the interior slabs and beams should be initiated and constructed as soon as possible to provide protection against failure. Strengthening methods could include support of the slabs by installing fiberglass beams under the slabs for support or grouting epoxy coated reinforcing to strengthening the beams. All interior concrete surfaces should be blast cleaned, repaired as necessary and coated with a protective sealer.

APPENDIX A

STRUCTURAL CONDITION ASSESSMENT

INFLUENT PUMP STATION WET WELL

SAVANNAH STREET WWTF

CITY OF JACKSON, MISSISSIPPI

Background

The influent pump station wet well is a cast-in-place, reinforced concrete structure constructed in the early 1970's. The structure has multiple level reinforced concrete platforms at El. 267.00 (top slab), El. 245.5 (intermediate platform), El. 236.0 (intermediate platform) and El. 223.6 (bottom slab). The wet well chamber consists of an inlet sump, screening chamber and a sloping channel to the raw sewage pumps located in an adjacent pumping building. The original wet well had an enclosed screening room at El. 267.0 consisting of precast concrete walls and a concrete roof deck but this structure has been removed leaving an open concrete deck. Access to the lower platforms in the wet well is limited by the condition of the reinforced slabs and by flow rates and water levels in the wet well.

Structural Condition Assessment

A structural condition assessment was conducted on 1/24/2013. In addition, previous photographs of the wet well taken on 3/06/2012 were used to provide insight into the structural condition of the wet well. These photographs were taken from a suspended access platform during low flows to allow assessment of the lower parts of the wet well. No core samples or testing has been performed to determine the extent of any concrete or reinforcement contamination.

The platform at El. 267.00 (top slab) consists of an 8 inch, reinforced concrete slab with thickened concrete beams. Photographs #1 and #2 show extensive scaling and disintegration of the concrete on the bottom of the face of the slab. This scaling has reached the reinforcement causing the unprotected, reinforcement bars to corrode. Photographs #3 and #4 show additional areas on the walls and underside of the slab which have been subjected to scaling.

The platform at El. 245.5 (intermediate slab) consists of an 18 inch, reinforced concrete slab. Photograph #5 shows the top surface of the slab with a coating of deposited sludge and screenings material. The underside of the intermediate concrete slab exhibits even more corrosion than what was observed at the top slab. Photograph #6 shows the concrete cover over the reinforcement to be completely scaled off, exposing the reinforcement to corrosion and eventually disintegration.

The platform at El. 236.0 (intermediate slab) consists of a 12 inch, reinforced concrete slab. Photograph #7 is a view of the top surface of the slab. Photograph #8 shows the corroded concrete and reinforcing bars on the bottom surface of the slab at El. 236.0

The bottom slab at El. 223.5 consists of an 18 inch, reinforced concrete slab on grade. Photograph #9 shows a sludge covered, reinforced concrete baffle wall which directs the incoming wastewater to the raw water sewage pumps. The walls are covered with accumulated sludge but, as the exposed aggregate indicates, significant corrosion of the concrete exits under the sludge. Photograph #10 shows the deterioration and exposure of aggregate in the top surface of the bottom slab.

Summary

The concrete slabs at El. 267.0, El. 245.5 and El. 236.0 have been subjected to gaseous H2S which has acidified surface moisture in the headspaces under each platform and caused acidic corrosion of both the concrete and reinforcement. This process has progressed to the point where the load carrying capacity of the slabs has been compromised and offers little or no load carrying capacity.

The walls of the wet well structure have also been subjected to this corrosive atmosphere but visually do not exhibit the severity of the corrosion that the bottom surfaces of the slabs show. However, without cleaning the walls of built-up sludge, visually assessing the condition of the cleaned wall and core drilling to see if the prolonged exposure has penetrated into the reinforcement, an accurate structural assessment is not possible.

Photograph #1

Photograph #2

Photograph #3

Photograph #4

Photograph #5

Photograph #6

Photograph #7

Photograph #8

Photograph #9

Photograph #10

SOILTECH CONSULTANTS
Geotechnical Engineering

APPENDIX B

July 3, 2013

Neel-Schaffer, Inc.
125 South Congress Street
Jackson, Mississippi 39201

Attention: Mr. Ken McBeath, P.E.

Re: Concrete Core Test Results
Savanna Street WWTP
Jackson, Mississippi

Submitted herein are the results for five (5) concrete compression tests performed on cores delivered to our laboratory facility on June 2, 2013. Each core end was cut with a wet-cut diamond saw to establish an end condition suitable for compression testing. Average diameters, average heights, and sample weights were recorded and are shown. Length to diameter ratio factors were applied to raw compressive strengths per ASTM C 39.

Concrete Core Compressive Test Results

Cylinder No.	Date Tested	Density (lb/ft^3)	Machine Load (lbs)	Raw Compressive Strength (psi)	L/D Correction Factor	Compressive Strength (psi)	Type of Failure
E-1	7/3/13	153	115,470	10740	0.88	9450	C
E-2	7/3/13	148	96,110	8940	0.89	7960	C
E-3	7/3/13	151	81,350	7570	0.91	6890	C
W-1	7/3/13	145	86,110	8010	0.90	7210	C
W-2	7/3/13	123	96,640	8990	0.90	8090	C

Additionally, photographs are shown presenting the cores in their as-received condition and after saw-cutting.

We appreciate the opportunity to be of service and should you have any questions concerning the information provided, please do not hesitate to contact us.

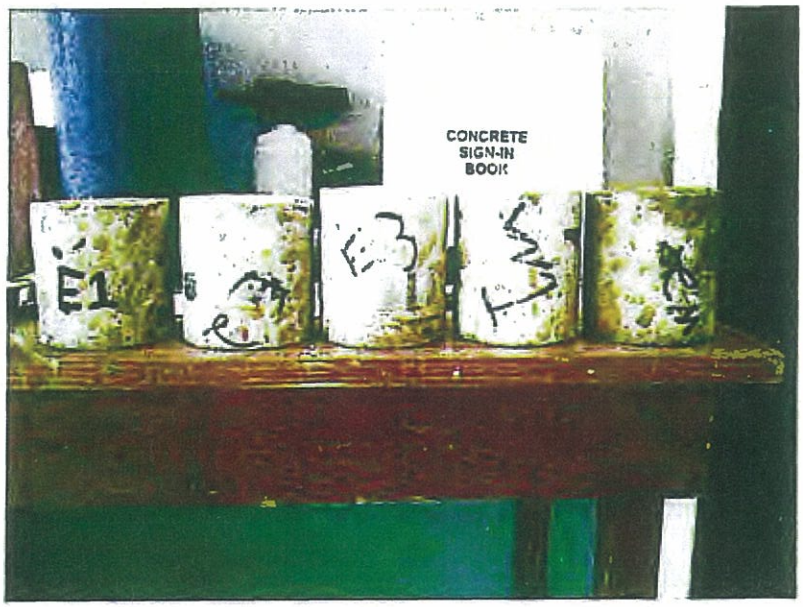
Very truly yours,
SoilTech Consultants, Inc.

Checked By

Reviewed By

P.O. Box 12466, Jackson, MS 39236, 101 Business Park Drive, Suite A, Ridgeland, MS 39157
601.952.2995, Fax 601.952.2944

Photograph 1: Concrete Cores As Received



Photograph 2: Concrete Cores after Saw-cutting Ends

NEEL-SCHAFFER
Solutions you can build upon

MEMORANDUM

To: Christopher Munson (CDM)

From: Ken McBeath (N-S)

Date: November 25, 2013

Subject: STRUCTURAL ALTERNATES
IPS WETWELL SLABS
SAVANNA STREET WWTF
CITY OF JACKSON, MISSISSIPPI

During previous visual assessments of the wetwell, the deteriorated condition of the intermediate slabs has been well documented. This deteriorated condition has not only presented safety issues for plant personnel needing access to the platforms but also in the operation of the pumps should any loose concrete fall into the wetwell. Two options to address these structural problems have been studied. The first option is a temporary solution to provide additional time to evaluate a more permanent fix. The second alternate is a more permanent fix which will extend the useful life of the pump station into the future. A description of each alternate with costs and time implications is as follows:

Alternate #1(Temporary support of the existing slabs to prevent collapse of slabs into wetwell)-Alternate #1 will provide support for the deteriorated slabs by installing aluminum beams under the slabs at elevation 245.5 and 236.0. In addition, a protective coating will be applied to the underside of the slabs to inhibit additional corrosion and deterioration of the existing concrete. All material necessary to construct this alternate is anticipated to be stock items and available for a timely installation. An estimated timeline and project costs for Alternate #1 is as follows:

1. Develop Plans and Specification-15 days(@ 8 hr/day
2. Estimated Construction Costs-$100,000
3. Estimated Construction Schedule-45 days(@ 8 hr/day

Alternate #2(Rehabilitation of the existing slabs to restore original load carrying capacity)-Alternate #2 will restore the load carrying of the slabs at elevation 245.5 and 236.0 by bonding a new 4" reinforced concrete/epoxy grout slab to the underside of the existing concrete slab. This alternate will include surface preparation of the existing slab, doweling into the existing wall and slab, placement of epoxy coated reinforcing steel and placement of a 4" thick concrete/epoxy grout slab on the underside of the existing slab. In addition, a protective coating will be applied to the underside of the slabs to inhibit corrosion and deterioration of the new concrete slab. All material necessary to construct this alternate will be available for a timely installation. The

construction schedule for this alternate will be longer due to the labor intensive work necessary to dowels in the reinforcing bars and the forming and placement of the slab. An estimated timeline and project costs for Alternate #2 is as follows:

1. Develop Plans and Specification-20 days @8 hr/day
2. Estimated Construction Costs-$300,000
3. Estimated Construction Schedule-90 days @ 8 hr/day

NEEL-SCHAFFER
Solutions you can build upon

MEMORANDUM

To: Christopher Munson (CDM)

From: Ken McBeath (N-S)

Date: February 19, 2014

Subject: CCP ANALYSIS (SUPPLEMENT #1)
INFLUENT PUMP STATION WET WELL
SAVANNA STREET WWTF
CITY OF JACKSON, MISSISSIPPI

In previous inspections and evaluations, the deteriorated condition of the reinforcing steel and concrete of the intermediate slabs at elevation 245.5 and 236.0 has been well documented. Because of debris and high flows in the Influent Pump Station, inspection of the 18 in slab immediately upstream of the pump inlets could not be observed. In the last few weeks, the pump station has been cleaned and bypass pumping has allowed access to the slab.

On February 18, 2014, access to inspect this slab was accomplished by lowering a crane supported basket to the slab at elev. 223.5. From there, access to the underside of the slab was obtained.

The slab supports approximately 18'-20'of earthen fill. According to the original design drawings, the slab was originally constructed to be 18" thick with reinforcing bars each way in the top and bottom of the slab. Inspection of the underside of the slab from within the wet well revealed significant deterioration of the concrete and reinforcing steel in the bottom mat of the slab (Photo #1 and #2) and in the reinforcement in the walls (Photo #3) at the top of the walls.

The load carrying capacity of the slab has been severely reduced from its original design by this deterioration. The deterioration is continuing with dangling reinforcing bars and concrete pop outs noted throughout the structure. In addition, large aggregate in the walls and slabs are exposed and subject to displacement with any additional exposure to corrosive gases or impact.

In its current state, this slab is considered to be structurally inadequate to support the loading it is currently under and is in danger of failure. The time frame of failure cannot be accurately determined due to the many mitigating conditions that are contributing to the slab still being in place such as:

1. Compression from the walls caused by soil pressure (acts similar to a prestressed beam in which the prestressing strands cause compression in the bottom flange);

2. Diaphragm action of the slabs because of two way action of the top mat of reinforcing;
3. Arching action of the soil much like a brick wall arching over an opening and
4. Actual concrete strength- much greater than the design value (samples taken in 2013 measured a compressive strength in excess of 6,800 psi).

Any and all of the above could be contributing to the support of the concrete slab. However, going forward, these factors should not be used because of their unknown reliability and contribution to the slab support. Additional support for the slab should be installed if the City desires to continue to operate the Influent Pump Station.

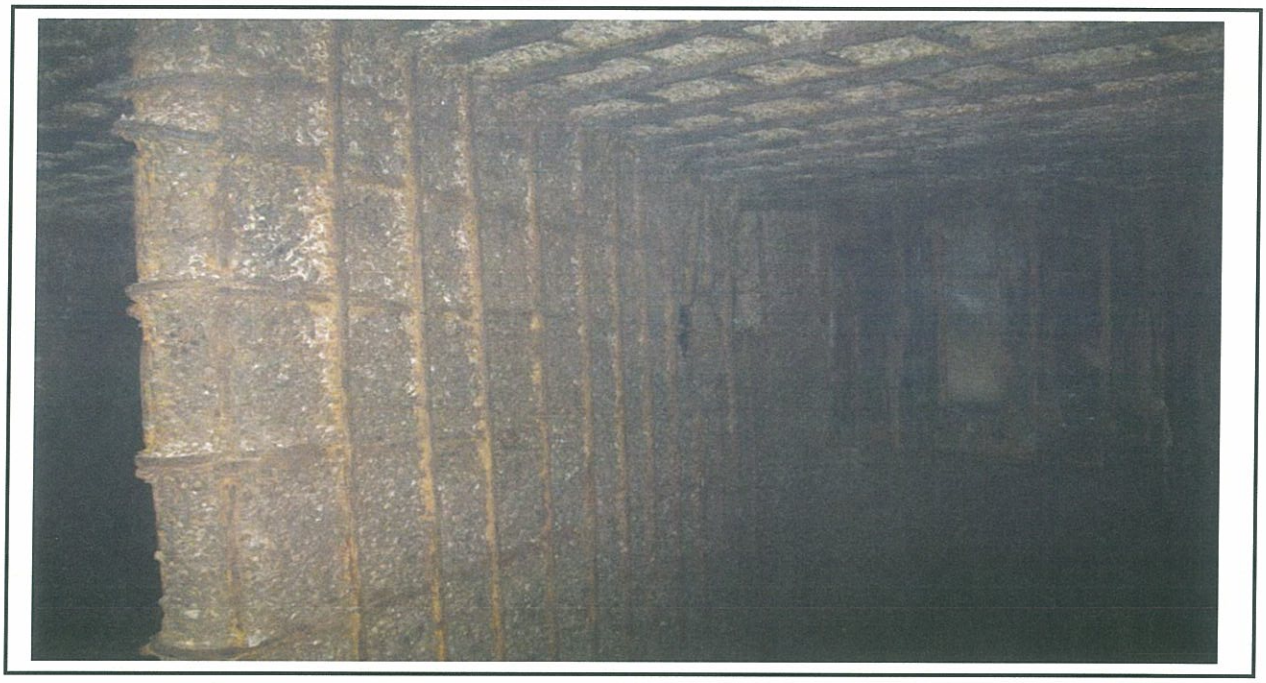
One method for consideration is constructing additional positive support of the slab by the installation of beams supporting a stay-in-place form that is grouted to the underside of the slab to not only provide support for the slab but prevent any corroded reinforcing steel or loose concrete from falling into the wet well and going thru the pumps. In addition, a coating should be applied to the support system and to all exposed reinforcing and concrete aggregate throughout the wet well to inhibit further deterioration. Other methods of rehabilitation may be considered but we recommend a structural engineer be retained to evaluate any proposed repair method.

This remedial work should be considered to be temporary (2-5 years) until a more permanent solution has been identified. Given the magnitude of the deterioration within the wet well and the existing conditions that caused the situation that will continue to persist, we recommend the City consider construction a new wet well structure. Any longer term rehabilitation methods will be very costly to construct and maintain given the current conditions.

Ken

Photograph #1

Photograph #2



Photograph #3

EPA Comments on the Savanna Street Wastewater Treatment Plant Comprehensive Performance Evaluation

City of Jackson's Response to EPA Comments

EPA Approval Letter for the Savanna Street Wastewater Treatment Plant Comprehensive Performance Evaluation

JH-orig
MJ/TWO
copy

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

AUG 28 2014

RECEIVED
SEP 02 2014
OFFICE OF THE CITY ATTORNEY

CERTIFIED MAIL 7010 1060 0002 1705 4099
RETURN RECEIPT REQUESTED

City of Jackson
Attn.: The Honorable Tony T. Yarber
Mayor, City Hall
219 South President Street
Jackson, Mississippi 39205

Re: Comprehensive Performance Evaluation Comment Letter
City of Jackson, Mississippi Consent Decree
Case No.: 3:12-cv-790 TSL-JMR

Dear Mayor Yarber:

The U.S. Environmental Protection Agency Region 4 has consulted with the Mississippi Department of Environmental Quality (MDEQ) upon reviewing the City of Jackson's (the City) Savanna Street Wastewater Treatment Plant (SSWWTP) Comprehensive Performance Evaluation (CPE) document, dated May 28, 2013, pursuant to Section V. of the subject Consent Decree above, and have the following questions and comments needing clarification:

1. Page 2-1: States, " Additional influent metering stations are to be installed in December 2013 or early 2014..." Also, throughout Section 6, the CPE noted that the "influent sampling location was downstream of the plant's recycle streams resulting in inaccurate influent data." This deficiency was also noted in the EPA's Science and Ecosystem Support Division (SESD) February 22-25, 2010, and April 12-14, 2010, Diagnostic/Performance Inspection Report (the "SESD Report"). Page 24 of the SESD Report states "Influent 24-hours composite samples were collected downstream of screening using an ISCO 3710 automatic sampler." Condition L-6 of the SSWWTP's National Pollutant Discharge Elimination System (NPDES) permit states, "The influent samples must be collected after the combination of all influent waste streams, but prior to influent screening and grit removal." This practice has rendered every Daily Monitoring Report submitted to the MDEQ suspect with regards to percent removal calculations. The EPA and the MDEQ are deeply concerned that the City has continued the practice of inappropriate influent sampling in violation of the NPDES permit. Please provide an update reflecting whether these flow and automatic sampling meters have been installed, or the estimated date of installation along with a brief nomenclature of the meters to be installed, including the flow and automatic samplers to be installed on the West Bank Interceptor, Caney Creek Interceptor and the West Rankin County Utility Authority Force Main.

2. Page 2-2: Has the toppled manhole stack located on the 48-in Lynch Creek Interceptor, described in the first paragraph of this page, that is believed to have collapsed in late 2008, been repaired? If so, please provide a date of repair. If not, please explain why it has not been

repaired along with a plan of action for repair, including a schedule. In addition, please provide a reason why it took the City and/or UWS-MS to figure out that the Lynch Creek interceptor manhole collapsed, when the influent flow spiked in December 2008 and stayed high (i.e. it took over 4.5 years for the City to even recognize the problem).

3. Page 2-2: As annotated in the SESD Report, the flow was not measured continuously with a chart recorder and totalizer, leaving flow measurement increments up to the discretion of the plant operators. In the absence of properly collected flow data, the data set being used from January 2005 to December 10, 2008, is suspect. Please provide amplifying information concerning the validity of the data being used and any concerns with regards to data accuracy.

4. Page 2-2: In addition to the above comment, please explain why the City chose to use older flow data (due to the collapsed manhole on the Lynch Creek Interceptor) from prior to December 10, 2008 for the hydraulic evaluation of the influent pump station (IPS), but used later concentration and loading data (mostly November 2010 – September 2013) for evaluating the loadings to the plant (e.g. Section 6 and Tables 6-6 through 6-16).

5. Section 4.1 states that for the IPS, "the total rated capacity of the IPS is 195 MGD; however, the firm capacity of the station is 95 MGD." Please provide further detail as to how and why there is so much discrepancy between the rated and firm capacities of the IPS.

6. Section 4.2 emphasizes the electrical system for the influent pump station is "obsolete technology and in need of replacement to prevent pump stoppage due to electrical failure." The CPE further states that the "HVAC system has been non-operable for many years" and goes on to state the importance of this system in providing protection from heat and humidity for both the electrical and mechanical equipment. These systems have been classified in the CPE as remedial measure Type 3. Given the importance of these systems and the classification of "Reliability of Station Pumps" as Type 2, please provide additional explanation as to why it would not be necessary to classify the HVAC system and electrical system as remedial measure Type 2 so that any pump station upgrades would be afforded the protections of the systems as stated in the CPE. Alternatively, please provide a reasonable (as soon as possible) timeframe past the "two years remediation timeframe of CCP approval for Type 2 remediate" that the HVAC and electrical system will be remediated.

7. Section 4.2 (page 4-3) states that "Outside of the footprint of the station's structure, both the line coming into the station and the discharge line (force main) which conveys flows to the headworks station of [sic] plant have required point repairs within the last 10 years." However, no further mention of assessment and/or rehabilitation/repair of these lines is mentioned in the rest of this Section (e.g. Table 4-1). Please provide the age and pipe material(s) of these lines, as well as an explanation as to why the City did not further mention these lines, but doesn't mention the reliability of the 84" line to the EQ basins.

8. Section 5.2 states that the "...key contributor of the headworks overflows has not yet been confirmed and will be addressed as part of the CCP report." Please provide an update as to any investigation into the cause/contributors to the overflows at the headworks, as this should have been investigated during the CPE.

9. Section 6.2 (page 6-1) mentions a future sixth secondary clarifier. Please provide a schedule for the construction of this clarifier.

10. Section 6.4 (page 6-3) mentions that the aeration basin diffusers have not been inspected, much less maintained or cleaned of debris since their installation in 1996. Please address this in the WWTP Operations and Maintenance Plan, as the CPE mentions that the WEF MOP 11 recommends an annual inspection and cleaning of debris, as well as the fact that the diffusers are currently operating at 1.5 times the normal design life.

11. Section 6.6 (pages 6-11 through 6-14) shows numerous effluent violations of the NPDES permit for Flow, TSS, $CBOD_5$, Total Nitrogen and Total Phosphorus. Has the City paid any penalties to the MDEQ for these effluent limit violations?

12. Section 6.7 (page 6-14) states that the aeration basin designations "...may change upon receiving influent data that does not contain the plant's recycle streams." Does the City have a date certain as to when it will get this data and if so, how much data will the City use to determine if a designation needs to change?

13. Page 6-16: Please explain further why the correction or remediation of non-operational pH, Dissolved Oxygen, Oxygen Reduction Potential, ammonia and aeration basin's air flow meters cannot be accomplished as a Type 2 remediation, given that these meters would be necessary to maximize treatment efficiency and may be a relatively minor expense (cost of installation is not discussed).

14. Section 8.3 (page 8-3) mentions that "...in Mississippi, MDEQ regulations require that all land applied sludge be incorporated into the subsoil (plowed in), which in itself is an acceptable vector attraction reduction option." What if the sludge from the Savanna Street WWTP is hauled to another State?

15. Section 8.4 (page 8-9) fails to mention any limiting factor of the sludge digesters themselves, only the sludge thickeners, dewatering equipment, associated buildings and sludge storage. However, Section 8.3 states that "Provision of more effective sludge stabilization should be addressed as part of the CCP." Please explain why sludge digestion seems to be a concern, but there is no accounting of limiting factors in Section 8.4.

16. Page 10-5: Please explain further why remediation of the Paralleling Equipment is classified as Type 3 and repairing the Transfer Switch as Type 2. Given the importance of the Paralleling Equipment during power outage(s), the EPA and the MDEQ believe that a Type 2 classification may be more appropriate.

17. Section 10.3 (Page 10-5): Please explain why the CPE includes Emergency Generator for Blowers as a performance limiting factor in Table 10-1, but does not include it in the summary for Type 3 remedial measures below the table.

18. Section 11-3 (Page 11-2): The CPE states that "*It was noted that a list of capital improvement items needed for effective plant operations are submitted to the City yearly, but not approved. An annual budget for capital repairs is needed by the City of Jackson to properly fund annual needs as required.*" The EPA and the MDEQ are deeply concerned that the City has continued the funding practices that led to the current conditions of the SSWWTP and the associated WCTS. Please provide a plan of action to address funding concerns (especially capital improvements) stated in the CPE. In addition, please discuss whether or not this funding issue will be addressed in the forthcoming Financing and Cost Analysis Program, required by Paragraph 43 of the Consent Decree.

funding issue will be addressed in the forthcoming Financing and Cost Analysis Program, required by Paragraph 43 of the Consent Decree.

19. Section 11.6 (page 11-3): The CPE states that "*Review of the existing operations contract between the city of Jackson and UWS-MS indicated there are few specific operational performance requirements within the contract. The few parameters provided address only basic permit limits at specified flows. Specific requirements like operational parameters to control the use of storm lagoons, what if any discharges can occur from the storm lagoons, and other critical operational parameters are not addressed. In addition, requirements concerning regular maintenance activities are virtually non-existent.*" In addition, the CPE adds that "*The current contract also does not address the new permit requirements or any pending changes that will be required by the Consent Decree.*" and goes so far as to recommend the City renegotiate and re-procure the contract. Given the above mentioned lack of requirements in the City's contract with UWS-MS, please provide the expiration date of the City's contract, as well as any plans the City may have to re-open, re-negotiate and/or re-procure the current contract, including a schedule.

The EPA will approve the SSWWTP CPE pending a timely and complete response to the above comments. Pursuant to Section V, Paragraph 13 of the Consent Decree, please respond in writing within 30 days of receipt of this letter. If you should have any questions regarding the above comments, please contact Mr. Brad Ammons at (404) 562-9769 or via email at ammons.brad@epa.gov.

Sincerely,

Maurice L. Horsey, IV, Chief
Municipal & Industrial Enforcement Section
Clean Water Enforcement Branch

cc: Mr. Les Herrington, P.E.
Mississippi Department of Environmental Quality

Mr. Terry Williamson
City of Jackson

Ms. Keisha Powell
City of Jackson

Department of Public Works

200 South President Street
Post Office Box 17
Jackson, Mississippi 39205-0017

December 30, 2014

By Mail and Email
Chief, Clean Water Enforcement Branch
Water Protection Division
U.S Environmental Protection Agency, Region 4
ATTN: Brad Ammons
61 Forsyth Street, S.W.
Atlanta, GA 30303
Ammons.Brad@epa.gov

RE: City of Jackson, Mississippi Consent Decree
Certifications for Responses to Comments on CMOM Program Deliverables

Dear Mr. Ammons:

This letter will serve as my certification under paragraph 16 of the Consent Decree for the City of Jackson's responses to EPA comments on the following Consent Decree deliverables:

- Gravity Line Preventive Maintenance Program (letter dated 9/12/2014);
- WWTP Operations and Maintenance Program (letter dated 9/12/2014);
- Comprehensive Performance Evaluation (letter dated 9/28/2014).

I certify under penalty of law that this document and the three (3) letters listed above were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact me if you have any questions.

Sincerely,

Kishia L. Powell
Director, Department of Public Works

cc: Tony Yarber, Mayor
Monica Joiner, City Attorney
Terry Williamson, Consent Decree Manager
Karl Fingerhood, U.S. Department of Justice
Les Herrington, P.E., Mississippi Department of Environmental Quality

Department of Public Works

200 South President Street
Post Office Box 17
Jackson, Mississippi 39205-0017

September 28, 2014

Mr. Maurice L. Horsey, IV, Chief
Municipal & Industrial Enforcement Section
Clean Water Enforcement Branch
Region IV, U.S. Environmental Protection Agency
61 Forsyth Street
Atlanta, GA 30303-8960

Re: Savanna Street WWTP Comprehensive Performance Evaluation Comments
City of Jackson, Mississippi Consent Decree
Case No.: 3:12-ev-790 TSL-JMR

Dear Mr. Horsey:

We are in receipt of your letter of August 28, 2014 providing review comments for the subject document. A response to each review comment is provided below.

1. Page 2-1: The installation of the sampler and flow meter systems is complete and the samplers are scheduled to be placed into service as soon as the proper protocols can be worked out with United Water. For the three conveyance lines; the West Bank Interceptor, the Caney Creek Interceptor, and the West Rankin Force Main, a 24-hr composite sampler and flow meter system has been installed on each of the lines at defined locations. The West Bank Interceptor's sampler and flow meter system is installed at the North Gate where the interceptor enters the plant site, upstream of the equalization basin return flow connection in Manhole A. The Caney Creek Interceptor's sampler and flow meter system is positioned in the Caney Creek Gate Structure just upstream of the interceptor's connection to the plant's 108-in influent gravity line. The West Rankin Force Main sampler and flow meter system is installed near the end of the force main, prior to its diversion point to the equalization basin and discharge into the West Bank Interceptor.
2. Page 2-2: Repair of the toppled manhole stack on the Lynch Creek Interceptor began on the day of discovery, which was July 25, 2010. All the dirt had been washed away from the manhole riser. Repair of the manhole has been ongoing since discovery. City personnel continue to haul fill dirt to the toppled manhole site as it is being re-stacked. The manhole was re-stacked to its original level by the summer of 2013. To eliminate future occurrences of this nature, the Department will be reviewing options to replace with flood proof manhole covers. This should

improve our ability to manage this asset and protect it against the 100 year flood. We will report on this effort in the next quarterly report, ending December 31, 2014.

3. Page 2-2: The flow data from January 2005 to December 10, 2008 is the most representative data currently available to determine the required pumping capacity of the Savanna Street WWTP Influent Pump Station (IPS). According to the US Census bureau statistics, following the end of 2008, the City of Jackson's population, through 2013 has decreased approximately 0.7%, so this flow period would not expected to be much different than current flows. Regarding the flow data subsequent to December 10, 2008, the inflow due to the toppled manhole resulted in artificially higher flow rates coming into the plant, as described within the CPE. The required capacity of the IPS will be size based on the January 2005 to December 10, 2008 data; however, the required capacity shall be reevaluated as data is collected on the West Bank Interceptor Flow Monitoring Project.

4. Page 2-2: The Savanna Street WWTP entered into an Agreed Order with MDEQ on September 29, 2011, to remove excess biosolids being held within the plant. In November 2010, the current contract plant operator assumed operational responsibility of the plant and began removing the excess solids from the plant shortly after taking over operations. The operational parameters of the plant need to be closer to the design parameters for a true evaluation of the plant's treatment capabilities to be performed. The November 2010 through September 2013 data set was used to evaluate the loading to the plant for the two previously mentioned reasons. Prior operational data was not utilized due to excess solids being held within the plant. As stated in the CPE, influent data and design loading will be reevaluated as part of the CCP based on the new influent data gathered by the three new influent samplers and flow meters discussed in response No. 1 of this memorandum.

5. Section 4.1: As indicated in the CPE, the Influent Pump Station (IPS) contains a total of four dry-pit pumps, three 31.7 MGD rated pumps and one 100 MGD rated pump, providing a total IPS capacity of 195 MGD. Per the original design of the IPS, the three 31.7 MGD pumps were designed to pump raw wastewater to the WWTP's headworks. The 100 MGD pump was designated for use during high rainfall events to convey wastewater to the plant's equalization basins. A pump station's "firm capacity" is defined as the capacity of the station with the largest pump out of service. Therefore, in the event that the 100 MGD rated pump is out of service, the firm capacity of the IPS is 95 MGD.

6. Section 4.2: The HVAC and electrical system of the existing influent pump station will be changed to a Type 2. The timeframe for the repair of the existing electrical system will be dependent upon the approach and timeline for the IPS improvements. If the decision is made to construct a new modern IPS for the plant, the repairs to the existing electrical system will not be required. However, if the City elects to move forward with an option of rehabilitating the existing IPS for a smaller capacity rating along with the construction a new IPS; the electrical upgrades will be included as part of the IPS modification construction project.

7. Section 4.2 (page 4-3): The absence of a detailed discussion of the gravity lines and force mains associated with the IPS was an inadvertent omission during the development of the CPE due to

the focus on the condition of the structural and mechanical elements of the IPS. The 96-inch interceptor coming into the WWTP, from the North Gate to the 108-inch interceptor line, will be rehabilitated as part of the West Bank Interceptor construction project. The 84-inch steel force main from the IPS to the inlet of Equalization Basin #1 will be rehabilitated/replaced as part of the IPS improvements to provide reliable conveyance of wastewater to the equalization basins during wet weather flows. The force main from the IPS to the headworks of the WWTP consists of approximately 1,365 feet of 54-inch ductile iron pipe which transitions to 60-inch ductile iron piping for the last 185 feet until it discharges into the headworks. The original 54-inch force main was replaced in 2007 with new **401** ceramic **epoxy** lined ductile iron pipe and the 60-inch cement lined ductile iron pipe was installed in 2000. At the time of the CPE report, both sections of the line were reported to be in good condition. Although the force main is operational with no issues reported at the time of this response letter, the piping may be rehabilitated/replaced as part of the IPS improvements.

8. Section 5.2: As part of the CPE, a hydraulic analysis of the piping between the treatment units was conducted to identify any potential restrictions; however none were identified by the model. During the assessment of the headworks, it was reported that there were two occurrences of the headworks overflowing within the past 18 months. During interviews, WWTP staff confirmed that the two overflow events were the result of operational issues associated with the IPS pumps. One event occurred as a result of all three of the 31.7 MGD IPS pumps being turned on simultaneously, which hydraulically overloaded the headworks. Typically, pump operation is staggered to avoid overwhelming the mechanical WWTP. The other reported overflow event occurred during the installation and startup of the bypass pumping system during the fall of 2013. During the coming wet season, the CPE/CCP team will closely monitor the water levels with headworks' basin to identify cause of past overflows, and identify the appropriate corrective action.

9. Section 6.2 (page 6-1): The Consent Decree listed the addition of the sixth clarifier as a Type 3 remedial measure. The details of the sixth clarifier will be provided as part of the CCP report.

10. Section 6.4 (page 6-3): Maintenance of the aeration basin diffusers was included as part of the WWTP Operations and Maintenance Program review comments recently submitted to EPA.

11. Section 6.6 (pages 6-11 through 6-14): No penalties were assessed by MDEQ for the effluent limit violations. The violations referred to were minor excursions of the permit limits.

12. Section 6.7 (page 6-14): A minimum of two months of data for the May-October permit flow time period is needed to make the determination. The earliest the designations could change would be July 2015.

13. Page 6-16: The existing plant has operated many years successfully without the pH, DO, ORP, ammonia, and individual basin air flow meters. As a Type III Remedial Measure, any new process control meters will be installed consistent with the planned level of automation and SCADA.

14. Section 8.3 (page 8-3): If sludge were hauled to another state, incorporation would still be used to meet the vector attraction reduction requirement since it is an allowable method under 40 CFR Part 503.

15. Section 8.4 (page 8-9): As indicated on page 8-3 of the CPE and in the first paragraph of Section 8-4, the aerobic digester detention time is inadequate to achieve good reduction of volatile solids and to reliably achieve Class B stabilization criteria. Additional aerobic digestion capacity or alternate sludge stabilization method should be provided. Aerobic digestion should be listed in Table 8-6 with a Performance Limiting Factor Rating of A and Remedial Measure Type 2, similar to sludge thickening and dewatering.

16. Page 10-5: As stated in the CPE, one 900 Kw generator can operate 2 small influent pumps, the administration building and the disinfection system. The Automatic Transfer Switch (ATS) repair is a much more immediate need so that the one generator does not have to rely on manual transfer of power. The paralleling equipment repair can be accomplished at a later time following Generator repair/replacement and ATS repair.

17. Section 10.3 (page 10-5): The exclusion "Emergency Generator for Blowers" from the Type 3 remedial measures list was an inadvertent omission. "Emergency Generator for Blowers" was intended to be included in the list.

18. Section 11.3 (page 11-2): Funding for required capital improvements at the Savanna Street WWTP are included in the FY15 budget, and will be included as needed in future budgets. Funding of capital projects was addressed in the Financing and Cost Analysis Program, recently submitted to EPA.

19. Section 11.6 (page 11-3): The City's contract with UWS-MS expires October 31, 2015. The City is in the process of developing an RFP to re-procure contract operations services. The new contract will contain more definitive performance requirements, more specific maintenance requirements, and procedures for permit changes.

If you have any additional questions or require more information please let us know.

Sincerely,

Kishia Powell
Director, Department of Public Works

cc: Mr. Les Herrington, P.E.
Mississippi Department of Environmental Quality

Mr. Terry Williamson, Legal Counsel
City of Jackson Department of Public Works

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

TW

APR 21 2015

CERTIFIED MAIL 7010 1060 0002 1703 8440
RETURN RECEIPT REQUESTED

RECEIVED
APR 23 2015
OFFICE OF THE CITY ATTORNEY

City of Jackson
Attn.: Ms. Kishia L. Powell
Director, Department of Public Works
200 South President Street
P.O. Box 17
Jackson, Mississippi 39205-0017

Re: Approval of the Gravity Line Preventive Maintenance Program,
WWTP Operations and Maintenance Program and the Comprehensive Performance Evaluation
City of Jackson, Mississippi Consent Decree
Case No.: 3:12-cv-790 TSL-JMR

Dear Ms. Powell:

On behalf of the U.S. Environmental Protection Agency Region 4 and the Mississippi Department of Environmental Quality, the EPA has reviewed the responses to comments on the following submittals: (1) the Gravity Line Preventive Maintenance Program (GLPMP) (response dated 9/12/2014); (2) the WWTP Operations and Maintenance Program (WWTP O&MP) (response dated 9/12/2014) and (3) the Comprehensive Performance Evaluation (CPE) for the Savanna Street WWTP (response dated 9/28/2014) as well as the certification for these 3 responses dated 12/30/2014, for the City of Jackson (Jackson). The EPA hereby approves the revised GLPMP, the revised WWTP O&MP and the revised CPE for the Savanna Street WWTP.

Jackson shall place all documents related to the above submittals in the Public Document Repository. In addition, Jackson shall implement the above revised Programs and Evaluation in accordance with each revised submittal. Finally, Jackson shall certify the status of the implementation of each Program or Evaluation, including its completion, in the Semi-Annual Report or Annual Report pursuant to Section IX of the subject Consent Decree.

Please contact Mr. Brad Ammons at (404) 562-9769 or via email at ammons.brad@epa.gov, if you have any questions.

Sincerely,

Maurice L. Horsey, IV, Chief
Municipal & Industrial Enforcement Section
NPDES Permitting & Enforcement Branch

cc: Mr. Les Herrington, P.E.
Mississippi Department of Environmental Quality

Mr. Terry Williamson
City of Jackson

Appendix B

Consent Decree

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IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF MISSISSIPPI
(Jackson Division)

UNITED STATES OF AMERICA and, the STATE OF MISSISSIPPI, Plaintiffs, v. THE CITY OF JACKSON, MISSISSIPPI, Defendant.	Case: No. 3:12-cv-790 TSL-MTP CONSENT DECREE

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WHEREAS, Plaintiff, the United States of America ("United States"), by the authority of the Attorney General of the United States and through its undersigned counsel, acting at the request and on behalf of the United States Environmental Protection Agency ("EPA"), filed a Complaint ("Complaint") concurrently with the lodging of this Consent Decree alleging that Defendant, the City of Jackson, Mississippi (the "City"), has violated and continues to violate Sections 301 of the Clean Water Act, 33 U.S.C. § 1311 ("CWA"), and terms and conditions of its National Pollutant Discharge Elimination System ("NPDES") permits issued under Section 402 of the CWA, 33 U.S.C. § 1342;

WHEREAS, Plaintiff, the State of Mississippi (the "State"), acting through the Mississippi Commission on Environmental Quality and the Mississippi Department of Environmental Quality (collectively, "MDEQ"), joined in the Complaint and seeks injunctive relief and civil penalties for the City's alleged violations of the Mississippi Air and Water Pollution Control Law, Miss. Code Ann. § 49-17-1 *et seq.*;

WHEREAS, the State is also a Plaintiff in this action and is joined as a party under Section 309(e) of the CWA, 33 U.S.C. § 1319(e), which requires the state in which a municipality is located to be joined as a party whenever the municipality is a party to a civil action brought by the United States under Section 309 of the CWA;

WHEREAS, MDEQ has been authorized by EPA to administer the NPDES program pursuant to Section 402(b) of the CWA, 33 U.S.C. § 1342(b);

WHEREAS, the City is a "municipality" pursuant to Section 502 of the CWA, 33 U.S.C. § 1362;

WHEREAS, the City's Wastewater Collection and Transmission System ("WCTS") transports wastewater to three (3) publicly owned wastewater treatment plants ("WWTPs"): the Savanna Street Wastewater Treatment Plant ("Savanna Street WWTP"), the Trahon/Big Creek Wastewater Treatment Plant ("Trahon WWTP"), and the Presidential Hills Wastewater Treatment Plant ("Presidential Hills WWTP"), which are operated by the City pursuant to NPDES permit numbers MS0024295, MS0044059 and MS0030295, respectively ("NPDES Permits");

WHEREAS, EPA and MDEQ have determined, based upon information provided by the City, that the City has had at least 2,300 unauthorized Sanitary Sewer Overflows ("SSOs") in the past five (5) years;

WHEREAS, EPA and MDEQ have determined that the City has experienced a number of Prohibited Bypasses, in which the Savanna Street WWTP has discharged wastewater without required primary and/or Secondary Treatment into the Pearl River, a water of the United States;

WHEREAS, the City has reported to MDEQ a number of violations of the effluent limitations in the NPDES Permits;

WHEREAS, EPA and MDEQ have determined that the City had no effective system of SSO reporting or record-keeping, and has thus failed to comply with the reporting requirements of its NPDES Permits;

WHEREAS, the United States and the State contend that these SSOs, Prohibited Bypasses, effluent limit exceedances, and reporting failures are violations of the CWA, Miss. Code Ann. § 49-17-29, and the City's NPDES Permits;

WHEREAS, on September 10, 2010, MDEQ and the City entered into an Agreed Order, as amended on October 11, 2010 and again amended on September 29, 2011, a copy of which is attached hereto as Appendix A, that includes requirements for the City to address certain violations and other specific environmental issues at the Savanna WWTP and pay a civil penalty of $240,000 (the "MDEQ Agreed Order I");

WHEREAS, on August 23, 2011, MDEQ and the City entered into an Agreed Order, a copy of which is attached hereto as Appendix B, that requires the City to address certain violations and other specific environmental issues at the Presidential Hills WWTP and pay a civil penalty of $22,500 (the "MDEQ Agreed Order II");

WHEREAS, on May 4, 2012, MDEQ issued to the City a revised NPDES Permit for the Savanna Street WWTP that includes more stringent effluent limits for the nutrients Nitrogen (Total) and Phosphorous (Total), and more stringent effluent limits for parameters Ammonia Nitrogen (Nov-Oct); Flow (Nov-Apr); Oxygen Demand, Carbonaceous (Nov-Oct); Solids (Total Suspended) Effluent (Nov-Apr); % Effect Static Renewal 7-Day Chronic Ceriodaphnia, Effluent (Jan-Dec); and % Effect Static Renewal 7-Day Chronic Pimephales, Effluent (Jan-Dec);

WHEREAS, the City contends that it is not currently able to meet the new effluent limits for these nutrients;

WHEREAS, this Consent Decree requires the City to develop, submit, finalize, and implement plans for the continued improvement of its WCTS and WWTPs; to eliminate SSOs, effluent limit violations (including any violations of the new effluent limits for nutrients), and reporting violations; and to minimize Prohibited Bypasses;

WHEREAS, the Parties to this Consent Decree have negotiated in good faith and have reached a settlement of the issues raised in the Complaint;

WHEREAS, the City's agreement to this Consent Decree is not an admission of liability, except for the City's consent to jurisdiction and venue as provided in Section I of this Consent Decree, nor is it an adjudication or admission of any law or fact;

WHEREAS, the Parties recognize, and the Court by entering this Consent Decree finds, that this Consent Decree has been negotiated by the Parties in good faith and will avoid litigation between the Parties and that this Consent Decree is fair, reasonable, and in the public interest.

NOW THEREFORE, with the consent of the Parties, it is hereby ORDERED, ADJUDGED and DECREED as follows:

I. JURISDICTION AND VENUE

1. This Court has jurisdiction over the subject matter of this action, pursuant to 28 U.S.C. §§ 1331, 1345, and 1355, and Section 309(b) of the CWA, 33 U.S.C. § 1319(b), and over the Parties. This Court has supplemental jurisdiction over the state law claims asserted by the State pursuant to 28 U.S.C. § 1367. Venue is proper in the Southern District of Mississippi pursuant to Section 309(b) of the CWA, 33 U.S.C. § 1319(b), and 28 U.S.C. §§ 1391(b) and 1395(a), because the violations alleged in the Complaint are alleged to have occurred in this judicial district. For purposes of this Decree, or any action to enforce this Consent Decree, the City consents to the Court's jurisdiction over this Consent Decree and any such action and over the City and consents to venue in this judicial district.

2. For purposes of this Consent Decree, the City agrees that the Complaint states claims upon which relief may be granted pursuant to Sections 309(b) of the CWA, 33 U.S.C. § 1319(b), and Miss. Code Ann. § 49-17-29 and § 49-17-43.

II. APPLICABILITY

3. The obligations of this Consent Decree apply to and are binding upon the United States, the State, and upon the City and any successors, assigns, or other entities or persons otherwise bound by law.

4. No transfer of ownership or operation of the Sewer System, whether in compliance with the procedures of this Paragraph or otherwise, shall relieve the City of its obligation to ensure that the terms of this Consent Decree are implemented. At least thirty (30) Days prior to such transfer, the City shall provide a copy of this Consent Decree to the proposed transferee and shall simultaneously provide written notice of the prospective transfer, together with a copy of the proposed written agreement, to EPA Region IV, the United States Department of Justice and MDEQ, in accordance with Section XVI of this Consent Decree (Notices). The City shall require, as a condition of any sale or transfer, that the purchaser or transferee agrees in writing to be bound by this Consent Decree and submit to the jurisdiction of the Court for its enforcement. Any attempt to transfer ownership or operation of the Sewer System without complying with this Paragraph constitutes a violation of this Consent Decree.

5. The City shall provide a copy of this Consent Decree to all officers, employees, and agents whose duties might reasonably include compliance with any provision of this Consent Decree, as well as to any contractor retained to perform work required under this Consent

Decree. The City shall condition any such contract upon performance of the work in conformity with the terms of this Consent Decree.

6. In any action to enforce this Consent Decree, the City shall not raise as a defense the failure by any of its officers, directors, employees, agents, or contractors to take any actions necessary to comply with the provisions of this Consent Decree.

III. OBJECTIVES

7. All plans, measures, reports, construction, maintenance, operational requirements, and other obligations in this Consent Decree or resulting from the activities required by this Consent Decree shall have the objective of causing the City to achieve and maintain full compliance with the CWA, the Mississippi Air and Water Pollution Control Law, and the NPDES Permits, including the elimination of all Sanitary Sewer Overflows.

IV. DEFINITIONS

8. Terms used in this Consent Decree that are defined in the CWA or in regulations promulgated pursuant to the CWA (including, without limitation, those terms defined in Section 502 of the CWA, 33 U.S.C § 1362, and at 40 C.F.R. § 122.2) shall have the meanings assigned to them in the CWA, 33 U.S.C. §§ 1251 *et seq.*, and regulations promulgated under the CWA, unless otherwise provided in this Consent Decree. Whenever the terms set forth below are used in this Consent Decree, the following definitions shall apply:

(a) "Building Backup" shall mean a wastewater release or backup into a building that is caused by blockages, flow conditions, or other malfunctions in the Wastewater Collection and Transmission System. A wastewater backup or release that is caused by blockages, flow conditions, or other malfunctions of a Private Lateral is not a Building Backup.

(b) "Calendar Quarter" shall mean the three (3)-month periods ending on March 31, June 30, September 30, and December 31.

(c) "Calendar Year" shall mean the twelve (12)-month period starting on January 1 and ending on December 31.

(d) "Certification" or "certify" when used in this Consent Decree shall require the City to comply with Paragraph 16 of this Consent Decree.

(e) "The City" or "Defendant" shall mean the City of Jackson, Mississippi, a municipal corporation, including all of its departments, agencies, instrumentalities such as the Public Works Department, and any successor thereto.

(f) "CMOM" or "Capacity, Management, Operations, and Maintenance" shall mean a program of accepted industry practices to properly manage, operate and maintain sanitary wastewater collection, transmission and treatment systems, investigate capacity-constrained areas of these systems, and respond to SSO events.

(g) "Complaint" shall mean the complaint filed by the United States and the State in this action.

(h) "Consent Decree" or "Decree" shall mean this Decree and all appendices attached hereto listed in Section XXV. In the event of a conflict between this document and any appendix, this document shall control.

(i) "CWA" shall mean the Clean Water Act, as amended, 33 U.S.C. §§ 1251, *et seq.*

(j) "Date of Entry" shall mean the date on which this Consent Decree is entered by the United States District Court for the Southern District of Mississippi.

(k) "Date of Lodging" shall mean the date this Consent Decree is filed for lodging with the Clerk of the Court for the United States District Court for the Southern District of Mississippi.

(l) "Day" shall mean a calendar day unless expressly stated to be a business day. In computing any period of time under this Consent Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business of the next business day.

(m) "Deliverable" shall mean any written document required to be prepared and/or submitted by or on behalf of the City pursuant to this Consent Decree.

(n) "DOJ" shall mean the United States Department of Justice and any of its successor departments or agencies.

(o) "EPA" shall mean the United States Environmental Protection Agency and any of its successor departments or agencies.

(p) "Excessive Inflow/Infiltration" or "Excessive I/I" shall have the meaning provided in 40 C.F.R. § 35.2005(b)(16).

(q) "Force Main" shall mean any pipe that receives and conveys, under pressure, wastewater from the discharge side of a pump. A Force Main is intended to convey wastewater under pressure.

(r) "Gravity Sewer Line" or "Gravity Sewer" shall mean a pipe that receives, contains and conveys wastewater not normally under pressure, but is intended to flow unassisted under the influence of gravity.

(s) "Infiltration" as defined by 40 C.F.R. § 35.2005(b)(20) shall mean water other than wastewater that enters the WCTS (including sewer service connections and foundation drains) from the ground through such means as defective pipes, pipe joints, connections, or manholes.

(t) "Inflow" as defined by 40 C.F.R. § 35.2005(b)(21) shall mean water other than wastewater that enters the WCTS (including sewer service connections) from sources such as, but not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm water, surface runoff, street wash waters, or drainage.

(u) "I/I" shall mean the total quantity of water from inflow, infiltration, and rainfall induced inflow and infiltration without distinguishing the source.

(v) "Major Gravity Line" shall mean any of the following:

(i) all Gravity Sewer Lines that are twelve (12) inches in diameter or larger;

(ii) all Gravity Sewer Lines that convey wastewater from one pumping station service area to another pumping station service area; and

(iii) all Gravity Sewer Lines that have caused or contributed, or that the City knows will likely cause or contribute to capacity-related SSOs.

(w) "MDEQ" shall mean the Mississippi Department of Environmental Quality and any of its successor departments or agencies of the State.

(x) "NPDES" shall mean the National Pollutant Discharge Elimination System authorized under Section 402 of the CWA, 33 U.S.C. § 1342.

(y) "NPDES Permits" shall mean NPDES permit No. MS0024295 issued to the City pursuant to Section 402 of the Clean Water Act, 33 U.S.C. § 1342, for the Savanna Street WWTP; NPDES permit No MS0044059 issued to the City pursuant to Section 402 of the Clean Water Act, 33 U.S.C. § 1342, for the Trahon/Big Creek WWTP; NPDES permit No. MS0030295 issued to the City pursuant to Section 402 of the Clean Water Act, 33 U.S.C. § 1342, for the Presidential Hills WWTP; and any future extended, modified, or reissued permits.

(z) "Paragraph" shall mean a portion of this Consent Decree identified by an Arabic numeral.

(aa) "Parties" shall mean the United States of America on behalf of EPA, the State on behalf of MDEQ, and the City.

(bb) "Plaintiffs" shall mean the United States of America on behalf of EPA and the State of Mississippi on behalf of MDEQ.

(cc) "Private Lateral" shall mean that portion of a sanitary sewer conveyance pipe that extends from the wastewater main to the single-family, multi-family, apartment, or other dwelling unit or commercial or industrial structure to which wastewater service is or has been provided.

(dd) "Prohibited Bypass" shall mean the intentional diversion of waste streams from any portion of a treatment facility which is prohibited pursuant to the terms set forth at 40 C.F.R. § 122.41(m).

(ee) "Public Document Repository" or "PDR" shall mean the City of Jackson's Eudora Welty Library, located at 300 N. State Street, Jackson, Mississippi 39201, and the City's website, http://www.jacksonms.gov/home/index.php.

(ff) "Publicly Owned Treatment Works" or "POTW" shall mean a publicly owned treatment works or POTW as defined in 40 C.F.R. § 403.3(q), and includes the WCTS and the WWTPs as defined in this Consent Decree.

(gg) "Pump Station" shall mean facilities comprised of pumps which lift wastewater to a higher hydraulic elevation, including all related electrical, mechanical, and structural systems necessary to the operation of that pump station.

(hh) "Sanitary Sewer Overflow" or "SSO" shall mean any discharge of wastewater to waters of the United States or the State from the City's Sewer System through a point source not specified in any NPDES permit, as well as any overflow, spill, or release of wastewater to public or private property from the Sewer System that may not have reached waters of the United States or the State, including all Building Backups.

(ii) "Secondary Treatment" is a biological wastewater treatment technology required by the Clean Water Act for discharges from Publicly Owned Treatment Works, as that term is defined at 40 C.F.R. § 403.3(q). The minimum level of effluent quality attainable through the application of Secondary Treatment is established in 40 C.F.R. § 133.102 in terms of the parameters for 5-day biochemical oxygen demand ("BOD_5") concentration and percent removal, total suspended solids ("TSS") concentration and percent removal, and pH.

(jj) "Section" shall mean a portion of this Consent Decree identified by a Roman numeral.

(kk) "Sewershed" shall mean the subdivisions of the City's WCTS containing sewers that are primarily hydraulically linked as identified on Appendix C, attached hereto and incorporated herein.

(ll) "Sewer System" shall mean the WCTS and the WWTPs.

(mm) "State" shall mean the State of Mississippi including all of its departments, agencies, and instrumentalities.

(nn) "Timely" when applied to the submittal of a Deliverable shall mean submitted no later than the deadline established in this Consent Decree (or in a document approved pursuant to this Consent Decree) and containing all of the elements pertaining to the submittal as set forth in this Consent Decree (or in a document approved pursuant to this Consent Decree). "Timely," when applied to the implementation of any Work shall mean implemented no later than the deadline established in this Consent Decree (or in a document approved pursuant to this Consent Decree) and in accordance with the elements pertaining to such Work as set forth in this Consent Decree (or in a document approved pursuant to this Consent Decree).

(oo) "United States" shall mean the United States of America, acting on behalf of EPA, including its departments, agencies, and instrumentalities.

(pp) "Wastewater Collection and Transmission System" or "WCTS" shall mean the municipal wastewater collection, retention and transmission system, including all pipes, Force Mains, Gravity Sewer Lines, Pump Stations, pumps, manholes, and appurtenances thereto, which are owned or operated by the City.

(qq) "Wastewater Treatment Plant" or "WWTP" shall mean devices or systems used in the storage, treatment, recycling, and reclamation of municipal wastewater. For purposes of this Consent Decree, this definition shall include all facilities owned, managed, operated, and maintained by the City, including but not limited to the following treatment facilities: the Savanna Street WWTP located at 3810 I-55 South & Savanna Street, Jackson, MS 39121; the

Trahon/Big Creek WWTP located at One Apache Dr., Landfill Road, Byram, Mississippi; the Presidential Hills WWTP located at Franklin D. Roosevelt Dr. W, Jackson, Mississippi; and all components of such sewage treatment plants.

(rr) "Work" shall mean all activities the City is required to perform under this Consent Decree.

V. REVIEW OF DELIVERABLES/CERTIFICATION OF DELIVERABLES

9. Public Document Repository. Within seven (7) Days after a Deliverable is submitted to EPA, the City shall place a copy in the PDR along with a one (1)-page instruction flyer containing a brief synopsis of the Deliverable and instructions on how to navigate to the City's website. Within seven (7) Days after EPA's approval, approval contingent upon conditions, or modification by EPA, the City shall place a copy of such version of the Deliverable in the PDR. This copy shall replace all previous copies of that Deliverable in the PDR and shall remain in the PDR along with all comments until termination of this Consent Decree. In addition, the City shall maintain in the PDR a listing of all Deliverables.

10. Copy to MDEQ. The City shall provide a copy of any Deliverable to MDEQ at the same time such Deliverable is due to EPA.

11. EPA Action on Deliverables. After review of any Deliverable that is required to be submitted pursuant to this Consent Decree, EPA, after consultation with MDEQ, shall in writing:

(a) approve the submission;

(b) approve the submission upon specified conditions;

(c) approve part of the submission and disapprove the remainder; or

(d) disapprove the submission.

12. Approved Deliverables. If a Deliverable is approved by EPA pursuant to Paragraph 11.(a), the City shall take all actions required by the Deliverable in accordance with the schedules and requirements of the Deliverable as approved. If the Deliverable is conditionally approved or approved only in part, pursuant to Paragraph 11.(b) or (c), the City shall, upon written direction from EPA, after consultation with MDEQ, take all actions required by the approved plan, report, or other item that EPA, after consultation with MDEQ, determines are technically severable from any disapproved portions, subject to the City's right to dispute only the specified conditions or the disapproved portions, under Section XII of this Consent Decree (Dispute Resolution). Following EPA approval of any Deliverable or portion thereof, such Deliverable or portion thereof so approved shall be incorporated into and become enforceable under this Consent Decree.

13. Disapproved Deliverables. If the Deliverable is disapproved in whole or in part pursuant to Paragraph 11.(c) or (d), the City shall, within thirty (30) Days or such other time as EPA and the City agree to in writing, correct all deficiencies and resubmit to EPA the Deliverable, or disapproved portion thereof, for approval, in accordance with Paragraphs 11 and 12. If the resubmission is approved in whole or in part, the City shall proceed in accordance with Paragraph 12.

14. Stipulated Penalties Accruing. Any stipulated penalties applicable to the original Deliverable, as provided in Section X of this Decree, shall accrue during the thirty (30)-Day period or other specified period, but shall not be payable unless the resubmitted Deliverable is untimely or is disapproved in whole or in part; provided that, if the original submission was so

deficient as to constitute a material breach of the City's obligations under this Decree, the stipulated penalties applicable to the original submission may be due and payable notwithstanding any subsequent resubmission.

15. Resubmitted Deliverable. If a resubmitted Deliverable, or portion thereof, is disapproved in whole or in part, EPA, after consultation with MDEQ, may again require the City to correct any deficiencies, in accordance with preceding Paragraph 13, or may itself correct any deficiencies, subject to the City's right to invoke Dispute Resolution and the right of EPA to seek stipulated penalties as provided in preceding Paragraph 14. Upon EPA's correction of any deficiencies, such resubmitted plan, report, or other item, or portion thereof will be incorporated into and become enforceable under this Consent Decree and shall be implemented by the City according to the approved schedule subject to the City's right to invoke Dispute Resolution.

16. Certification. In all Deliverables, notices, documents or reports submitted to the United States and State pursuant to this Consent Decree, the City shall, by a senior City management official, sign and certify such notices, documents and reports as follows:

> *I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

VI. COMPLIANCE REQUIREMENTS

A. Summary of the Sewer System Remedial Actions

17. The remedial actions for the City's Sewer System consist of a phased approach for the evaluation and rehabilitation of the City's WCTS (Section VI.B); the development and

implementation of a Comprehensive Performance Evaluation ("CPE") and Composite Correction Program ("CCP") for the Savanna Street WWTP (Section VI.C); the development and implementation of programs to insure proper Capacity, Management, Operations and Maintenance of the Sewer System ("CMOM") (Section VI.D); and the implementation of certain work set forth in MDEQ Agreed Orders I and II (Section VI.E).

18. The evaluation and rehabilitation of the WCTS consist of a multi-phased program which will result in a prioritized analysis and evaluation of the City's WCTS, the identification of deficiencies, and the correction of deficiencies. The City shall first develop and implement a West Bank Interceptor Work Plan and a West Bank Interceptor Rehabilitation Plan pursuant to which the City will conduct sewage flow monitoring and inspection of the West Bank Interceptor to identify and remediate any structural deficiencies in the West Bank Interceptor. The City shall also develop and implement a Prioritization Work Plan and a Prioritization Report pursuant to which the City will estimate the severity of I/I within each Sewershed comprising the WCTS; map the Sewer System; assess the capacity of the WCTS; and establish Sewershed priorities for further evaluation and rehabilitation. The City shall also develop and implement a Sewershed Evaluation Plan that will outline how Sewersheds or groups of Sewersheds will be assessed in phases pursuant to the approved schedules set forth in the Prioritization Report. These evaluations will determine the extent of rehabilitative needs and corrective actions the City shall perform in the WCTS pursuant to an Evaluation Report/Rehabilitation Plan to meet the objectives of this Consent Decree. Such rehabilitative needs and corrective actions shall be completed for the Sewersheds or groups of Sewersheds in accordance with an approved schedule as set forth in the Evaluation Report/Rehabilitation Plan for that Sewershed or groups of

Sewersheds, provided, however, that all such rehabilitative needs and corrective actions shall be completed on or before two hundred seven (207) months after the Date of Entry of this Consent Decree.

19. The CPE consists of an in-depth diagnostic evaluation of the capacity and operation of the Savanna Street WWTP and its ability to comply with the NPDES Permit including eliminating Prohibited Bypasses. Based on this evaluation, the CCP shall identify rehabilitative needs and corrective actions to address problems identified in the CPE which shall be completed on or before sixty (60) months after EPA's approval of the CCP.

20. The CMOM programs that the City will develop and implement include the following: Training Program; Capacity Assurance Program; Sewer Overflow Response Plan; Inter-Jurisdictional Agreement Program; Private Lateral Program; Water Quality Monitoring Program; Pump Station Operations Program; Fats, Oils and Grease Control Program; Pump Station Preventive Maintenance Program; Gravity Line Preventive Maintenance Program; WWTP Operations and Maintenance Program; and Financing and Cost Analysis Program.

21. Specific references must be cited for proposed procedures, techniques, and design criteria to be used in evaluating the City's Sewer System. The I/I evaluations and WCTS evaluations and rehabilitation shall be consistent with EPA's Handbook: *Sewer System Infrastructure Analysis and Rehabilitation*, EPA/625/6-91/030, October 1991; Water Environment Federation's *Manual of Practice FD-6, Existing Sewer Evaluation & Rehabilitation*, 1994; and the most current edition of MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities*. The CPE and CCP shall be consistent with the following publications: *Improving POTW Performance Using the Composite Correction Approach,* EPA

CERI, October 1984; *Retrofitting POTWs,* EPA CERI, July 1989; and the most current edition of MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities*. The Pump Stations evaluations shall be consistent with the "Pumping Systems" chapter of the most current version of Water Environment Federation's *Manual of Practice FD-4, Design of Wastewater and Stormwater Pumping Stations*.

B. Phased Approach for WCTS Evaluation and Rehabilitation

22. West Bank Interceptor Work Plan. Within five (5) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a West Bank Interceptor Work Plan. Upon approval by EPA, the City shall implement the West Bank Interceptor Work Plan. The West Bank Interceptor Work Plan shall include, at a minimum, the following:

(a) The proposed locations selected, and proposed methodologies and criteria that the City will implement and use, to conduct sewage flow monitoring and inspection of the West Bank Interceptor to identify and analyze structural deficiencies in the West Bank Interceptor.

(b) The methodologies and procedures the City will implement for monitoring and determining the total dry weather and wet weather (peak) flow rate in the West Bank Interceptor in order to estimate the severity of I/I in the West Bank Interceptor.

(c) The methodologies and procedures the City will implement for evaluating and assessing the West Bank Interceptor to enable the City, in the West Bank Interceptor Rehabilitation Plan set forth below, to identify any deficiencies therein and a specific list of proposed remedial measures to correct such deficiencies. The proposed remedial measures shall

be performed in two (2) phases. The first phase of such remedial measures shall include cleaning of debris accumulated in the West Bank Interceptor and repairs throughout the length of the West Bank Interceptor that have been evaluated as being necessary to prevent imminent structural failure or have been evaluated as necessary to correct a major structural defect, including sources of Excessive I/I. The first phase shall also include total rehabilitation of at least 20% of the total length of the West Bank Interceptor, or a lesser amount as approved by EPA based upon justification by the City in the West Bank Interceptor Work Plan. Examples of these repairs include, but are not limited to, point repairs, manhole repairs, and replacement of sections of sewer pipe or pipe lining of critical segments. The second phase of such remedial measures shall include rehabilitation of those segments throughout the length of the West Bank Interceptor that include long-term repairs necessary for proper "Asset Management" and/or addressing sources of non-Excessive I/I. Examples of these repairs include, but are not limited to, manhole repairs, sewer pipe lining, and replacement or construction of new gravity sewer pipe segments. Asset Management is a continuous process that guides the acquisition, use, and disposal of infrastructure assets to optimize service delivery and minimize costs over the asset's entire life.

23. West Bank Interceptor Rehabilitation Plan. Within twenty-two (22) months after EPA approval of the West Bank Interceptor Work Plan, the City shall submit to EPA for review and approval a West Bank Interceptor Rehabilitation Plan setting forth the results and conclusions from the implementation of the West Bank Interceptor Work Plan. Upon approval by EPA, the City shall implement the West Bank Interceptor Rehabilitation Plan. The West Bank Interceptor Rehabilitation Plan shall include, at a minimum, the following:

(a) The results of flow monitoring conducted pursuant to the West Bank Interceptor Work Plan and estimates of the severity of I/I within the West Bank Interceptor.

(b) Proposed remedial measures to be conducted in two (2) phases, as more particularly described in Paragraph 22.(c) above, to correct any identified deficiencies. Any such proposal for remedial measures for the West Bank Interceptor shall include a detailed work plan for the implementation of such measures within each phase including beginning and completion dates and a date for the submittal to EPA of a West Bank Interceptor Final Report upon completion of the remedial measures in each phase detailing the activities taken; provided, however, that such remedial measures for phase I shall be completed within seventy-two (72) months after EPA approval of the West Bank Interceptor Rehabilitation Plan and that such remedial measures for phase II shall be completed within one hundred seventy-four (174) months after EPA approval of the West Bank Interceptor Rehabilitation Plan.

24. Prioritization Work Plan. Within seven (7) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a Prioritization Work Plan which shall set forth the proposed locations selected, and proposed methodologies and criteria that the City will implement and use, to identify the severity of I/I within the WCTS, to map the Sewer System, to assess the capacity of WCTS, and to establish Sewershed priorities for further evaluation and rehabilitation of the WCTS pursuant to the Sewershed Evaluation Plan and Evaluation Report/Rehabilitation Plan as set forth in Paragraphs 26 and 27 below. Upon approval by EPA, the City shall implement the Prioritization Work Plan. The Prioritization Work Plan shall include, at a minimum, the following:

(a) The methodologies and procedures the City will implement to estimate the severity of I/I within each Sewershed.

(b) The methodologies and procedures the City will implement for the development of a computerized digital mapping system for each Sewershed that shall include, and have the ability to display, the West Bank Interceptor, all Gravity Sewer Lines, Force Mains, Pump Stations, manholes, inverts, siphons, WWTP locations, diversion valves, outfall locations, and all other appurtenances relating to the City's Sewer System. The mapping system does not need to include Private Laterals. The mapping system shall have the capability to store, update, and display information in a manner that will aid City personnel in the development and implementation of a Hydraulic Model, the Sanitary Sewer Evaluation Survey and the proper operation and maintenance of the Sewer System.

(c) The methodologies and procedures the City will implement for assessing the capacity of the WCTS including the West Bank Interceptor, all Pump Stations, all Major Sewer Gravity Lines, all Force Mains and siphons and their respective related appurtenances, all known SSO locations, and any other portions of each Sewershed. The capacity assessment shall include the WCTS that must be assessed so as to allow a technically-sound evaluation of the causes of SSOs and Prohibited Bypasses at the WWTPs. The capacity assessment shall specifically identify, at a minimum, the hydraulic capacities of the WCTS, and compare those capacities to existing and future projected average and peak flows in dry and wet weather. This assessment shall identify those portions of the WCTS that are expected to cause or contribute to SSOs and/or Prohibited Bypasses at the WWTPs under existing and future projected average and peak flows in dry and wet weather, and the degree to which those portions experience or cause,

under current or projected future conditions, SSOs and/or Prohibited Bypasses at the WWTPs. As part of the capacity assessment, the City shall use the information it is required to develop pursuant to Section VI.B to assess existing and future projected capacity of the WCTS and the ability of the WCTS to transmit peak flows experienced by and predicted for the WCTS.

(d) The methodologies and procedures the City will implement to develop a computerized Hydraulic Model of the WCTS within each Sewershed using a hydraulic modeling software package. The City shall use the Hydraulic Model in the assessment of the hydraulic capacity of the WCTS in that Sewershed and in the identification of appropriate rehabilitative and corrective actions to address all capacity and condition limitations identified in that Sewershed's WCTS. The City shall develop the Hydraulic Model to provide a detailed understanding of the response of the WCTS to wet weather events and an evaluation of the impacts of proposed remedial measures and removal of I/I flow.

The City shall configure the Hydraulic Model to accurately represent the City's WCTS, in accordance with currently accepted engineering practice. The City may model its WCTS in different levels of detail, as necessary to identify the causes of all known SSOs and to assess proposed remedial measures with the goal of eliminating those SSOs. The City's Hydraulic Model shall include at a minimum the West Bank Interceptor, all Major Gravity Lines and associated manholes, and all Pump Stations and associated Force Mains.

The City shall configure the Hydraulic Model using adequate, accurate, and sufficiently current physical data (e.g., invert and ground elevations, pipe diameters, slopes, pipe run lengths, Manning roughness factors, manhole sizes and configurations, Pump Station performance

factors) for its WCTS. In particular, the City shall field verify the physical data to allow calibration and verification of the model.

The City shall calibrate and verify the Hydraulic Model using appropriate rainfall data, actual hydrographs, and WCTS flow data. The City shall use at least three (3) separate data sets each for calibration and verification. As part of the calibration process, the City shall either use existing sensitivity analyses for the selected model, or carry out its own sensitivity analyses, such that calibration effectiveness is maximized.

The Hydraulic Model shall, at a minimum, include:

(i) a description of the Hydraulic Model that includes the criteria set forth above;

(ii) specific attributes, characteristics, and limitations of the Hydraulic Model;

(iii) identification of all input parameters, constants, assumed values, and expected outputs;

(iv) digitized map(s) and schematics that identify and characterize the portions (including the specific Gravity Sewer Lines) of the WCTS that shall be included in the Hydraulic Model;

(v) identification of input data to be used;

(vi) configuration of the Hydraulic Model;

(vii) procedures and protocols for performance of sensitivity analyses (*i.e.*, how the Hydraulic Model responds to changes in input parameters and variables including the use of various design storms of varying durations and intensities);

(viii) procedures for calibrating the Hydraulic Model to account for values representative of the WCTS and WWTPs using actual system and WWTP data (*e.g.*, flow data); and

(ix) procedures to verify the Hydraulic Model's performance using additional, independent actual Sewer System data (*e.g.*, flow data).

(e) The methodology and criteria for prioritizing Sewersheds or groups of Sewersheds in order to conduct the phased evaluation and rehabilitation of the WCTS in each Sewershed as required by this Consent Decree. The criteria for prioritizing Sewersheds shall include, at a minimum, the following:

(i) the severity of the estimated I/I in the Sewersheds;

(ii) the frequency, volume and location of SSOs in the Sewersheds;

(iii) the relative potential impact of SSOs in the Sewersheds to human health and the environment;

(iv) the average age of Gravity Sewer Lines within each Sewershed;

(v) the pipe material used within each Sewershed; and

(vi) any ongoing rehabilitation or corrective action work in the Sewersheds including detailed information on the current status and completion dates for such work.

(f) The methodologies, procedures and criteria for developing proposed schedules for implementing and completing the evaluation and rehabilitation of the WCTS in each Sewershed or groups of Sewersheds as required by this Consent Decree.

25. Prioritization Report. Within thirty-two (32) months after EPA approval of the Prioritization Work Plan, the City shall submit to EPA for review and approval a Prioritization Report setting forth the results and conclusions from the implementation of the Prioritization Work Plan. The Prioritization Report shall include, at a minimum, the following:

(a) The results of flow monitoring conducted pursuant to the Prioritization Work Plan and estimates of the severity of I/I within each Sewershed.

(b) The computerized digital map of the Sewer System.

(c) The results of the capacity assessment of the WCTS.

(d) The results of the Hydraulic Model.

(e) The results of applying to each Sewershed the prioritization criteria approved in the Prioritization Work Plan.

(f) An organization of the Sewersheds into three (3) Sewer Groups, based upon the severity of I/I, and other criteria set forth in Paragraph 24(e), with the most severe being prioritized into Sewer Group 1. In addition, the Sewersheds in Group 1 shall contain at a minimum at least 30% of the estimate of total I/I within all the Sewersheds, and the Sewersheds in Group 2 shall contain at a minimum at least 40% of the estimate of total I/I within all the Sewersheds. The Prioritization Report shall also include a schedule for the Sewersheds in the Sewer Groups to be evaluated in accordance with the Sewershed Evaluation Plan as set forth in Paragraph 26 below, including beginning and completion dates; provided, however, that such schedule shall provide for all Sewersheds in Group 1 to be evaluated within sixty-three (63) months after the Date of Entry of this Consent Decree and all Sewersheds in Group 2 be

evaluated within one hundred forty-one (141) months after the Date of Entry of this Consent Decree.

Upon approval by EPA of the Prioritization Report, the City shall evaluate the Sewersheds in accordance with the Sewershed Evaluation Plan as approved by EPA in accordance with Paragraph 26 below and the prioritized schedule for the Sewersheds as set forth in the approved Prioritization Report.

26. Sewershed Evaluation Plan. Within twelve (12) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a Sewershed Evaluation Plan that the City will implement for the Sewersheds in Sewer Groups 1 and 2 pursuant to the schedule set forth in the approved Prioritization Report. The Sewershed Evaluation Plan shall provide for the City to evaluate the WCTS within the Sewersheds in order to support the development of the Evaluation Report/Rehabilitation Plan for the Sewershed, as provided in Paragraph 27 below, and the identification of rehabilitative and corrective actions to meet the objectives of this Consent Decree. The City's evaluation of the Sewersheds shall include (and the Sewershed Evaluation Plan shall describe) at minimum the following requirements:

(a) Sanitary Sewer Evaluation Survey. The Sewershed Evaluation Plan shall provide for the City to characterize and address the structural integrity of the WCTS and to identify means to improve WCTS capacity and eliminate SSOs and Prohibited Bypasses at the WWTPs, including the identification and reduction of I/I, by conducting a Sanitary Sewer Evaluation Survey for the Sewershed. The Sanitary Sewer Evaluation Survey component of the Sewershed Evaluation Plan shall include, at a minimum, the following:

(i) the criteria that the City will use for establishing the location of flow and rainfall monitoring equipment installation for the Sewershed evaluations, and for determining whether the City will install the flow and rainfall monitoring equipment either permanently or temporarily, in order to adequately characterize flow in the Sewershed;

(ii) a map showing the location of each permanent and temporary flow and rainfall monitoring site established in the WCTS;

(iii) a description of the data management system that will organize, analyze, and report flow and rainfall data collected from the WCTS;

(iv) a description of the quality assurance and quality control program the City will follow to ensure the accuracy and reliability of flow and rainfall data collected from the WCTS;

(v) procedures to identify and evaluate I/I in the Sewersheds (including, without limitation, Private Laterals);

(vi) dry weather monitoring to characterize base flows and wet weather monitoring following events of sufficient duration and intensity to characterize peak flows;

(vii) techniques for reducing Infiltration;

(viii) a program to eliminate sources of Inflow (including legal mechanisms and enforcement programs);

(ix) a program to identify and eliminate cross connections between the WCTS and the City's municipal separate storm sewer system;

(x) methodologies to evaluate the success of items (v) through (ix) above;

(xi) a review of the legal authority in the current sewer use ordinance to require that the owner of an illegal stormwater connection to the WCTS take all appropriate steps necessary to eliminate the connection;

(xii) if the review of the legal authority indicates a need to amend the legal authority in order to assume better control over illegal stormwater connections to the WCTS, the Plan shall include the proposed revisions to the ordinance with a schedule for proposing the draft ordinance to the City Council for adoption;

(xiii) decision-making criteria, procedures, and protocols for prioritization of the evaluation and rehabilitation of Gravity Sewer Lines and associated manholes;

(xiv) decision-making criteria, procedures, and protocols to determine the need for, and the conduct of, internal condition inspection of Gravity Sewer Lines and associated manholes;

(xv) decision-making criteria, procedures, and protocols to determine the need for, and the conduct of, grouting in Gravity Sewer Lines and associated manholes (e.g., leakage rate for application of grout);

(xvi) decision-making criteria, procedures, and protocols used to determine the need for, and the conduct of, smoke testing;

(xvii) decision-making criteria, procedures, and protocols used to determine the need for, and the conduct of, dye testing;

(xviii) decision-making criteria, procedures, and protocols used to determine the need for, and the conduct of, point repair(s), slip lining or line replacement;

(xix) decision-making criteria, procedures, and protocols to determine whether I/I from a Private Lateral is excessive and needs to be addressed;

(xx) decision-making criteria, procedures, and protocols to determine the need for, and the conduct of, flow isolation of Gravity Sewer Lines and associated manholes;

(xxi) guidelines for conducting a cost-effectiveness analysis to consider the rehabilitation costs for I/I sources and rainfall-induced I/I source eliminations versus the costs of transportation, storage, and treatment; and

(xxii) documentation of the basis and criteria for rehabilitation, transportation, storage, and treatment costs.

(b) Pump Station Evaluations. The Sewershed Evaluation Plan shall provide for the City to evaluate the design capacity, current effective capacity, equipment condition, and operational redundancy in its Pump Stations in the Sewersheds. This evaluation shall include, at a minimum, the following criteria:

(i) adequacy of station capacity;

(ii) critical response time, defined as the time interval between activation of the high wet well level alarm and the first SSO, under peak flow conditions;

(iii) adequacy of station condition, based upon both physical inspection and any available operating and mechanical failure history during at least the past five (5) years preceding the lodging date of the Consent Decree;

(iv) adequacy of station design and equipment, including redundancy of pumps and electrical power supply (including whether emergency or back-up power is available

on a portable or fixed basis), and other equipment installed, based upon the most current edition of MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities*; and

(v) the ability of maintenance personnel to take corrective action within the critical response time calculated for each Pump Station.

27. Evaluation Report/Rehabilitation Plan. Within three (3) months after completion of the WCTS evaluation within a Sewershed pursuant to the Sewershed Evaluation Plan, the City shall submit to EPA for review and approval an Evaluation Report/Rehabilitation Plan setting forth the results of the Sewershed Evaluation Plan for that Sewershed, proposed rehabilitative and corrective actions and schedules in order to meet objectives of this Consent Decree. Upon approval by EPA, the City shall implement the remedial measures in the approved Rehabilitation Plan portion of this submittal in accordance with the schedule contained therein.

(a) The Evaluation Report portion of this submittal shall include, at a minimum, the following:

(i) a thorough analysis of historical and current flow monitoring, inspection, rainfall and other data, including data collected during the evaluation of the Sewershed;

(ii) identification of areas with Excessive I/I, such that these conditions are causing and/or contributing to SSOs and/or Prohibited Bypasses at the WWTPs;

(iii) identification of sources of I/I within the Sewershed , if identifiable, by manhole/line segment, street address, type (Infiltration or Inflow), source (*e.g.*, "wall leakage"), and estimated flow from the source;

(iv) identification of cross-connections between the WCTS and the City's municipal separate storm sewer system;

(v) identification and quantification of SSOs, including all potential SSOs identified pursuant to implementation of the Prioritization Work Plan and the Sewershed Evaluation Plan;

(vi) a summary of activities undertaken to configure the Hydraulic Model for each Sewershed and certification that the Hydraulic Model is capable of performing those functions identified in Paragraph 24.(d);

(vii) a summary of activities undertaken to calibrate the Hydraulic Model and certification that the Hydraulic Model has been calibrated (including the performance of sensitivity analyses) and verified in accordance with the Prioritization Work Plan using actual system data (e.g., flow data) from permanent and temporary sewage flow monitoring points in the WCTS (this certification shall include a description of the methodology, data collected, and results of the Hydraulic Model calibrations and verifications);

(viii) identification of portions of the WCTS within the Sewershed in which physical degradation is causing or contributing to SSOs;

(ix) results of average and peak daily dry and wet weather flow measurements;

(x) a determination of maximum Infiltration rate during periods of high ground water (in gpd/inch diameter-mile);

(xi) a determination of maximum hourly Inflow rate during wet weather for various storm durations and intensities (in gpd/inch diameter-mile);

(xii) a determination of peaking factors for each Sewershed (the ratio of measured peak flow to average dry weather flow as measured through the duration of the evaluation);

(xiii) a summary of flow monitoring activities, to include, at a minimum, a map showing the delineation of the Sewershed, location and type of each flow meter, problems encountered and deviations from the Prioritization Work Plan and Sewershed Evaluation Plan, and a description of flow monitor calibration activities, including any scatter graphs and calibration and verification graphs;

(xiv) a summary of field investigative activities performed to include, at a minimum: type of activity; number of activities performed (*e.g.*, "100 out of 500 manholes inspected in Sewershed XX"), observations made under each activity (inspection procedure), and summaries of the results;

(xv) a summary of the structural defects identified in the WCTS to include, at a minimum: number of each type of defect by line segment, manhole number or street address, and estimates of peak flow or impact on WCTS capacity (as appropriate) from defects in each line segment, based on a consistently applied set of stated criteria as set forth in the Sewershed Evaluation Plan;

(xvi) a summary of the technical approach utilized in carrying out the capacity assessment analyses;

(xvii) a detailed description of any deviations from the capacity assessment portion of the Prioritization Work Plan, including a discussion of the reasons for such deviation;

(xviii) identification of all portions of the WCTS within the Sewershed with insufficient capacity as identified by the Hydraulic Model of a Major Gravity Line, Pump Station or other structure to convey peak flows without experiencing surcharge sufficient to cause an SSO under either predicted peak flows or predicted average conditions or both;

(xix) a description of future projected flows;

(xx) information on the predicted (e.g. Manning equation) and actual peak flow capacity of all Major Gravity Lines (by segment), all Force Mains, siphons, and Pump Stations;

(xxi) summaries of the number and footage of sewer segments surcharged, and the number of structures at which an SSO might be expected to occur under each condition investigated;

(xxii) mapping for each condition investigated, illustrating each pipe segment operating in surcharge, and each manhole or structure at which an SSO might be expected to occur;

(xxiii) information regarding the Pump Station evaluation as required by Paragraph 26.(b) above;

(xxiv) the results of the capacity assessment as required by the Prioritization Work Plan; and

(xxv) a summary of any capital projects implemented since commencement of the Sewershed Evaluation Plan.

(b) The Rehabilitation Plan portion of this submittal shall include, at a minimum, the following:

(i) identification of specific measures and schedules that, when implemented, will result in adequate capacity in the WCTS within that Sewershed to collect, convey and treat anticipated peak flows, without SSOs or Prohibited Bypasses at the WWTPs;

(ii) identification of the degree to which sources of Excessive I/I shall be removed, and the degree to which Excessive I/I removal is expected to alleviate capacity constraints, and propose specific remedial measures and schedules that will address those capacity limitations not expected to be addressed by Excessive I/I removal (anticipated I/I removal rates used in the development of the Rehabilitation Plan shall reflect current industry practice);

(iii) identification of specific remedial measures and schedules to address capacity limitations that may also include increases in Pump Station and sewer line capacity, construction of storage or equalization basin facilities, or increases in WWTP capacity;

(iv) identification of all measures and schedules necessary to eliminate all cross-connections between the WCTS and the City's municipal separate storm sewer system;

(v) identification of all measures and schedules necessary to eliminate all SSOs caused by physical degradation of sewers, inadequate Pump Station capacities, or inadequate Pump Station reliability;

(vi) prioritized schedules for remedial measures based upon relative likely human health and environmental impact risks, SSO frequencies, and SSO volumes;

(vii) a description of the methodology used to apply the prioritization factors in Paragraph 27.(b)(vi) above;

(viii) estimated capital, operations and maintenance, and present value costs for each identified remedial measure in consistent, year-specific dollars;

(ix) an expeditious schedule such that design, construction, and placement in service of all proposed measures for Sewersheds in Group 1 shall be completed within one hundred twenty-nine (129) months after the Date of Entry of this Consent Decree and for Sewersheds in Group 2 completed within two hundred seven (207) months after the Date of Entry of this Consent Decree; and

(x) identification of the dates for preliminary design, complete design, complete permitting, contract award, construction commencement, and construction completion dates for each measure proposed.

28. Rehabilitation Report for each Sewershed. Within three (3) months after completion of all remedial measures set forth in a Rehabilitation Plan for a Sewershed, the City shall submit to EPA for review and approval a Rehabilitation Report summarizing the implementation of the Rehabilitation Plan for that Sewershed. Such summary shall include, at a minimum, the following:

(a) Identification of specific measures taken to achieve, and an analysis of whether such measures resulted in, adequate capacity in the WCTS within that Sewershed to collect and convey and treat anticipated peak flows, without SSOs or Prohibited Bypasses at the WWTPs.

(b) An analysis of the degree to which sources of Excessive I/I were removed, and the degree to which Excessive I/I removal alleviated capacity constraints.

(c) Identification of all measures taken to eliminate, and an analysis of whether such measures resulted in the elimination of, all cross-connections and SSOs caused by physical degradation of sewers, inadequate Pump Station capacities, or inadequate Pump Station reliability.

C. Comprehensive Performance Evaluation ("CPE") and Composite Correction Program ("CCP") for the Savanna Street WWTP

29. CPE. Within fifteen (15) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a CPE for the Savanna Street WWTP. The CPE shall be consistent with the EPA publications *Improving POTW Performance Using the Composite Correction Approach,* EPA CERI, October 1984, and *Retrofitting POTWs,* EPA CERI, July 1989, and the most current edition of MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities*. The purpose of the CPE is to identify flow and/or loading rate restricted treatment process unit(s) at the Savanna Street WWTP. Upon approval by EPA, the City shall implement the CPE in accordance with the schedule contained therein. The CPE shall include, at a minimum, the following:

(a) An in-depth diagnostic evaluation of the capacity and operation of the Savanna Street WWTP and its ability to provide Secondary Treatment to all dry and wet weather flow and otherwise meet all terms of the NPDES Permit.

(b) An evaluation of the major individual unit processes, identification of all performance-limiting factors, prioritization of performance-limiting factors, and a comprehensive assessment of the ability to improve performance with a CCP.

(c) Identification of whether the design requirements for the Savanna Street WWTP are consistent with the most current edition of MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities*.

(d) Identification of design flow capacity requirements for the Savanna Street WWTP to adequately treat 100% of the peak annual dry weather flow, including providing Secondary Treatment without experiencing a Prohibited Bypass.

(e) Identification of design capacity requirements to adequately treat 100% of the peak wet weather flow, including providing Secondary Treatment for all flows without experiencing a Prohibited Bypass. The CPE may include estimated wet weather flow anticipated after performance of I/I reduction efforts identified in the Rehabilitation Plans for the WCTS and after sludge/solids removal at the Savanna Street WWTP.

(f) Identification of design requirements necessary to treat sewage to the level established by the most current MDEQ effluent permit requirements, including to the extent feasible any planned TMDLs to be implemented by MDEQ.

(g) A schedule and procedures that the City will use to prepare a Composite Correction Plan ("CCP"), as set forth below, based on the results of the CPE.

(h) Use of flow modeling and other appropriate techniques to evaluate Savanna Street WWTP capacity and operation, taking into account the net (cumulative) increase or decrease to the existing volume of wastewater introduced to the Savanna Street WWTP as a result of the City's actual and anticipated increases in flow from the authorization of new sewer service connections and/or from existing sewer service connections pursuant to Paragraph 33,

and the reduction of I/I into the WCTS as a result of any remedial measures taken pursuant to Section VI.B of this Consent Decree.

(i) A schedule for submission of the CCP as set forth below; provided, however, that for submission of the CCP, such schedule shall not exceed twelve (12) months after EPA's approval of the CPE.

30. CCP. Pursuant to the schedule set forth in the approved CPE, the City shall submit to EPA for review and approval a CCP as described below. The purpose of the CCP is to identify rehabilitation and/or upgrades to the Savanna Street WWTP to address the problems identified in the CPE as more particularly described below. To the extent applicable, the CCP shall be consistent with the EPA publications *Improving POTW Performance Using the Composite Correction Approach,* EPA CERI, October 1984, and *Retrofitting POTWs,* EPA CERI, July 1989; and the most current edition of MDEQ's *Guidance for the Design of Publicly Owned Wastewater Facilities*. Upon approval by EPA, the City shall implement the remedial measures in the approved CCP in accordance with the expeditious schedules contained therein.

The CCP shall include, at a minimum, the identification of specific Type 1, Type 2 and Type 3 remedial measures, as such terms are used in the above-referenced EPA publications and as further clarified below. Type 1 and Type 2 remedial measures shall include, minor process changes, minor equipment additions or enhancements, or flow configuration changes to meet NPDES Permit effluent limits and to maximize Secondary Treatment of peak wet weather flow through the Savanna Street WWTP. For purposes of this Paragraph 30, Type 3 remedial measures shall include any capital improvements, including, without limitation, the addition of a clarifier of equal size to the existing clarifiers at the Savanna Street WWTP and Biological

Nutrient Removal ("BNR"), necessary for the Savanna Street WWTP to meet the May 4, 2012 NPDES Permit effluent limits including nutrient limits. The CCP shall also include expeditious schedules for the implementation of such measures; provided, however, that all Type 1 and Type 2 measures shall be completed within twenty-four (24) months after EPA's approval of the CCP and all Type 3 measures shall be completed within sixty (60) months after EPA's approval of the CCP.

D. Capacity, Management, Operations and Maintenance Programs

31. The City shall develop and implement the Capacity, Management, Operations and Maintenance ("CMOM") programs as provided below. All CMOM programs shall be developed in accordance with EPA Region IV guidance, as set forth in the CDROM disk attached hereto as Appendix D. The City shall ensure that each CMOM program has a written, defined purpose; a written, defined goal; is documented in writing with specific detail; is implemented by trained personnel; has established performance measures; and has written procedures for periodic review. The Parties recognize that the City may need or want to revise the CMOM Programs set forth below during the term of this Consent Decree. Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XIX (Modification). The City must obtain EPA's prior written approval of any revision to the substance of any CMOM Program required by this Consent Decree and shall place copies of any such revised Program in the PDR in accordance with the provisions of Section V. The City may revise the form of any CMOM Program required by this Consent Decree without EPA's approval and shall provide a copy of any revised Program to EPA and MDEQ, and place a copy of any such revised Program in the PDR within seven (7) Days after making such revision.

32. Training Program. Within twelve (12) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a Training Program, including a schedule for full implementation of the program not to exceed twelve (12) months after its approval by EPA. The Training Program shall include, at a minimum, the following:

(a) Technical Training. The technical training component shall include, at a minimum, the following:

(i) employee technical training and refresher technical training requirements (curriculum) that ensure that each City employee has a level of knowledge, commensurate with duties, of the overall functions of the City's infrastructure;

(ii) a description of outside technical training and networking opportunities, such as conferences and seminars, that are made available to City employees;

(iii) a description of the extent to which employee certification, at the State or at the City level, is required as a basis for obtaining or maintaining a position;

(iv) records of technical training, including on-the-job training, which shall be maintained in an information management system and shall describe the degree to which completed technical training and on-the-job training is tied to promotion and pay; and

(v) a description of the technical training required before an employee can undertake specific work assignments or tasks.

(b) Skills Training. The skills training component shall include, at a minimum, the following:

(i) employee skills training and refresher skills training requirements (curriculum) that ensure that each City employee has a level of knowledge, commensurate with

duties, of the specific equipment to be used and the procedures to be followed in carrying out duties;

(ii) a description of outside skills training opportunities, such as manufacturers' training, that are made available to employees;

(iii) a description of the extent to which employee certification, at the State or at the City level, is required as a basis for obtaining or maintaining a position;

(iv) records of skills training, including on-the-job training, which shall be maintained in an information management system) and shall describe the degree to which completed skills training and on-the-job training is tied to promotion and pay; and

(v) a description of the skills and on-the-job training required before an employee can undertake specific work assignments or tasks.

(c) Safety Training. The safety training component shall include, at a minimum, the following:

(i) employee safety training and refresher safety training requirements (curriculum) that ensure that each City employee has level of knowledge regarding on-the-job safety that is commensurate with the employee's equipment and work environment;

(ii) a description of the extent to which employee safety certification at the State or at the City level is required as a basis for obtaining or maintaining a position;

(iii) records of safety training, including on-the-job training, which shall be maintained in an information management system and shall describe the degree to which completed safety training and on-the-job training is tied to promotion and pay; and

(iv) a description of the safety training required before an employee can undertake specific work assignments or tasks.

33. Capacity Assurance Program. Within fifty-four (54) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a Capacity Assurance Program ("CAP"), including a schedule for full implementation of the program not to exceed twelve (12) months after EPA approval of the CAP. Pursuant to the capacity assessment performed in accordance with Paragraph 24.(c) above, the CAP shall identify each Sewershed or part of a Sewershed with insufficient capacity under either peak wet weather, or average conditions, or both. It shall also analyze all portions of the WCTS that hydraulically impact all known SSOs and all components of a WWTP that may contribute to violations of the NPDES Permits. The CAP shall assess peak flow capacity of the West Bank Interceptor, all Pump Stations, all Major Sewer Gravity Lines, all Force Mains and siphons and their respective related appurtenances, all known SSO locations, and any other portions of the WCTS that must be assessed so as to allow a technically-sound evaluation of the causes of SSOs and Prohibited Bypasses at the WWTPs for existing and proposed flows. The CAP shall enable the City to authorize new sewer service connections, or increases in flow from existing sewer service connections, only after the City certifies that the analysis procedures contained in the approved CAP have been used and that the City has determined, based on those procedures, that there is Adequate Treatment Capacity, Adequate Transmission Capacity, and Adequate Collection Capacity as set forth below. The Capacity Assurance Program shall include, at a minimum, the following:

(a) The technical information, methodology, and analytical techniques, including the model or software, to be used by the City to calculate collection, transmission, and treatment capacity.

(b) The means by which the City will integrate its certification of Adequate Treatment Capacity, Adequate Transmission Capacity, and Adequate Collection Capacity with the issuance of building permits by the City and the City's acquisition of new or existing sewers from other owners.

(c) The means by which the City will integrate its certification of Adequate Treatment Capacity, Adequate Transmission Capacity, and Adequate Collection Capacity with the requirements of Mississippi Commission on Environmental Quality Regulation WPC-1, Section I.C.1.(b) and Sections VI.B.2 and VI.B.4., regarding the certification of capacity for the construction of new sewer lines that provide new flow into the City's Sewer System.

(d) The technical information, methodology, and analytical techniques, including the model or software, to be used by the City to calculate the net (cumulative) increase or decrease in volume of wastewater introduced to the WCTS as a result of the City's authorization of new sewer service connections and increases in flow from existing connections and the completion of: (i) specific projects that add or restore collection or transmission capacity to the WCTS or add or restore Secondary Treatment capacity at a WWTP ("Capacity Enhancing Projects"), (ii) specific projects that reduce peak flow through removal of I/I ("I/I Projects"), and (iii) permanent removal of sewer connections ("Removal of Connections").

(e) An Information Management System capable of tracking the accumulation of banked credits, earned pursuant to Paragraph 33.(i) below, from completion of Capacity

Enhancing Projects, I/I Projects and Removal of Connections; the capacity-limited portion of the Sewershed in which those credits were earned; and the expenditure of such credits on future increases in flow from new or existing sewer service connections in that capacity-limited portion of the Sewershed.

(f) All evaluation protocols to be used to calculate collection, transmission, and treatment capacity including, but not limited to, standard design flow rate rules of thumb regarding pipe roughness, manhole head losses, as-built drawing accuracy (distance and slope), water use (gallons per capita per day), projected flow impact calculation techniques, and metering of related existing peak flows (flows metered in support of analysis and/or manual observation of existing peak flows). The City may identify sewer line segments which have been specifically designed and constructed to operate under surcharge conditions (e.g., with welded or bolted joints) and identify the level of surcharge for those segments.

(g) Capacity Certifications. Except as provided in Paragraphs 33.(h), (i), (j) and (k) below, after twelve (12) months of EPA's approval of the CAP, the City shall authorize a new sewer service connection, or additional flow from an existing sewer service connection, only after it certifies that the analysis procedures contained in the approved CAP have been used and that the City has determined, based on those procedures, that there is Adequate Treatment Capacity, Adequate Transmission Capacity, and Adequate Collection Capacity as defined below:

(i) Treatment Capacity Certifications. The City's certification of "Adequate Treatment Capacity" shall confirm that, at the time the WWTP receives the flow from a proposed sewer service connection(s) or increased flow from an existing sewer service connection(s), when combined with the flow predicted to occur from all other authorized sewer

service connections (including those which have not begun to discharge into the WCTS), the WWTP will not be in "non-compliance" for quarterly reporting as defined in 40 C.F.R. Part 123.45, Appendix A. In addition, the City's certification of "Adequate Treatment Capacity" shall confirm that the new or increased flow to the WWTP will not result in a Prohibited Bypass.

(ii) Transmission Capacity Certifications. The City's certification of "Adequate Transmission Capacity" shall confirm that each Pump Station, through which the proposed additional flow from new or existing sewer service connections would pass to the WWTP receiving such flow, has the capacity to transmit, with its largest pump out of service, the existing one (1) hour peak flow passing through the Pump Station, plus the addition to the existing one (1) hour peak flow predicted to occur from the proposed connection, plus the addition to the existing one (1) hour peak flow predicted to occur from all other authorized sewer service connections which have not begun to discharge into the WCTS.

(iii) Collection Capacity Certifications. The City's certification of "Adequate Collection Capacity" shall confirm that each Major Gravity Line, through which the proposed additional flow from new or existing connections would pass, has the capacity to carry the existing one (1) hour peak flow passing through the Major Gravity Line, plus the addition to the existing one (1) hour peak flow from the proposed connection, plus the addition to the existing one (1) hour peak flow predicted to occur from all other authorized sewer service connections which have not begun to discharge into the WCTS without causing a Surcharge Condition.

(iv) Definition of "One (1) Hour Peak Flow" and "Surcharge Condition". The terms set forth below are defined herein only for purposes of implementation of the CAP.

The City agrees that it shall not use these definitions for purposes of establishing any design criteria for the implementation of rehabilitation measures to the Sewer System. The term "one (1) hour peak flow" shall mean the greatest flow in a sewer averaged over a sixty (60) minute period at a specific location expected to occur as a result of a representative 2 year-24 hour storm event. Except for the West Bank Interceptor as set forth below, the term "Surcharge Condition" shall mean the condition that exists when the supply of wastewater resulting from the one (1) hour peak flow is greater than the capacity of the pipes to carry it and the surface of the wastewater in manholes rises to an elevation greater than twenty-four (24) inches above the top of the pipe or within three (3) feet of the rim of the manhole, and the sewer is under pressure or head, rather than at atmospheric pressure, unless the City has, pursuant to Paragraph 33.(f) above, identified that pipe segment and manhole as designed to operate in that condition, in which case the identified level of surcharge will be used. For the West Bank Interceptor, the term "Surcharge Condition" shall mean the condition that exists when the supply of wastewater resulting from the one (1) hour peak flow is greater than the capacity of the Interceptor to carry it and the surface of the wastewater rises to an elevation within three (3) feet of the rim of any manhole. The City agrees to not construct additional manholes for the West Bank Interceptor and to not increase the elevation of existing manholes except to ensure that the elevation is no higher than five (5) feet above the Base Flood elevation as that term is defined at 44 C.F.R. § 59.1.

(h) Minor Sewer Connections. For minor sewer service connections, the City may elect to perform a monthly capacity analysis for each Sewershed or part of a Sewershed by certifying that the Sewershed has adequate capacity, as defined above, to carry existing peak

flows and the additional flows generated by all such minor sewer service connections projected to be approved in the subsequent month. For any Sewershed or part of a Sewershed which can be so certified, the City may approve these projected minor sewer service connections without performing individual certifications for each connection. For the purposes of this paragraph only, a "minor sewer service connection" is a connection with an average flow not to exceed 2,500 gallons per day.

(i) Capacity for Treatment, Transmission, and Collection in Lieu of Certification. The City may authorize a new sewer service connection, or additional flow from an existing sewer service connection, even if it cannot satisfy the requirements of Paragraph 33.(g), provided the City certifies that all of the following provisions, where applicable, are satisfied:

(i) the City is in substantial compliance with this Consent Decree;

(ii) the sewer lines which will convey the proposed additional flow from new or existing sewer service connections have not experienced dry weather SSOs due to inadequate capacity within the previous twelve (12) Months; or, in the alternative, the causes of any dry weather SSOs due to inadequate capacity have been eliminated;

(iii) the City has identified the sewer line segment(s), Pump Station(s) and/or wastewater treatment systems that do not meet the conditions for certification of Adequate Treatment Capacity, Adequate Collection Capacity, and/or Adequate Transmission Capacity;

(iv) the City shall complete, prior to the time the proposed additional flow from new or existing sewer service connections is introduced into the WCTS, specific Capacity

Enhancing Projects, I/I Projects, and/or Removal of Connections which will add sewer capacity or reduce peak flows to the identified sewer line segment(s), Pump Atation(s), and wastewater treatment system(s) in accordance with the factors set forth in Paragraphs 33.(i)(v) and (vi) below;

(v) where the City has undertaken specific Capacity Enhancing Projects that provide for additional off-line storage or additional Secondary Treatment capacity, and/or specific Removal of Connections to satisfy the requirements of Paragraph 33.(i)(iv) above, the estimated added capacity resulting from such projects must be equal to or greater than the estimated amount of any proposed additional flow;

(vi) where the City has undertaken specific I/I Projects or Capacity Enhancing Projects, other than those that provide for additional off-line storage or additional Secondary Treatment capacity, to satisfy the requirements of Paragraph 33.(i)(iv) above, the estimated reduction in peak flows or added capacity resulting from such projects must exceed the estimated amount of any proposed additional flow by a factor of 3:1;

(vii) commencing within twelve (12) months of EPA's approval of the CAP and annually thereafter, the City has performed a review of specific Capacity Enhancing Projects and I/I Projects undertaken to determine if actual added capacity and peak flow reductions are in line with what the City originally estimated for such projects; and the City has used the results of this review to adjust future estimates as necessary;

(viii) any new sewer service connection or increase in flow to an existing connection authorized prior to the completion of a necessary added capacity or peak flow reduction project as set forth above shall be conditioned upon completion of such project prior to

the time that the new sewer service connection or flow increase is introduced into the WCTS; and

(ix) in implementing the provisions of this Paragraph 33.(i), the City may use a "banking credit system" for the sewer line segment(s), pump station(s), and/or wastewater treatment systems for which the City is not able to satisfy the conditions set forth in Paragraph 33.(g) above.

(j) Essential Services. Notwithstanding the above provisions, the City may authorize a new sewer service connection, or additional flow from an existing sewer service connection, even if it cannot certify that it has Adequate Transmission Capacity, Adequate Collection Capacity, and/or Adequate Treatment Capacity as defined above for health care facilities, public safety facilities, and public schools and, subject to EPA review and approval, for government facilities; and in those cases where a pollution or sanitary nuisance condition exists, as determined by the local county health department or its regulatory successor, as the result of a discharge of untreated wastewater from an on-site septic tank.

(k) Existing Illicit Connections. Notwithstanding the provisions above, the City may authorize a new sewer service connection, or additional flow from an existing sewer service connection, even if it cannot certify that it has Adequate Transmission Capacity and/or Adequate Collection Capacity and/or Adequate Treatment Capacity as defined above for any illicit connections or discharge of wastewater to the stormwater system or to waters of the State. For purposes of this subparagraph, the term "illicit connection" shall mean any connection resulting in a discharge to the municipal separate storm sewer system ("MS4") that is not

composed entirely of storm water, except for discharges allowed under a NPDES permit or waters used for firefighting operations.

(l) Certifications. All certifications pursuant to this Paragraph 33 shall be made by a professional engineer registered in the State of Mississippi and shall be approved by a responsible party of the City as defined by 40 C.F.R. § 122.22(b). The City shall maintain all such certifications, and all data on which the certifications are based, in its offices for inspection by EPA and MDEQ. EPA and MDEQ may request, and the City shall provide, any and all documentation necessary to support any certification made by the City pursuant to this Paragraph 33, and make available, to the extent possible, individuals providing such certifications to meet with EPA and MDEQ.

34. Sewer Overflow Response Plan ("SORP"). The City submitted to MDEQ a SORP on September 28, 2011, pursuant to the MDEQ Agreed Order I. MDEQ approved the SORP on October 10, 2011. A copy of the SORP is attached hereto as Appendix E and hereby incorporated herein by reference. The City shall continue to implement the SORP as an enforceable obligation under this Consent Decree.

35. Inter-Jurisdictional Agreement Program. Within twenty-four (24) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval an Inter-Jurisdictional Agreement Program for when the City reopens or renews existing agreements or enters into new agreements that cover the collection, conveyance, and treatment of sewage by the City from municipal satellite sewer systems and/or large volume sewer customers. The program shall delineate the minimum provisions to be set forth in these agreements with which the contracting municipality or large volume sewer customer must comply. Such

provisions shall include requirements on the contracting party to properly manage, operate, and maintain its sewage collection and conveyance systems including, without limitation, the management of FOG and the minimization of peak flows into the City's Sewer System by excluding, to the maximum reasonable extent, I/I. In addition, such provisions shall include requirements on the contracting party to ensure that any of its municipal satellite sewer systems and/or large volume sewer customers also properly manage, operate, and maintain their sewage collection and conveyance systems. The program shall also delineate provisions addressing the term or life of these agreements; mechanisms for appropriate modification of the agreements; and mechanisms for enforcement of the agreements (including a description of the legal support necessary to develop, oversee and enforce the agreements) which may include provisions permitting termination of the agreement and physical disconnection from the City's Sewer System within a reasonable time not exceeding two (2) years upon the failure of the contracting party to comply with its management, operations, and maintenance obligations.

The City represents that it currently has in place agreements covering the collection, conveyance, and treatment of sewage with all municipal satellite sewer systems that may or may not currently satisfy the requirements of the Inter-Jurisdictional Agreement Program as set forth above. The City represents that these existing agreements may expire or terminate before or after the Date of Entry of this Consent Decree. When any of these currently existing agreements expire or terminate, the City may, but shall not be required to, renew any such agreement or enter into a new agreement covering the collection, conveyance, and treatment of sewage from such other municipal satellite sewer system. In the event the City does reopen or renew such an

agreement or enters into any new agreement, each agreement shall be consistent with the requirements of this Inter-Jurisdictional Agreement Program.

36. Private Lateral Program. Within twenty-four (24) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval Private Lateral Program, including a schedule for full implementation of the program not to exceed twelve (12) months after its approval by EPA. The Private Lateral Program shall include, at a minimum, the following:

(a) A legal review of the City's sewer use ordinance to ensure that the City has the authority to require customers to repair or replace Private Laterals that may contain defects and/or improper connections that:

(i) are potential sources of I/I to the WCTS that may cause or contribute to SSOs or other violations of the NPDES Permits;

(ii) allow for the possible exfiltration of wastewater onto or below the surface of the ground that could then enter the stormwater system; or

(iii) allow roots and/or debris to enter the WCTS through cracks, holes, or poorly sealed joints, thus restricting flow and increasing the likelihood of SSOs.

(b) If the legal review indicates a need to amend the legal authority in order to assume better control over problems with capacity on the Private Laterals, the Plan shall include the proposed revisions to the ordinance with a schedule for proposing the draft ordinance to the City Council for adoption.

(c) An enforcement response guide to address Private Laterals that contain defects and/or improper connections. The enforcement response guide shall:

(i) identify the process that the City will follow to require customers to repair or replace the identified Private Laterals;

(ii) set forth a series of graduated enforcement responses by the City, which may include termination of services, in the event a customer fails to repair or replace the identified Private Laterals;

(iii) describe the notice the City provides to customers to require repair or replacement of identified Private Laterals and the process a customer must follow in order to challenge the City's determination that repair or replacement is necessary or the City's enforcement response, such as termination of services; and

(iv) identify the process a customer must follow to request a waiver of any of the obligations to properly operate and maintain Private Laterals imposed by the City's sewer use ordinance and the process the City will use to consider granting and revoking such waivers.

(d) Establishment of technical and legal staffing to ensure effective implementation of the enforcement response guide.

(e) An information management system.

37. Water Quality Monitoring Program. Within twenty-four (24) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a Water Quality Monitoring Program, including a schedule for full implementation of the program not to exceed twelve (12) months after its approval by EPA. Water Quality Monitoring Program described below shall identify SSOs originating at sewer pipe creek crossings and other isolated or remote sewer locations adjacent or in proximity to waterways; locate the source or sources of

such SSOs; and assess the impact upon the environment and public health of such SSOs. The Water Quality Monitoring Program shall also include standard sampling and quality assurance procedures and an information management system. The Water Quality Monitoring Program is in addition to any other sampling required by the NPDES Permits. The Water Quality Monitoring Program shall include, at a minimum, the following:

(a) Routine Water Quality Monitoring Component. The City shall develop and implement a Routine Water Quality Monitoring component to detect SSOs originating at or in proximity to stream crossings or other isolated and remote sewer locations. This component shall provide for scheduled sampling during both dry and wet weather periods from a network of monitoring stations located in each of the City's Sewersheds. The Routine Water Quality Monitoring component shall propose the exact number and location of monitoring points depending upon drainage configuration and other factors, but in no event shall the number of monitoring points be less than twelve (12) monitoring points. The Routine Water Quality Monitoring component shall include a map of all sampling locations, and shall specify sampling frequency and sampling parameters, including pH, dissolved oxygen, and fecal coliform and/or *E. coli* bacteria. The City may elect to specify one or both of fecal coliform and *E. coli* bacteria as a sampling parameter.

(b) Investigative Water Quality Monitoring Component. The City shall develop and implement an Investigative Water Quality Monitoring component to determine whether the WCTS and/or any WWTP is a source of pollution identified as a result of complaints, routine water quality monitoring pursuant to Paragraph 37.(a) above, or by other means. This component shall specify the conditions under which the City will initiate an

investigation under this Paragraph 37.(b). The Investigative Water Quality Monitoring component shall include a requirement for development of a map of all actual sampling locations, and shall specify a protocol for determining sampling parameters to be used depending on the type of pollution identified or suspected. The Investigative Water Quality Monitoring component shall include the following:

(i) Dry Weather Monitoring. The purpose of dry weather monitoring shall be to detect chronic line leaks. Dry weather sampling shall be conducted for a definite period of time, e.g., one week ("Testing Period"). During the Testing Period, the City shall collect fecal coliform and/or *E. Coli* bacteria samples at least once a day at locations to be investigated.

(ii) Wet Weather Monitoring. The purpose of wet weather monitoring shall be to detect capacity problems. The wet weather sampling period shall be defined using rainfall and stream stage data or sewer flow data. During the sampling period, the City shall collect fecal coliform and/or *E. Coli* bacteria samples at least two (2) times a day at locations to be investigated.

(iii) Location of Source of Release. If necessary, the isolated stream segment shall be sampled at defined intervals to identify the source of the release. Fecal coliform and/or *E. Coli* bacteria samples shall be taken in each of the monitoring locations. After repair of the source, the City shall take additional samples to ensure that the repair has been successful.

(c) Spill Impact Water Quality Monitoring Component. The City shall develop and implement a Spill Impact Water Quality Monitoring component to assess any

impact upon public health and the environment of pollution resulting from SSOs, and to assist in assessing the need for any environmental and/or public health response. The City shall consult with EPA, MDEQ, and public health authorities during development and implementation of the Spill Impact Water Quality Monitoring component. As part of the Spill Impact Water Quality Monitoring component, the City shall develop protocols for mapping all actual sampling locations, for determining the frequency and duration of sampling (depending upon the potential impact of the spill on public health and the environment), and for sampling for pH, dissolved oxygen, and fecal coliform and/or *E. coli* bacteria. The sampling protocol shall include sampling upstream (control) and downstream of the spill. The sampling protocol also shall identify the circumstances under which the City shall sample for those Priority Pollutants known to be present in the wastewater of any Significant Industrial User that discharges into the portion of the WCTS upsewer of the SSO. The Water Quality Monitoring information management system shall contain a list of the Priority Pollutants, if any, in wastewater discharged by any Significant Industrial User to the WCTS, and the lines affected by any such discharge.

(d) Quality Assurance, Sampling, Data Analysis. The City shall use analytical procedures, sample containers, preservation techniques, and sample holding times that are specified in 40 C.F.R. Part 136. Upon request, the City shall allow split or duplicate samples to be taken by EPA, MDEQ, or their authorized representatives. In addition, EPA and MDEQ shall have the right to take any additional samples that EPA or MDEQ may deem necessary.

(e) Water Quality Reporting. The City shall report, pursuant to the requirements of Section IX (Reporting Requirements), the following information:

(i) the actions which have been taken under the Water Quality Monitoring Program during the previous Calendar Quarter, including the dates and times of all sampling;

(ii) a summary of all results of sampling during the previous Calendar Quarter; and

(iii) all actions including, but not limited to, data collection, which are scheduled for the next Calendar Quarter.

38. Pump Station Operations Programs. Within twelve (12) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval Pump Station Operations Programs, including a schedule for full implementation of the programs not to exceed twelve (12) months after their approval by EPA. The Pump Station Operations Programs shall include, at a minimum, the following:

(a) Routine Pump Station Operations Program. The Routine Pump Station Operations Program shall be developed to ensure proper Pump Station operations that will necessitate prevention of Pump Station failure. This program shall include, at a minimum, the following:

(i) procedures for reading and recording information appropriate to each Pump Station including, as applicable, pump run-time meter readings, start counters, amperage readings, checking and resetting conditions, wet-well points, grease accumulations, and any other information that is necessary for the proper operation of a Pump Station;

(ii) development of standard inspection routes and schedules; and

(iii) provisions for needs determination, establishing priorities and scheduling, number of crews and personnel (including, where appropriate, contract crews), standard forms, records and performance measures, and an information management system.

(b) Emergency Pump Station Operations Program. The Emergency Pump Station Operations Program shall be developed to necessitate emergency operations in the event of Pump Station failure. This program shall provide guidance and ensure timely response to atypical situations in the WCTS through the use of written standard emergency operating procedures for each type of Pump Station and shall include, at a minimum, the following:

(i) emergency contact information;

(ii) location(s) of auxiliary power including portable or fixed emergency generators applicable to each Pump Station;

(iii) location(s) of portable pumping equipment;

(iv) guidance for initiating auxiliary power with portable or fixed generators;

(v) guidance for installing portable pumps during high flow;

(vi) applicable contingency plans; and

(vii) standard forms, records and performance measures and an information management system.

39. Fats, Oils and Grease ("FOG") Control Program. Within twenty-four (24) months after the Date on Entry of this Consent Decree, the City shall submit to EPA for review and approval a FOG Control Program, including a schedule for full implementation of the

program not to exceed twelve (12) months after its approval by EPA. The FOG Control Program shall include, at a minimum, the following:

(a) The legal authority to control the discharge of FOG into the WCTS, including the ability to implement a permit and enforcement program.

(b) Specification of accepted devices to control the discharge of FOG into the WCTS.

(c) Establishment of standards for the design and construction of FOG control devices including standards for capacity and accessibility, site map, design documents, and as-built drawings.

(d) Establishment of FOG control device management, operations, and maintenance standards, or best management practices, that address onsite record keeping requirements, cleaning frequency, cleaning standards, use of additives, and ultimate disposal.

(e) Establishment of construction inspection protocols, including scheduling, inspection report forms, and inspection record keeping requirements, to assure that FOG control devices are constructed in accordance with established design and construction standards.

(f) Establishment of compliance inspection protocols, including scheduling, inspection report forms, and inspection record keeping requirements to assure that FOG control devices are being managed, operated, and maintained in accordance with the established management, operations, and maintenance standards or best management practices.

(g) Establishment of a FOG disposal manifest system.

(h) Establishment of an enforcement program, including specific enforcement mechanisms, to ensure compliance with the FOG Control Program.

(i) Establishment of a compliance assistance program to facilitate training of FOG generators and their employees.

(j) Establishment of a public education program directed at reducing the amount of FOG entering the WCTS from private residences.

(k) Establishment of staffing (technical and legal) and equipment requirements to ensure effective implementation of the FOG Control Program.

(l) A FOG characterization study that shall indentify the sources of FOG causing problems in the WCTS and the best method or mechanism for addressing those sources.

(m) A list of current commercial establishment FOG generators including a description of their FOG generating processes and average daily discharge volume.

(n) Establishment of performance indicators to be used by the City to measure the effectiveness of the FOG Control Program.

40. Pump Station Preventive Maintenance Programs. Within twelve (12) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval Pump Station Preventive Maintenance Programs, including a schedule for full implementation of the programs not to exceed twelve (12) months after their approval by EPA. The Pump Station Preventive Maintenance Programs shall include, at a minimum, the following:

(a) An electrical maintenance component which shall provide guidance to managers and field personnel responsible for electrical maintenance to ensure that preventive maintenance on Pump Station electrical components are performed on a routine basis. This component shall include meter calibration schedules for any meter used to record data collected at or from a Pump Station.

(b) A mechanical maintenance component that shall provide guidance to managers and field personnel responsible for mechanical maintenance to ensure that preventive maintenance on Pump Station mechanical components are performed on a routine basis.

(c) A physical maintenance component that shall provide guidance to managers and field personnel responsible for physical maintenance (pipes, walls, inverts, covers, etc.) to ensure that preventive maintenance on Pump Station physical components are performed on a routine basis.

(d) A Pump Station repair component that shall serve as a reactive maintenance system to repair Pump Stations that are currently in a state of disrepair but still cost-effective to service. This component shall provide for the identification, prioritization, scheduling, and repair of Pump Stations on a timely basis once a Pump Station has deteriorated beyond the scope of the preventive maintenance programs. This component shall include, at a minimum, the following:

(i) guidance outlining when a Pump Station is to be placed in the Pump Station Repair Program;

(ii) a prioritized inventory of Pump Stations in need of repair;

(iii) an ongoing inventory of completed repairs;

(iv) a work schedule for repairs; and

(v) standard forms, records and performance measures, and an information management system.

41. Gravity Line Preventive Maintenance Program. Within fifteen (15) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a

Gravity Line Preventive Maintenance Program, including a schedule for full implementation of the program not to exceed twelve (12) months after its approval by EPA. The Gravity Line Preventive Maintenance Program shall include, at a minimum, the following:

(a) A preventive hydraulic cleaning component which shall include protocols for implementing routine hydraulic cleaning component of the preventive maintenance program for Gravity Sewer Lines. This component shall include provisions for needs determination, establishing priorities and scheduling, number of crews and personnel (including, where appropriate, contract crews), hydraulic cleaning equipment to be used, standard hydraulic cleaning maintenance procedures, standard forms, records and performance measures, and an information management.

(b) A preventive mechanical cleaning component which shall include protocols for implementing routine mechanical cleaning component of the preventive maintenance program for Gravity Sewer Lines. This component shall include provisions for needs determination, establishing priorities and scheduling, number of crews and personnel (including, where appropriate, contract crews), mechanical cleaning equipment to be used, standard mechanical cleaning maintenance procedures, standard forms, records and performance measures, and an information management system.

(c) A root control component which shall include protocols, methods, and approaches for implementing a root control component of the preventive maintenance program for Gravity Sewer Lines. This component shall include provisions for needs determination, establishing priorities and scheduling, number of crews and personnel (including, where appropriate, contract crews), root control methods and approaches, root control maintenance

procedures, standard forms, records and performance measures, and an information management system.

(d) A manhole preventive maintenance component which shall include protocols, methods, and approaches for implementing a routine inspection and maintenance component of the preventive maintenance program for Gravity Sewer Lines. This component shall include provisions for needs determination, establishing priorities and scheduling, number of crews and personnel (including, where appropriate, contract crews), inspection methods and approaches, standard maintenance procedures, standard forms, records and performance measures, and an information management system.

(e) A prioritized and expedited schedule for implementation of the Program for the West Bank Interceptor.

42. WWTP Operations and Maintenance Program. Within fifteen (15) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a WWTP Operations and Maintenance Program, including a schedule for full implementation of the program not to exceed twelve (12) months after its approval by EPA. The WWTP Operations and Maintenance Program shall include, at a minimum, the following:

(a) Equipment, Parts, and Material Inventory. The City shall inventory its WWTPs' operating equipment and materials and evaluate the impacts of the loss of use or failure of each major system component. The City shall develop an inventory control system which shall have the capability of tracking spare parts use and inventory, as well as generating inventory replenishment needs reports. The City's inventory control system shall also include the following elements:

(i) prioritization of WWTP components as critical, semi-critical, or non-critical which shall allow the City to focus its maintenance capabilities and spare parts inventories on the WWTP components and potential failures that would have the greatest impact on treatment capacity, Prohibited Bypassing, and NPDES Permit compliance;

(ii) identification of critical spare parts and materials, and procedures to ensure that these parts and materials are stored and maintained in inventory at the WWTP;

(iii) a list of where the remaining spare parts may be secured to enable the repair or replacement of such equipment in a minimum amount of time and to ensure proper operation of the WWTP; and

(iv) tracking of spare parts use and inventory, as well as generating inventory replenishment needs reports.

(b) Sludge Processing and Removal. Not inconsistent with the requirements of the MDEQ Agreed Order I, the maintenance program shall include sludge removal procedures, schedules, and standard practices for the WWTPs and from any storage lagoons, wet weather storage cells, equalization ponds, or any other wet weather storage facility that is, or is planned for use by, a WWTP.

(c) Preventive Maintenance. The City develop and implement a preventive maintenance system for the WWTPs to ensure that preventive and corrective maintenance is conducted and that equipment integral to proper operation and maintenance, treatment units, and tanks are maintained so as to achieve compliance with the NPDES permit. The preventive maintenance system shall include, at a minimum, the following:

(i) identification of equipment used in the treatment of wastewater liquids and biosolids;

(ii) identification of the standard procedures to conduct preventive maintenance of such WWTP equipment;

(iii) identification of the frequency and duration of preventive maintenance necessary to ensure that all WWTP equipment is maintained in such a way so as to achieve compliance with the NPDES permit;

(iv) identification of the training and education required for maintenance personnel to perform the standard preventive maintenance procedures;

(v) procedures for recognition of indicators that corrective maintenance on WWTP equipment is necessary;

(vi) procedures for the generation of work orders for preventive and corrective maintenance of WWTP equipment;

(vii) procedures for the generation of purchase orders associated with preventive and corrective maintenance of WWTP equipment;

(viii) examples of the types of reports and forms which will be used in implementing the preventive maintenance system;

(ix) a system for tracking preventive and corrective maintenance activities and histories including the generation of summary reports each month that identify major equipment failures occurring in the previous month and the end-of-month status of preventive and corrective maintenance work orders issued or outstanding in the previous month for equipment; and

(x) procedures to ensure that failures of equipment and/or loss of power supply during abnormal and emergency conditions are corrected in a timely fashion so as to limit the downtime of the facility or component.

43. Financing & Cost Analysis Program. Within eighteen (18) months after the Date of Entry of this Consent Decree, the City shall submit to EPA for review and approval a Financing and Cost Analysis Program. The Financing and Cost Analysis Program shall include, at a minimum, the following:

(a) A process (including a schedule of implementation) that regularly analyzes, projects, plans, and finances management, operating, and maintenance costs of its Sewer System, including those management, operating, and maintenance costs associated with labor and equipment needed to properly implement the CMOM programs required pursuant to this Consent Decree.

(b) A process (including a schedule of implementation) that regularly analyzes, projects, plans, and finances capital improvements to its Sewer System, including those capital improvements required pursuant to this Consent Decree. Capital improvement financing shall be planned using, at a minimum, a five (5)-year planning horizon followed by annual updates.

(c) A process, including a schedule of implementation, to ensure that life cycle cost analysis is incorporated into its operations cost analyses, maintenance cost analyses, and management cost analyses for all Sewer System equipment and infrastructure.

(d) A process, including a schedule of implementation, to establish its annual budget and set customer rates that assures that the budget and rates are based on the programs referenced in Paragraph 43.(a) through (c) above.

D. Work under MDEQ Orders Enforceable under this Consent Decree

44. As set forth in Section 2.D of the MDEQ Agreed Order I, the City has agreed to implement a Sludge and Solids Removal Plan that provides for the removal and proper disposal of excess, accumulated sludge/solids from the Savanna Street WWTP storm diversion cells. The Parties agree that the City shall implement the Sludge and Solids Removal Plan as an enforceable obligation under this Consent Decree. In addition, as set forth in Sections 2.B., C. and D. of the MDEQ Order II, the City has agreed to implement certain remedial measures to address NPDES permit effluent limitation violations at the Presidential Hills WWTP. The Parties agree that the City shall implement such remedial measures as an enforceable obligation under this Consent Decree.

VII. CIVIL PENALTY

45. The City shall pay the sum of $437,916 as a civil penalty to be paid in four (4) installments of $109,479. The first installment shall be due within thirty (30) Days after the Date of Entry of this Consent Decree. The second installment shall be due within seven (7) months after the Date of Entry of this Consent Decree, the third installment shall be due thirteen (13) months after the Date of Entry of this Consent Decree, and the fourth installment shall be due nineteen (19) months after the Date of Entry of this Consent Decree. The second, third and fourth installment payment of the civil penalty shall also include an additional sum for interest accrued on the unpaid portion of the principal amount calculated from the Date of Entry of this

Consent Decree until the date of the payment. The Financial Litigation Unit ("FLU") of the U.S. Attorney's Office for the Southern District of Mississippi, 500 One Jackson Place, 188 E. Capital Street, Jackson, Mississippi 39201 (601-955-4480), shall send to the City a calculation of the interest due for the second, third and fourth installment payment. The City may pay any installment payment prior to the due date, but must contact the FLU in advance for a determination regarding the amount of interest to be included with the payment. In the event any installment payment includes an overpayment, the amount of the overpayment shall be applied to the remaining principal.

46. The City shall pay to the United States sixty percent (60%) of each installment of the civil penalty plus any interest due by FedWire Electronic Funds Transfer ("EFT") to the U.S. Department of Justice in accordance with written instructions to be provided to the City by the FLU. At the time of payment, the City shall send a copy of the EFT authorization form and the EFT transaction record, together with a transmittal letter, which shall state that the payment is for the civil penalty owed pursuant to the Consent Decree in United States et al. v. City of Jackson, and shall reference the civil action number and DOJ case number 90-5-1-1-09841, to the United States in accordance with Section XVI of this Decree (Notices); by email to acctsreceivable.CINWD@epa.gov; and by mail to:

EPA Cincinnati Finance Office
26 Martin Luther King Drive
Cincinnati, Ohio 45268.

In the event that full cash payment of any installment to the United States is not made within the due date for such installment, the City shall also pay to the United States interest on the balance

due from the original due date to the date of payment, at the rate calculated pursuant to 28 U.S.C. § 1961.

47. The City shall pay to the State forty percent (40%) of each installment of the civil penalty plus any interest due by check payable to the "Mississippi Department of Environmental Quality." Each check shall reference the case name and civil action number herein and shall be sent to:

Mississippi Department of Environmental Quality
Attn: Mona Varner
P. O. Box 2329
Jackson, Mississippi 39225

VIII. SUPPLEMENTAL ENVIRONMENTAL PROJECT

48. The City shall satisfactorily implement and complete a Supplemental Environmental Project ("SEP") in accordance with all provisions of Appendix F of this Consent Decree. The SEP shall be completed in accordance with the schedule set forth in Appendix F.

49. As more particularly described in Appendix F, the SEP shall consist of projects to reduce extraneous flows entering the WCTS through defective private laterals and through illicit connections from residential properties the owners of which face financial hardship. The City may use contractors or consultants in planning and implementing the SEP.

50. With regard to the SEP, the City certifies the truth and accuracy of each of the following:

(a) That all cost information provided to EPA in connection with EPA's approval of the SEP is complete and accurate and that the City in good faith estimates that the cost to implement the SEP is $875,000.

(b) That, as of the date of executing this Consent Decree, the City is not required to perform or develop the SEP by any federal, state, or local law or regulation and is not required to perform or develop the SEP by agreement, grant, or as injunctive relief awarded in any other action in any forum.

(c) That the SEP is not a project that the City was planning or intending to construct, perform, or implement other than in settlement of the claims resolved in this Consent Decree.

(d) That the City has not received and will not receive credit for the SEP in any other enforcement action.

(e) That the City will not receive any reimbursement for any portion of the SEP from any other person.

(f) That the City is not a party to any open federal financial assistance transaction that is funding or could be used to fund the same activity as the SEP, and that, to the best of its knowledge and belief after reasonable inquiry, there is no such open federal financial transaction that is funding or could be used to fund the same activity as the SEP, nor has the same activity been described in an unsuccessful federal financial assistance transaction proposal submitted to EPA within two (2) years of the date of this settlement (unless the project was barred from funding as statutorily ineligible). For the purposes of this certification, the term "open federal financial assistance transaction" refers to a grant, cooperative agreement, loan, federally-guaranteed loan guarantee or other mechanism for providing federal financial assistance whose performance period has not yet expired.

51. SEP Completion Report. Within thirty (30) Days after the date set for completion of the SEP, the City shall submit a SEP Completion Report to EPA for review and approval. The SEP Completion Report shall contain all of the following information:

(a) A detailed description of the SEP as implemented.

(b) A description of any problems encountered in completing the SEP and the solutions thereto.

(c) An itemized list of all eligible SEP costs expended.

(d) Certification that the SEP has been fully implemented pursuant to the provisions of this Consent Decree.

(e) A description of the environmental and public health benefits resulting from implementation of the SEP (with a quantification of the benefits and pollutant reductions, if feasible).

52. EPA may, in its sole discretion, require information in addition to that described in the preceding Paragraph, in order to evaluate the City's SEP Completion Report.

53. After receiving the SEP Completion Report, EPA shall notify the City whether or not the City has satisfactorily completed the SEP. If the City has not completed the SEP in accordance with this Consent Decree, stipulated penalties may be assessed under Section X of this Consent Decree.

54. Disputes concerning the satisfactory performance of the SEP and the amount of eligible SEP costs may be resolved under Section XII of this Decree (Dispute Resolution). No other disputes arising under this Section shall be subject to Dispute Resolution.

55. Each submission required under this Section shall be signed by an official with knowledge of the SEP and shall bear the certification language set forth in Paragraph 16.

56. Any public statement, oral or written, in print, film, or other media, made by the City making reference to the SEP under this Consent Decree shall include the following language: "This project was undertaken in connection with the settlement of an enforcement action, United States et al. v. City of Jackson, taken on behalf of the U.S. Environmental Protection Agency and the Mississippi Department of Environmental Quality under the Clean Water Act and the Mississippi Air and Water Pollution Control Law."

IX. REPORTING REQUIREMENTS

57. The City shall submit the following reports:

(a) Quarterly Reports. Beginning thirty (30) Days after the first full three (3) month period following the Date of Entry of this Consent Decree, and thirty (30) Days after each subsequent three (3)-month period thereafter until termination of the Consent Decree, the City shall submit to EPA for review and approval a Quarterly Report that shall include the following:

(i) the date, time, location, source, estimated duration, estimated volume, receiving water (if any), and cause of all SSOs occurring in the applicable three (3)-month period in a tabulated electronic format; and

(ii) the date, time, estimated duration, estimated volume, and cause of all Prohibited Bypasses occurring in the applicable three (3)-month period in a tabulated electronic format.

(b) Semi-Annual Reports. Beginning thirty (30) Days after the first full six (6)-month period following the Date of Entry of this Consent Decree, and thirty (30) Days after

each subsequent six (6)-month period until termination of the Consent Decree, the City shall submit to EPA for review and approval a Semi-Annual Report. Each Semi-Annual Report shall include, at a minimum:

(i) A description of projects and activities completed and milestones achieved during the previous applicable six (6)-month period pursuant to the requirements of this Consent Decree, in Gantt chart or similar format, including a description of the status of compliance or non-compliance with the requirements of this Consent Decree and, if applicable, the reasons for non-compliance. If any non-compliance cannot be fully explained at the time the report is due, the City shall include a statement to that effect in the report. The City shall investigate to determine the cause of the non-compliance and then shall submit an amendment to the report, including a full explanation of the cause of the non-compliance, within thirty (30) Days after submission of the Semi-Annual Report.

(ii) A summary of significant projects and activities anticipated to be performed, and milestones anticipated to be achieved, in the successive applicable six (6)-month period to comply with the requirements of this Consent Decree, in Gantt chart or similar format.

(iii) Any additional information the City determines is appropriate to demonstrate that the City is implementing the remedial actions required under this Consent Decree in an adequate and timely manner.

(c) Annual Reports. Beginning sixty (60) Days after the first full twelve (12)-month period following the Date of Entry of this Consent Decree, and sixty (60) Days after each subsequent twelve (12)-month period until termination of this Consent Decree, the City shall

submit to EPA for review and approval an Annual Report. Each Annual Report shall cover the most recent applicable twelve (12)-month period and shall include, at a minimum:

(i) A summary of the CMOM Programs implemented or modified pursuant to this Consent Decree, including a comparison of actual performance with any performance measures that have been established.

(ii) A trends analysis of the number, volume, duration, and cause of the City's SSOs for a twenty-four (24)-month period updated to reflect the SSOs that occurred during the previous twelve (12)-month period except that the first Annual Report shall only include the first twelve (12) months.

(iii) A trends analysis of the number, volume, duration, and cause of all Prohibited Bypasses for a twenty-four (24)-month period updated to reflect the Prohibited Bypasses that occurred during the previous twelve (12)-month period except that the first Annual Report shall only include the first twelve (12) months.

58. Whenever any violation of this Consent Decree or any other event affecting the City's performance under this Consent Decree or its NPDES Permits may pose an immediate threat to the public health or welfare or the environment, the City shall notify EPA and MDEQ orally or by electronic or facsimile transmission as soon as possible, but no later than twenty-four (24) hours after the City first knew of the violation or event. This procedure is in addition to the requirements set forth in the preceding Paragraph.

59. All reports shall be submitted to the persons designated in Section XVI of this Consent Decree (Notices).

60. Each report by the City under this Section shall be submitted in accordance with the provisions of Paragraph 16 of this Consent Decree. The certification requirement in Paragraph 16 does not apply to emergency or similar notifications where compliance would be impractical.

61. The reporting requirements of this Consent Decree do not relieve the City of any reporting obligations required by the CWA or its implementing regulations, the Mississippi Air and Water Pollution Control Law or its implementing regulations, or by any other federal, state, or local law, regulation, permit, or other requirement. Notification to EPA or MDEQ pursuant to this Section of an anticipated delay shall not by itself excuse the delay or otherwise satisfy the notification requirements set forth in Section XI (Force Majeure).

62. Any information provided pursuant to this Consent Decree may be used by the United States or the State in any proceeding to enforce the provisions of this Consent Decree and as otherwise permitted by law.

X. STIPULATED PENALTIES

63. The City shall be liable for stipulated penalties to the United States and the State for violations of this Consent Decree as specified below, unless excused under Section XI (Force Majeure). A violation includes failing to perform any obligation required by the terms of this Consent Decree, including any work plan or schedule approved under this Consent Decree, according to all applicable requirements of this Consent Decree and within the specified time schedules established by or approved under this Consent Decree.

64. If the City fails to pay the civil penalty required to be paid under Section VII of this Decree (Civil Penalty) when due, the City shall pay a stipulated penalty of $1,000 per day for each day that the payment is late.

65. The following stipulated penalties shall accrue for each violation identified below:

(a) SSOs Reaching Waters. For each SSO that reaches waters of the United States or the State, a stipulated penalty may be assessed as follows:

If SSO Occurs:	Penalty Per SSO Per Day:
Within 7 years from Date of Entry	$ 500
7 years or more from Date of Entry but before 10 years from Date of Entry	$1,000
10 years or more from Date of Entry	$2,000

(b) Prohibited Bypasses. For each Prohibited Bypass, a stipulated penalty may be assessed as follows:

If Prohibited Bypass Occurs:	Penalty Per Prohibited Bypass:
After April 30, 2014 but before 7 years from Date of Entry	$1,000
7 years or more from Date of Entry	$10,000

(c) Failure to Timely Submit Deliverable. For each day the City fails to Timely submit any Deliverable, a stipulated penalty for each such Deliverable may be assessed as follows:

Period of Noncompliance:	Penalty Per Deliverable Per Day:
1-30 days	$500
More than 30 days	$2,000

(d) Failure to Timely Implement Work. For each day the City fails to Timely implement any Work (other than work pursuant to the MDEQ Agreed Orders I and II or the Timely submittal of a Deliverable or the implementation of the SEP), daily stipulated penalties may be assessed for each such item of Work as follows:

Period of Noncompliance:	Penalty Per Violation Per Day:
1 - 30 days	$500
31 - 60 days	$1,000
61-180 days	$2,000
More than 180 days	$5,000

(e) Failure to Timely Implement SEP Milestones. For each Day the City fails to Timely implement a SEP milestone set forth in Section VIII or Appendix F, daily stipulated penalties may be assessed as follows:

Period of Noncompliance:	Penalty Per Violation Per Day:
1 - 30 days	$500
More than 30 days	$1,000

(f) Failure to Complete the SEP. After receiving the SEP Completion Report, in the event EPA notifies the City that the City has failed to satisfactorily complete the SEP in accordance with the terms of this Consent Decree as described in Section VIII and Appendix F (including the allowable expenditures for the SEP), a stipulated penalty of $375,000 may be

assessed if the City cannot certify, with supporting documentation, that at least fifty (50) percent of the required amount of money has been spent on the SEP; and a stipulated penalty of $300,000 may be assessed if the City has certified, with supporting documentation, that at least fifty (50) percent of the required amount of money has been spent on the SEP. Notwithstanding the foregoing, if EPA determines that the City has made good faith efforts to satisfactorily complete the SEP and has certified, with supporting documentation, that at least ninety (90) percent of the required amount of money has been spent on the SEP, the City shall not be liable for any stipulated penalty.

(g) Failure to Remove Sludge from the Savanna Street WWTP Storm Diversion Cells. For each Day the City fails to Timely remove sludge from the Savanna Street WWTP storm diversion cells in accordance with the schedule required by the MDEQ Agreed Order I, a stipulated penalty of $100 per day may be assessed.

(h) Failure to Comply with the MDEQ Agreed Order II. For each Day the City fails to Timely submit its compliance plan or, once that plan is implemented, to meet the ammonia limits for the Presidential Hills WWTP as set forth in the MDEQ Agreed Order II, a stipulated penalty of $100 per day may be assessed.

66. Stipulated penalties under this Section shall begin to accrue on the day after performance is due or on the day a violation occurs, whichever is applicable, and shall continue to accrue until performance is satisfactorily completed or until the violation ceases. Stipulated penalties shall accrue simultaneously for separate violations of this Consent Decree.

67. For stipulated penalties set forth in Paragraphs 64 and 65.(a) through (f), the City shall pay stipulated penalties to the United States and the State within sixty (60) Days of a

written demand by EPA. For stipulated penalties set forth in Paragraphs 64 and 65.(a) through (f), the City shall pay fifty percent (50%) of the total stipulated penalty amount due to the United States and fifty percent (50%) to the State. For stipulated penalties set forth in Paragraphs 65.(g) and (h), the City shall pay stipulated penalties to the State within sixty (60) Days of a written demand by MDEQ.

68. The United States may in the unreviewable exercise of its discretion, reduce or waive stipulated penalties otherwise due under this Consent Decree pursuant to Paragraphs 64 and 65.(a) through (f). MDEQ may in the unreviewable exercise of its discretion, reduce or waive stipulated penalties otherwise due under this Consent Decree pursuant to Paragraphs 65.(g) through (h).

69. Stipulated penalties shall continue to accrue as provided in Paragraph 66, during any Dispute Resolution, but need not be paid until the following:

(a) If the dispute is resolved by agreement or by a decision of the United States, after consultation with the State, that is not appealed to the Court, the City shall pay all accrued penalties determined to be owing, together with interest, within thirty (30) Days of the effective date of the agreement or the receipt of the United States' decision or order.

(b) If the dispute is appealed to the Court and the United States prevails in whole or in part, the City shall pay all accrued penalties determined by the Court to be owed, together with interest, within sixty (60) Days of receiving the Court's decision or order, except as provided in Paragraph 69.(c) below.

(c) If the District Court's decision is appealed, the City shall pay all accrued penalties determined to be owed, together with interest, within fifteen (15) Days of receiving the final appellate court decision.

70. The City shall pay stipulated penalties owing to the United States in the manner set forth and with the confirmation notices required by Paragraph 46, except that the transmittal letter shall state that the payment is for stipulated penalties and shall state for which violation(s) the penalties are being paid. The City shall pay stipulated penalties owing to the State in the manner set forth in Paragraph 47.

71. If the City fails to pay stipulated penalties according to the terms of this Consent Decree, the City shall be liable for interest on such penalties, as provided for in 28 U.S.C. § 1961, accruing as of the date payment became due. Nothing in this Paragraph shall be construed to limit the United States or the State from seeking any remedy otherwise provided by law for the City's failure to pay any stipulated penalties.

72. Subject to the provisions of Section XIV of this Consent Decree (Effect of Settlement/Reservation of Rights), the stipulated penalties provided for in this Consent Decree shall be in addition to any other rights, remedies, or sanctions available to the United States and the State for the City's violation of this Consent Decree or applicable law; provided, however, the State agrees that is shall only assess stipulated penalties for those matters addressed in Paragraphs 65.(g) through (h) pursuant to either this Consent Decree or the MDEQ Agreed Orders I and II, but not both.

XI. FORCE MAJEURE

73. "Force majeure," for purposes of this Consent Decree, is defined as any event arising from causes beyond the control of the City, of any entity controlled by the City, or of the City's consultants and contractors, that delays or prevents the performance of any obligation under this Consent Decree despite the City's best efforts to fulfill the obligation. The requirement that the City exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any such event (a) as it is occurring and (b) after it has occurred to prevent or minimize any resulting delay to the greatest extent possible. "Force Majeure" does not include the City's financial inability to perform any obligation under this Consent Decree.

74. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a force majeure event, the City shall provide notice orally or by electronic or facsimile transmission to EPA and MDEQ, within seventy-two (72) hours of when the City first knew that the event might cause a delay. Within seven (7) Days thereafter, the City shall provide in writing to EPA and MDEQ an explanation and description of the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for implementation of any measures to be taken to prevent or mitigate the delay or the effect of the delay; the City's rationale for attributing such delay to a force majeure event if it intends to assert such a claim; and a statement as to whether, in the opinion of the City, such event may cause or contribute to an endangerment to public health, welfare, or the environment. The City shall include with any notice all available documentation supporting the claim that the delay was attributable to a force

majeure event. Failure to comply with the above requirements shall preclude the City from asserting any claim of force majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. The City shall be deemed to know of any circumstance of which the City, any entity controlled by the City, or the City's contractors knew or should have known.

75. If EPA, after a reasonable opportunity for review and comment by MDEQ, agrees that the delay or anticipated delay is attributable to a force majeure event, the time for performance of the obligations under this Consent Decree that are affected by the force majeure event will be extended by EPA, after a reasonable opportunity for review and comment by MDEQ, for such time as is necessary to complete those obligations. An extension of the time for performance of the obligations affected by the force majeure event shall not, of itself, extend the time for performance of any other obligation. EPA will notify the City in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure event.

76. If EPA, after a reasonable opportunity for review and comment by MDEQ, does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, EPA will notify the City in writing of its decision.

77. If the City elects to invoke the dispute resolution procedures set forth in Section XII (Dispute Resolution), it shall do so no later than fifteen (15) Days after receipt of EPA's notice. In any such proceeding, the City shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event, that the duration of the delay or the extension sought was or will be warranted under the circumstances, that best efforts were exercised to avoid and mitigate the

effects of the delay, and that the City complied with the requirements of Paragraphs 73 and 74 above. If the City carries this burden, the delay at issue shall be deemed not to be a violation by the City of the affected obligation of this Consent Decree identified to EPA and the Court.

XII. DISPUTE RESOLUTION

78. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree. The City's failure to seek resolution of a dispute under this Section shall preclude the City from raising any such issue as a defense to an action by the United States or the State to enforce any obligation of the City arising under this Consent Decree.

79. Informal Dispute Resolution. Any dispute subject to Dispute Resolution under this Consent Decree shall first be the subject of informal negotiations. The dispute shall be considered to have arisen when the City sends the United States a written Notice of Dispute. Such Notice of Dispute shall state clearly the matter in dispute. The period of informal negotiations shall not exceed twenty (20) Days from the date the dispute arises, unless that period is modified by written agreement between the United States and the City. The United States shall consult with the State during the period of informal negotiations. If the United States and the City cannot resolve a dispute by informal negotiations, then the position advanced by the United States shall be considered binding unless, within forty-five (45) Days after the conclusion of the informal negotiation period, the City invokes formal dispute resolution procedures as set forth below.

80. Formal Dispute Resolution. The City shall invoke formal dispute resolution procedures, within the time period provided in the preceding Paragraph, by serving on the United States and the State a written Statement of Position regarding the matter in dispute. The Statement of Position shall include, but need not be limited to, any factual data, analysis, or opinion supporting the City's position and any supporting documentation relied upon by the City. The United States shall serve its Statement of Position within ninety (90) Days of receipt of the City's Statement of Position. The United States' Statement of Position shall include, but need not be limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the United States. The United States shall consult with the State during preparation of its Statement of Position. The United States' Statement of Position shall be binding on the City, unless the City files a motion for judicial review of the dispute in accordance with the following Paragraph.

81. Judicial Dispute Resolution. The City may seek judicial review of the dispute by filing with the Court and serving on the United States and the State, in accordance with Section XVI of this Consent Decree (Notices), a motion requesting judicial resolution of the dispute. The motion must be filed within ten (10) Days of receipt of the United States' Statement of Position pursuant to the preceding Paragraph. The motion shall contain a written statement of the City's position on the matter in dispute, including any supporting factual data, analysis, opinion, or documentation, and shall set forth the relief requested and any schedule within which the dispute must be resolved for orderly implementation of the Consent Decree. The United States shall respond to the City's motion within the time period allowed by the Local Rules of

this Court. The United States shall consult with the State during preparation of its response. The City may file a reply memorandum, to the extent permitted by the Local Rules.

82. Standard of Review.

a. Disputes Concerning Matters Accorded Record Review. Except as otherwise provided in this Consent Decree, in any dispute brought under Paragraphs 80 and 81 pertaining to the adequacy or appropriateness of plans, procedures to implement plans, schedules or any other items requiring approval by EPA under this Consent Decree; the adequacy of the performance of work undertaken pursuant to this Consent Decree; and all other disputes that are accorded review on the administrative record under applicable principles of administrative law, the City shall have the burden of demonstrating, based on the administrative record, that the position of the United States is arbitrary and capricious or otherwise not in accordance with law.

b. Other Disputes. Except as otherwise provided in this Consent Decree, in any other dispute brought under Paragraphs 80 and 81, the City shall bear the burden of demonstrating that its position complies with this Consent Decree and furthers the objectives of the Consent Decree.

83. The invocation of dispute resolution procedures under this Section shall not, by itself, extend, postpone, or affect in any way any obligation of the City under this Consent Decree, unless and until final resolution of the dispute so provides. Stipulated penalties with respect to the disputed matter shall continue to accrue from the first day of noncompliance, but payment shall be stayed pending resolution of the dispute as provided in Paragraph 69. If the City does not prevail on the disputed issue, stipulated penalties shall be assessed and paid as provided in Section X (Stipulated Penalties).

XIII. RIGHT OF ENTRY AND INFORMATION COLLECTION AND RETENTION

84. The United States, the State, and their representatives, including attorneys, contractors, and consultants, shall have the right of entry into any facility covered by this Consent Decree, at all reasonable times, upon presentation of credentials, to:

(a) Monitor the progress of activities required under this Consent Decree.

(b) Verify any data or information submitted to the United States or the State in accordance with the terms of this Consent Decree.

(c) Obtain samples and, upon request, splits of any samples taken by the City or its representatives, contractors, or consultants.

(d) Obtain documentary evidence, including photographs and similar data.

(e) Assess the City's compliance with this Consent Decree.

85. Upon request, the City shall provide EPA and MDEQ or their authorized representatives splits of any samples taken by the City. Upon request, EPA and MDEQ shall provide the City splits of any samples taken by EPA or MDEQ.

86. Until five (5) years after the termination of this Consent Decree, the City shall retain, and shall instruct its contractors and agents to preserve, all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or its contractors' or agents' possession or control, or that come into its or its contractors' or agents' possession or control, and that relate in any manner to the City's performance of its obligations under this Consent Decree. This information-retention requirement shall apply regardless of any contrary corporate or institutional policies or procedures. At any time during this information-retention period, upon request by the United

States or the State, the City shall provide copies of any documents, records, or other information required to be maintained under this Paragraph.

87. At the conclusion of the information-retention period provided in the preceding Paragraph, the City shall notify the United States and the State at least ninety (90) Days prior to the destruction of any documents, records, or other information subject to the requirements of the preceding Paragraph and, upon request by the United States or the State, the City shall deliver any such documents, records, or other information to EPA or MDEQ. The City may assert that certain documents, records, or other information is privileged under the attorney-client privilege or any other privilege recognized by federal law. If the City asserts such a privilege, it shall provide the following:

(a) The title of the document, record, or information.

(b) The date of the document, record, or information.

(c) The name and title of each author of the document, record, or information.

(d) The name and title of each addressee and recipient.

(e) A description of the subject of the document, record, or information.

(f) The privilege asserted by the City.

However, no documents, records, or other information created or generated pursuant to the requirements of this Consent Decree shall be withheld on grounds of privilege.

88. The City may also assert that information required to be provided under this Section is protected as Confidential Business Information ("CBI") under 40 C.F.R. Part 2. As to any information that the City seeks to protect as CBI, the City shall follow the procedures set forth in 40 C.F.R. Part 2.

89. This Consent Decree in no way limits or affects any right of entry and inspection, or any right to obtain information, held by the United States or the State pursuant to applicable federal or state laws, regulations, or permits, nor does it limit or affect any duty or obligation of the City to maintain documents, records, or other information imposed by applicable federal or state laws, regulations, or permits.

XIV. EFFECT OF SETTLEMENT/RESERVATION OF RIGHTS

90. This Consent Decree resolves the civil claims of the United States and the State for the violations alleged in the Complaint filed in this action through the Date of Lodging of this Consent Decree.

91. The United States and the State reserve all legal and equitable remedies available to enforce the provisions of this Consent Decree, except as expressly stated in Paragraph 90. This Consent Decree shall not be construed to limit the rights of the United States or the State to obtain penalties or injunctive relief under the CWA, the Mississippi Air and Water Pollution Control Law, or their implementing regulations, or under other federal or state laws, regulations, or permit conditions, except as expressly specified in Paragraph 90. The United States and the State further reserve all legal and equitable remedies to address any imminent and substantial endangerment to the public health or welfare or the environment arising at, or posed by, the City's Sewer System, whether related to the violations addressed in this Consent Decree or otherwise.

92. In any subsequent administrative or judicial proceeding initiated by the United States or the State for injunctive relief, civil penalties, other appropriate relief relating to the Sewer System or the City's violations, the City shall not assert, and may not maintain, any

defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States or the State in the subsequent proceeding were or should have been brought in the instant case, except with respect to claims that have been specifically resolved pursuant to Paragraph 90 of this Section.

93. This Consent Decree is not a permit, or a modification of any permit, under any federal, State, or local laws or regulations. The City is responsible for achieving and maintaining complete compliance with all applicable federal, State, and local laws, regulations, and permits; and the City's compliance with this Consent Decree shall be no defense to any action commenced pursuant to any such laws, regulations, or permits, except as set forth herein. The United States and the State do not, by their consent to the entry of this Consent Decree, warrant or aver in any manner that the City's compliance with any aspect of this Consent Decree will result in compliance with provisions of the CWA, the Mississippi Air and Water Pollution Control Law, or with any other provisions of federal, State, or local laws, regulations, or permits.

94. This Consent Decree does not limit or affect the rights of the City or of the United States or the State against any third parties, not party to this Consent Decree, nor does it limit the rights of third parties, not party to this Consent Decree, against the City, except as otherwise provided by law.

95. This Consent Decree shall not be construed to create rights in, or grant any cause of action to, any third party not party to this Consent Decree.

XV. COSTS

96. The Parties shall bear their own costs of this action, including attorneys' fees, except that the United States and the State shall be entitled to collect the costs (including attorneys' fees) incurred in any action necessary to collect any portion of the civil penalty or any stipulated penalties due but not paid by the City.

XVI. NOTICES

97. Unless otherwise specified herein, whenever notifications, submissions, or communications are required by this Consent Decree, they shall be made in writing and addressed as follows:

To the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
Box 7611 Ben Franklin Station
Washington, D.C. 20044-7611
Re: DOJ No. 90-5-1-1-09841

Karl Fingerhood
Environmental Enforcement Section
U.S. Department of Justice
Box 7611 Ben Franklin Station
Washington, D.C. 20044-7611

and

Chief, Clean Water Enforcement Branch
Water Protection Division
U.S Environmental Protection Agency, Region 4
ATTN: Brad Ammons
61 Forsyth Street, S.W.
Atlanta, GA 30303
(404) 562-9769

To EPA:

Chief, Clean Water Enforcement Branch
Water Protection Division
U.S Environmental Protection Agency, Region 4
ATTN: Brad Ammons
61 Forsyth Street, S.W.
Atlanta, GA 30303
(404) 562-9769

To the State/MDEQ

Chief, Environmental Compliance and Enforcement Division
Office of Pollution Control
Mississippi Department of Environmental Quality
ATTN: Rusty Lyons
P.O. Box 2261
Jackson, MS 39225-2261
(901) 961-5588

To the City:

Mayor
City of Jackson, Mississippi
ATTN: Harvey Johnson, Jr., Mayor
P.O. Box 17
Jackson, MS 39205-0017
(601) 960-1084

Director, Department of Public Works
City of Jackson, Mississippi
ATTN: Dan Gaillet, P.E.
P.O. Box 17
Jackson, MS 39205-0017
(601) 960-2091

98. Any Party may, by written notice to the other Parties, change its designated notice recipient or notice address provided above.

99. Notices submitted pursuant to this Section shall be deemed submitted upon mailing, unless otherwise provided in this Consent Decree or by mutual agreement of the Parties in writing.

XVII. EFFECTIVE DATE

100. The Effective Date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court or a motion to enter the Consent Decree is granted, whichever occurs first, as recorded on the Court's docket.

XVIII. RETENTION OF JURISDICTION

101. The Court shall retain jurisdiction over this case until termination of this Consent Decree, for the purpose of resolving disputes arising under this Consent Decree or entering orders modifying this Consent Decree, pursuant to Sections XII and XIX, or effectuating or enforcing compliance with the terms of this Consent Decree.

XIX. MODIFICATION

102. The terms of this Consent Decree, including any attached appendices, may be modified only by a subsequent written agreement signed by all the Parties. Other than a modification made pursuant to Paragraph 72 (Force Majeure), when the modification constitutes a material change to this Decree, it shall be effective only upon approval by the Court. Non-material changes to this Consent Decree (including appendices) may be made by written agreement of the Parties without Court approval, and the Parties may by mutual agreement determine whether a modification is non-material.

103. Any disputes between the United States, the State, and the City concerning modification of this Consent Decree shall be resolved pursuant to Section XII of this Consent

Decree (Dispute Resolution), provided, however, that, instead of the burden of proof provided by Paragraph 82, the Party seeking the modification bears the burden of demonstrating that it is entitled to the requested modification in accordance with Federal Rule of Civil Procedure 60(b).

XX. TERMINATION

104. This Consent Decree may be terminated when the United States determines that the City has satisfactorily completed performance of its compliance (Section VI) and SEP (Section VIII) obligations required by this Consent Decree, provided that the City has fulfilled all other obligations of this Consent Decree, including payment of the civil penalty under Section VII of this Consent Decree and any accrued stipulated penalties as required by Section X of this Consent Decree not waived or reduced by the United States. The City may serve upon the United States a Request for Termination, certifying that the City has satisfied those requirements, together with all necessary supporting documentation.

105. Following receipt by the United States of the City's Request for Termination, the United States and the City shall confer informally concerning the Request and any disagreement that they may have as to whether the City has satisfactorily complied with the requirements for termination of this Consent Decree. If the United States, after consultation with the State, agrees that the Consent Decree may be terminated, the United States and the City shall submit, for the Court's approval, a joint stipulation terminating the Consent Decree.

106. If the United States, after consultation with the State, does not agree that the Consent Decree may be terminated, the City may invoke Dispute Resolution under Section XII of this Consent Decree. However, the City shall not seek Dispute Resolution of any dispute

regarding termination, under Paragraph 80 of Section XII, until one hundred-twenty (120) Days after service of its Request for Termination.

XXI. PUBLIC PARTICIPATION

107. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) Days for public notice and comment in accordance with 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations indicating that the Consent Decree is inappropriate, improper, or inadequate. The City and the State each consent to entry of this Consent Decree without further notice and agrees not to withdraw from or oppose entry of this Consent Decree by the Court or to challenge any provision of the Consent Decree, unless the United States has notified the Parties in writing that it no longer supports entry of the Consent Decree.

XXII. SIGNATORIES/SERVICE

108. Each undersigned representative of the City, EPA, the Assistant Attorney General for the Environment and Natural Resources Division of the Department of Justice, MDEQ, and the State certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind the Party he or she represents to this document.

109. This Consent Decree may be signed in counterparts, and its validity shall not be challenged on that basis. The City agrees to accept service of process by mail with respect to all matters arising under or relating to this Consent Decree and to waive the formal service requirements set forth in Rules 4 and 5 of the Federal Rules of Civil Procedure and any applicable Local Rules of this Court including, but not limited to, service of a summons.

XXIII. INTEGRATION

110. This Consent Decree constitutes the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in the Consent Decree and supersedes all prior agreements and understandings, whether oral or written, concerning the settlement embodied herein. Other than Deliverables that are subsequently submitted and approved pursuant to this Consent Decree, no other document, nor any representation, inducement, agreement, understanding, or promise, constitutes any part of this Consent Decree or the settlement it represents, nor shall it be used in construing the terms of this Consent Decree.

XXIV. FINAL JUDGMENT

111. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a final judgment of the Court as to the United States, the State, and the City. The Court finds that there is no just reason for delay and therefore enters this judgment as a final judgment under Fed. R. Civ. P. 54 and 58.

XXV. APPENDICES

112. The following appendices are attached to and incorporated into this Consent Decree:

"Appendix A" is the MDEQ Agreed Order I entered into by MDEQ and the City on September 10, 2010, as amended.

"Appendix B" is the MDEQ Agreed Order II entered into by MDEQ and the City on August 23, 2011.

"Appendix C" is a map of the Sewersheds compromising the City's WCTS.

"Appendix D" is the CDROM disk containing EPA Region IV guidance on Capacity, Management, Operations and Maintenance ("CMOM") programs.

"Appendix E" is the City's SORP.

"Appendix F" is the Supplemental Environmental Project.

Dated and entered this __ day of _____, 20__.

_____
UNITED STATES DISTRICT JUDGE
Southern District of Mississippi

WE HEREBY CONSENT to the entry of this Consent Decree, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR PLAINTIFF UNITED STATES OF AMERICA:

[redacted]

IGNACIA S. MORENO
Assistant Attorney General
U.S. Department of Justice
Environment and Natural Resources Division

[redacted]

KARL J. FINGERHOOD
Trial Attorney
U.S. Department of Justice
Environment and Natural Resources Division
Environmental Enforcement Section
P.O. Box 7611
Ben Franklin Station
Washington, D.C. 20044-7611
Telephone: 202-514-7519
Facsimile: 202-616-2427

WE HEREBY CONSENT to the entry of this Consent Decree, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR PLAINTIFF UNITED STATES OF AMERICA (Continued):

GREGORY K. DAVIS
United States Attorney
Southern District of Mississippi

SAMUEL LYNN MURRAY (MS Bar ID No. 3690)
Assistant U.S. Attorney
Southern District of Mississippi
501 E. Court St., Suite 4.430
Jackson, MS 39201
Telephone: (601) 973-2853
Fascimile: (601) 965-4023

WE HEREBY CONSENT to the entry of this Consent Decree, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR PLAINTIFF UNITED STATES OF AMERICA (Continued):

[redacted]

MARY J. WILKES
Regional Counsel
United States Environmental Protection Agency
Region 4
61 Forsyth Street
Atlanta, GA 30303

[redacted]

WILLIAM B. BUSH, JR.
Associate Regional Counsel
United States Environmental Protection Agency
Region 4
61 Forsyth Street
Atlanta, GA 30303
Telephone: 404-562-9538
Facsimile: 404-562-9487

WE HEREBY CONSENT to the entry of this Consent Decree, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR PLAINTIFF UNITED STATES OF AMERICA (Continued):

[redacted]

PAMELA J. MAZAKAS
Acting Office Director
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
United States Environmental Protection Agency

[redacted]

MARK POLLINS
Division Director
Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
United States Environmental Protection Agency

[redacted]

CAROL DEMARCO
Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
United States Environmental Protection Agency
1200 Pennsylvania Ave., NW (2243A)
Washington, DC 20460
Telephone: 202-564-2412
Facsimile: 202-564-0024

FOR PLAINTIFF STATE OF MISSISSIPPI BY AND THROUGH THE MISSISSIPPI COMMISSION ON ENVIRONMENTAL QUALITY AND THE MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY:

[redacted]

TRUDY D. FISHER
Executive Director
Mississippi Department of Environmental Quality
P.O. Box 2261
Jackson, MS 39225

[redacted]

CHRISTOPHER G. WELLS
Senior Attorney
Office of Pollution Control
Mississippi Department of Environmental Quality
P.O. Box 2261
Jackson, MS 39225
Telephone: 601-961-5545
Facsimile: 601-961-5674

FOR THE CITY OF JACKSON:

[redacted]

HARVEY JOHNSON, JR.
Mayor
City of Jackson, Mississippi
P.O. Box 17
Jackson, MS 39205-0017
Telephone: 601-960-1084
Facsimile: 601-960-2504

[redacted]

PIETER TEEUWISSEN
City Attorney
Office of the City Attorney
P.O. Box 2779
Jackson, MS 39205-2779
Telephone: 601-960-1799
Facsimile: 601-960-1756

[redacted]

TERRELL S. WILLIAMSON
Legal Counsel
Office of the City Attorney
P.O. Box 2779
Jackson, MS 39205-2779
Telephone: 601-960-1799
Facsimile: 601-960-1756

APPENDIX A

BEFORE THE MISSISSIPPI COMMISSION
ON ENVIRONMENTAL QUALITY

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

COMPLAINANT

VS.

ORDER NO. 5823 10

CITY OF JACKSON
PO BOX 17
JACKSON, MISSISSIPPI 39205-0017

RESPONDENT

AGREED ORDER

COME NOW the Mississippi Commission on Environmental Quality ("Commission"), acting through the staff and Executive Director of the Mississippi Department of Environmental Quality ("MDEQ"), Complainant, and the City of Jackson, Respondent, in the above captioned cause and agree as follows:

1.

This Agreed Order addresses the following violations relating to Respondent's Savannah Street Waste Water Treatment Facility (the "SSWWTF") and its associated collection system:

A. On March 21, 2009, a 100 million gallon per day ("MGD") influent pump failed at the SSWWTF. On March 27, 2009, discharges of untreated wastewater were observed from manholes located near the State Fairgrounds, the east end of High Street, and at Eubanks Creek near I-55 as a result of such wastewater backing up into the collection system due to the pump failure. On March 30, 2009, Respondent notified Complainant of these discharges that occurred as a result of a 100 MGD pump failure. Water samples taken on April 2, 2009 from the Pearl River indicated that impacts, as a result of the discharges, violated water quality

standards. Respondent was contacted by Complainant on April 20, 2009, and notified that these discharges constituted violations of NPDES Permit No. MS0024295 (the "Permit) (see Conditions T-24: Proper Operation, Maintenance, and Replacement, T-25: Duty to Mitigate, and T-30: Bypassing- Prohibition of Bypass.)

B. On July 22, 2009, MDEQ staff observed Respondent diverting a portion of the SSWWTF's influent wastewater into the storm diversion cells located at the SSWWTF. On July 22, 2009, Respondent also released wastewater from the storm diversion cells and blended this flow into the main effluent from the SSWWTF. This blended flow was then discharged from the SSWWTF's Outfall 001. Respondent's actions were the result of the SSWWTF not having sufficient storage and/or treatment capacity to handle the volume of influent wastewater. The SSWWTF's storage and/or treatment capacity has been limited by the accumulation of excess sludge and solids in the storm diversion cells and in the aeration basins and secondary clarifiers within the SSWWTF as a result of, at least in part, Respondent's sludge handling facilities being unavailable to properly process the sludge and solids for disposal. This accumulation of sludge and thus this diversion of wastewater on July 22, 2009 constitutes a violation of the Permit (see Conditions T-24: Proper Operation, Maintenance, and Replacement and T-25: Duty to Mitigate).

C. Mississippi Code 49-17-29 prohibits the discharge of any wastes into any waters of the State which reduce the quality of those waters. Complainant notified Respondent of the following discharges within the collection system:

i. On August 11, 2009, MDEQ confirmed a discharge of untreated wastewater from a manhole located off Browning Street near Clinton. The discharge continued several days following MDEQ notifying Respondent of the discharge. Water samples taken on August 20, 2009 from Bakers Creek indicated that impacts, as a result of the discharge, violated water quality standards.

ii. On August 24, 2009, MDEQ confirmed a discharge of untreated wastewater from a lift station near the Brookwood Subdivision in south Hinds

County. The discharge continued several days following MDEQ notifying Respondent of the discharge. Water samples taken on August 27, 2009 from an unnamed tributary entering Trahon Creek indicated that impacts, as a result of the discharge, violated water quality standards.

D. On June 24, 2009, Complainant notified Respondent that land application activities of wastewater treatment sludges had been conducted on properties without a current, valid permit in violation of Section II of the Mississippi Nonhazardous Waste Management Regulations. Further, Respondent failed to timely submit applications for permit reissuance for the Jackson Landfill, Parcel 2 and Parcel 3 Landfarm, Jackson Biosolids Beneficial Agricultural Application Sites, and the Berry Land Application Site in violation of Solid Waste Management Permit No. SW02501A0005, No. SW02501C0420, No. SW0250030464, and No. SW0250030468, respectively.

2.

In lieu of a formal enforcement hearing concerning the specific violation(s) listed above, Complainant and Respondent agree to settle this matter as follows:

A. Respondent agrees to pay and Complainant agrees to accept a civil penalty in the amount of $240,000.00. Respondent shall pay this penalty to MDEQ within thirty (30) days after this Agreed Order has been executed by the MDEQ Executive Director, or her designee (the "Effective Date").

B. On or before August 31, 2010, Respondent shall submit to MDEQ for approval a Sewer Overflow Response Plan ("SORP") that will establish timely and effective methods and means of: (a) responding to, cleaning up, and/or minimizing the impact of all sanitary sewer overflows ("SSOs"); (b) timely reporting the location, volume, cause, impact, and other pertinent information of all SSOs to the appropriate regulatory agencies; and (c) notifying the potentially impacted public.

i. For purposes of the SORP and this Agreed Order, the following definitions

shall apply:

(a) "SSO" shall mean an overflow, spill, or release of wastewater from Respondent's Sewer System including: (i) Unpermitted Discharges; (ii) any overflows, spills, or releases of wastewater, including those that may not have reached waters of the State or waters of the United States; and (iii) all Building Backups.

(b) "Unpermitted Discharge" shall mean a discharge of pollutants which reaches waters of the United States or the State from (i) the Sewer System, (ii) a Wastewater Treatment Plant ("WWTP") through a point source not specified in an NPDES Permit, or (iii) a WWTP which constitutes a prohibited Bypass.

(c) "Building Backup" shall mean a wastewater backup into a building that is caused by blockages, malfunctions, or flow conditions in the Sewer System. A wastewater backup into a building that is caused by a blockage or other malfunction of a Private Lateral is not a Building Backup.

(d) "Sewer System" shall mean the Wastewater Collection Transmission Systems ("WCTS") and the WWTPs.

(e) "Wastewater Collection and Transmission Systems" or "WCTS" shall mean the municipal wastewater collection and transmission systems, including all pipes, force mains, gravity sewer lines, lift stations, pump stations, manholes and appurtenances thereto, which are owned or operated by Respondent.

(f) "Wastewater Treatment Plant" or "WWTP" shall mean devices or systems used in the storage, treatment, recycling, and reclamation of municipal wastewater. For purposes of this Agreed Order, this definition shall include all facilities owned, managed, operated, and maintained by Respondent, including but not limited to the following facilities: Savanna Street WWTP, Trahon/Big Creek WWTP and Presidential Hills WWTP.

(g) "Bypass" shall have the meaning set forth at 40 C.F.R. § 122.41(m).

(h) "Private Lateral" shall mean that portion of a sanitary sewer conveyance pipe, including that portion in the public right of way, that extends from the wastewater main to the single-family, multi-family, apartment or other dwelling unit or commercial or industrial structure to which wastewater service is or has been provided.

ii. Within twenty-four (24) hours of the time Respondent first becomes aware of an SSO, Respondent shall provide in an oral report to MDEQ the location of the SSO by street address or any other appropriate method (i.e., latitude-longitude). The oral report shall be given to MDEQ's Environmental Compliance and Enforcement Division's Municipal and Private Facilites Branch at (601) 961- 5171.

iii. Respondent shall also provide a written report to MDEQ for all SSOs within 5 days of the time Respondent becomes aware of the SSO. Respondent shall maintain a copy of any written reports prepared pursuant to this subparagraph for a period of not less than five (5) years from the date of the SSO. The written report shall contain the following:

(a) Location of the SSO by street address, or any other appropriate method (i.e., latitude-longitude);

(b) Estimated date and time when the SSO began and stopped, or if it is still an active SSO, the anticipated time to stop the SSO;

(c) Steps taken to respond to the SSO;

(d) Name of the receiving water, if applicable;

(e) An estimate of the volume (in gallons) of sewage discharged;

(f) Description of the Sewer System component from which the SSO was released (such as manhole, crack in pipe, pump station wet well or constructed overflow pipe);

(g) Estimate of the SSO's impact on public health and to water quality in the receiving water body;

(h) Cause or suspected cause of the SSO;

(i) The date of the last SSO at the same location;

(j) Steps taken or to be taken to reduce, eliminate, and prevent reoccurrence of the SSO and a schedule of major milestones for those steps; and

(k) Report of all notifications to the public and other agencies or departments.

If submitted within 24 hours of the SSO, this written report may be submitted in lieu of providing oral notification as stated in 2.B.ii. above.

iv. Respondent shall maintain for all SSOs, for a period of not less than five (5) years from the date of the SSO, all records documenting the steps that have been and will be taken to prevent the SSO from recurring, including work order records associated with investigation and repair activities related to the SSO. Respondent shall also maintain for a period of not less than five (5) years from the date of the SSO a list and description of complaints from customers or others regarding an SSO.

v. The SORP shall provide procedures for responding to SSOs to minimize the environmental impact and potential human health risk of SSOs. The SORP shall include, but not be limited to, the following:

(a) A detailed description of the actions Respondent will undertake to immediately provide notice to the public (through the local news media or other means including signs or barricades to restrict access) of the SSO;

(b) A detailed description of the actions Respondent will undertake to provide notice to appropriate federal, state or local agencies/authorities;

(c) A detailed plan (including the development of response standard operating procedures) to minimize the volume of untreated wastewater transmitted to the portion of the Sewer System impacted by the events precipitating the SSO to minimize overflow volumes;

(d) For Building Backups, the SORP shall include a detailed plan describing the standard operating procedures to be followed by Respondent personnel in responding, including:

(1) A description of methods for communicating with customers about how to report Building Backups and how to obtain clean-up;

(2) A description of Respondent's response to Building Backups, including:

(A) The timeframe for responses;

(B) The measures taken to cleanup Building Backups caused by conditions in Respondent's Sewer System. Such measures shall include procedures necessary to disinfect and/or remove items potentially contaminated by Building Backups, and shall include wet vacuuming or other removal of spillage, wiping floors and walls with cleaning solution and disinfectant, flushing out and disinfecting plumbing fixtures, carpet cleaning and/or replacement and other appropriate measures to disinfect and/or remove items potentially contaminated by Building Backups; and

(C) The measures taken to correct or repair conditions in the Sewer System causing or contributing to Building Backups; and

(3) A description of Respondent's follow-up process to insure adequacy of cleanup.

(e) A detailed plan of the resources to be used to correct or repair the condition causing or contributing to the SSO;

(f) A plan to ensure the preparedness, including response training of Respondent's employees, contractors, and personnel of other affected agencies necessary for the effective implementation of the SORP in the event of a SSO;

(g) Identification of SSO locations within the sewershed served by each pump station and those locations at which a SSO is likely to occur first in the event of pump station failure for each pump station; and

(h) Pump station-specific emergency procedures, bypass/pump-around strategies, and estimated storage capacity (i.e., maximum volume of sewage that can be stored in the event of a pump station failure or repair without causing a SSO and estimated time during which sewage can be stored before a SSO will occur). In the event that a repair may cause or lengthen the time of a SSO, the SORP shall provide a procedure for determining when additional storage or pump around will be needed.

vi. Respondent shall provide adequate training necessary for its employees, contractors, and personnel of other affected agencies to effectively implement the SORP. The SORP shall provide training guidelines to ensure adequate response training is provided to management and field personnel responsible for responding to SSOs. Respondent shall establish procedures, and provide adequate training to response personnel for estimating volumes of wastewater released during SSOs.

vii. Respondent shall identify and include in the SORP a list of those SSO locations within the sewershed that has been recorded as overflowing more

than once in the past two (2) years and those locations at which a SSO is likely to occur first in the event of pump station failure for each pump station. Respondent shall establish routine inspection routes to be performed after each rain event. The inspection routes shall include all SSOs identified as occurring more than once in the past two (2) years and those pump stations that are not monitored at a central location via telemetry, SCADA, or other remote monitoring devise.

viii. Respondent acknowledges that the SORP to be implemented as a part of this Agreed Order may be deemed interim in nature despite being approved by MDEQ and, as a result, MDEQ and/or the United States Environmental Protection Agency may require additional measures to be included in the SORP.

C. On or before August 31, 2010, Respondent shall submit to MDEQ for approval a written plan to address the proper maintenance of all pumps in the influent pump station at the SSWWTF. This plan should also include a contingency plan to be implemented in the event of pumps in the pump station failing or otherwise being taken off line to ensure adequate influent flow into the SSWWTF.

D. On or before November 30, 2010, Respondent shall submit to MDEQ for approval a Sludge and Solids Removal Plan that shall provide for the removal and proper disposal of excess, accumulated sludge/solids from the SSWWTF's storm diversion cells. The Sludge and Solids Removal Plan shall identify the minimum amount of sludge/solids that are to remain in the storm diversion cells, so as to achieve the maximum design capacity of the storm diversion cells as certified by a Professional Engineer licensed in the State of Mississippi. The Sludge and Solids Removal Plan shall also include, at a minimum, a schedule for completion of removal and disposal activities not to exceed September 1, 2011. The plan shall take into account the flow during the sludge/solids removal so as to minimize the environmental impact of the removal process. The Plan shall provide for Respondent to demonstrate that the minimum amount of sludge to remain in the

storm diversion cells has been achieved using acceptable measuring techniques. The plan shall also address sludge management to include proper storage and proper disposal. After Respondent has commenced sludge/solids removal, the Plan shall also provide for Respondent to submit weekly Status Reports to MDEQ that shall include, at a minimum, the hours of sludge removal operations performed, the quantity of sludge/solids removed, any operational setbacks experienced (weather, equipment failure, etc.), and an analysis of Respondent's progress to complete work under the Plan on or before the September 1, 2011 deadline.

E. On or before November 30, 2010, Respondent shall submit to MDEQ for approval a Sludge and Solids Removal Plan that shall provide for the removal and proper disposal of excess, accumulated sludge/solids from the SSWWTF's aeration basins and secondary clarifiers within the SSWWTF. The Sludge and Solids Removal Plan shall identify the minimum amount of sludge/solids that are to remain in the aeration basins and the secondary clarifiers so as to achieve the maximum secondary treatment of all flow discharged from the SSWWTF as certified by a Professional Engineer licensed in the State of Mississippi. The Sludge and Solids Removal Plan shall also include, at a minimum, a schedule for completion of removal and disposal activities not to exceed March 31, 2011. The plan shall take into account the flow during the sludge/solids removal so as to minimize the environmental impact of the removal process. The Plan shall provide for Respondent to demonstrate that the minimum amount of sludge to remain in the aeration basins and the secondary clarifiers has been achieved using acceptable measuring techniques. The plan shall also address sludge management to include proper storage and proper disposal. After Respondent has commenced sludge/solids removal, the Plan shall also provide for Respondent to submit weekly Status Reports to MDEQ that shall include the hours of sludge removal operations performed, the quantity of sludge/solids removed, any operational setbacks experienced (weather, equipment failure, etc.), and an analysis of Respondent's progress to complete work under the Plan on or before the March

31, 2011 deadline.

F. On or before August 31, 2010, Respondent shall submit to MDEQ for approval an engineering study on its sludge handling and disposal practices associated with the SSWWTF. To eliminate the current and any future accumulation of excess sludge at the SSWWTF, this study, at a minimum, shall determine the need for additional sludge dewatering facilities, additional land application sites, and alternative means of final disposal. The study shall include a schedule, not to exceed June 30, 2011, for actions to be taken by Respondent to address and provide for these additional needs to be met for its sludge handling and disposal practices.

G. Respondent shall immediately cease the land application of waste on properties that do not have a current, valid permit under Section II of the Mississippi Nonhazardous Waste Management Regulations and on properties that Respondent once held a solid waste management permit for such activities but did not submit a reissuance application 180 days prior to expiration.

3.

In addition to the penalty set forth in Paragraph 2.A. of this Agreed Order, Respondent agrees to pay a stipulated penalty of $100 per day each day after the expiration of any deadline set forth in Paragraphs 2.B. – 2.G. until each item has been completed. MDEQ shall have the discretion to calculate and notify Respondent of the amount of accrued stipulated penalties on a periodic basis, which shall be no more frequently than monthly. Respondent agrees to pay the entire amount of the accrued stipulated penalties within 30 days of receipt of such notification from MDEQ.

4.

Notwithstanding the provision by this Agreed Order for stipulated penalties to accrue in certain circumstances, the Commission reserves the right to conduct a separate enforcement action concerning any violation by Respondent of this Agreed Order or of the laws or regulations within the jurisdiction of the Commission. If the Commission conducts a separate enforcement action concerning a violation for which stipulated penalties are provided in this Agreed Order, the Commission will be deemed to have waived the right to collect stipulated penalties in lieu of

the right to conduct the separate enforcement action. In that separate enforcement action, the Commission may seek penalties, injunctive relief, or other appropriate relief different from or in the excess of the amount of stipulated penalties included in this Agreed Order, up to and including the statutory maximum penalty.

5.

Nothing in this Agreed Order shall limit the rights of MDEQ or the Commission in the event Respondent fails to comply with this Agreed Order. The Agreed Order shall be strictly construed to apply to those matters expressly resolved herein.

6.

The civil penalty imposed in Paragraph 2.A of this Agreed Order addresses only those specific violations asserted in Paragraph 1. Nothing contained in this Agreed Order shall limit the rights of MDEQ, the Commission, or the United States Environmental Protection Agency to take enforcement or other actions, including the imposition of injunctive relief and/or penalties, against Respondent for past violations not specifically addressed herein and for future violations of any law, rule, regulation and/or permit.

7.

Respondent understands and acknowledges that it is entitled to an evidentiary hearing before the Commission pursuant to Miss. Code Ann. Section 49-17-31 (Rev. 2003), and that it has made an informed waiver of that right.

ORDERED, this the 10 day of September, 2010.

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

BY: _____
TRUDY D. FISHER
EXECUTIVE DIRECTOR
MISSISSIPPI DEPARTMENT
OF ENVIRONMENTAL QUALITY

AGREED, this the _____ day of _____, 2010.

CITY OF JACKSON

BY: _____

TITLE: Mayor

STATE OF Mississippi

COUNTY OF Hinds

PERSONALLY appeared before me, the undersigned authority in and for the jurisdiction aforesaid, the within named Harvey Johnson, Jr. who first being duly sworn, did state upon his/her oath and acknowledge to me that he/she is the Mayor of the City of Jackson and is authorized to sign and enter this Agreement on behalf of the City of Jackson.

SWORN AND SUBSCRIBED BEFORE ME, this the 3rd day of August, 2010.

STATE OF MISSISSIPPI ANGELA WOODARD Notary Public ID No. 51649 Commission Expires JEFFERSON DAVIS COUNTY

_____

NOTARY PUBLIC

My Commission expires: Feb. 17, 2014

BEFORE THE MISSISSIPPI COMMISSION
ON ENVIRONMENTAL QUALITY

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

COMPLAINANT

VS.

AMENDMENT TO
AGREED ORDER NO.5823 10

JACKSON POTW, SAVANNA STREET
PO BOX 17DEPARTMENT OF PUBLIC WORKS
JACKSON, MISSISSIPPI 39205-0017

RESPONDENT

ORDER AMENDMENT

Mississippi Commission on Environmental Quality Order No. 5823 10, previously issued on September 10, 2010, in the above captioned matter, came before the Executive Director of the Mississippi Department of Environmental Quality (MDEQ) on Respondent's request for amendment. Having considered Respondent's request, the Executive Director finds that the requirements outlined in the above-referenced Order should be amended as follows:

1.

Paragraph 2.A. of Agreed Order No. 5823 10 is amended to read as follows:

Respondent agrees to pay, and Complainant agrees to accept, a civil penalty in the amount of $240,000.00. Respondent shall pay this penalty to MDEQ in four equal installments in accordance with the following schedule:

Installment Due Date	Installment Amount
October 15, 2010	$60,000.00
February 15, 2011	$60,000.00
May 15, 2011	$60,000.00
August 15, 2011	$60,000.00

This Order Amendment shall not, and is not intended to, supersede Order No. 5823 10, except to the limited extent described in Paragraph 1 above. Except as amended by Paragraph 1 above, all terms and conditions of Order No. 5823 10 shall remain in full force and effect.

ORDERED, this the 11 day of October, 2010.

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

BY: _____
TRUDY D. FISHER
EXECUTIVE DIRECTOR
MISSISSIPPI DEPARTMENT
OF ENVIRONMENTAL QUALITY

BEFORE THE MISSISSIPPI COMMISSION
ON ENVIRONMENTAL QUALITY

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

COMPLAINANT

VS.

AMENDMENT TO
AGREED ORDER NO.5823 10

JACKSON POTW, SAVANNA STREET
PO BOX 17DEPARTMENT OF PUBLIC WORKS
JACKSON, MISSISSIPPI 39205-0017

RESPONDENT

AGREED ORDER AMENDMENT

Mississippi Commission on Environmental Quality Agreed Order No. 5823 10, previously issued on September 10, 2010, and amended on October 11, 2010, in the above captioned matter, came on this day for reconsideration upon the joint request of the Mississippi Commission on Environmental Quality, Complainant, and Jackson POTW, Savanna Street, Respondent, and the Executive Director of the Mississippi Department of Environmental Quality having received additional information in this cause, finds that the requirements outlined in the above-referenced Order should be amended as follows:

1.

Paragraph 2.D. of Agreed Order No. 5823 10 is amended to read as follows:

On or about December 3, 2010, Respondent submitted to MDEQ for approval its "Savanna Street Wastewater Treatment Plant Sludge Removal Plan." That plan contained four alternative proposals for the removal and proper disposal of excess, accumulated sludge/solids from the SSWWTF's storm diversion cells. The plan included, for each such

alternative, a schedule for completion of removal and disposal activities. After considering the alternative proposals, MDEQ tentatively approved implementation of "Option 2A" contained in the plan, but requested additional, clarifying information regarding implementation of that option. On June 3, 2011, Respondent submitted to MDEQ its "Savanna Street Wastewater Treatment Plant Sludge Removal Plan Addendum," and on July 19, 2011, Respondent submitted its "Sludge Removal Plan Addendum II." Those documents provided additional details regarding certain aspects of the sludge removal plan, including sludge excavation and dewatering and odor control. However, in the addendum, Respondent reserved the right to choose at a later date, depending upon contractor capabilities and resource availability, among various alternatives for sludge excavation, dewatering, and ultimate disposal. MDEQ has now approved the implementation of Option 2A of the sludge removal plan, as supplemented by the Savanna Street Wastewater Treatment Plant Sludge Removal Plan Addendum and Sludge Removal Plan Addendum II. Respondent shall immediately begin implementation of the plan. In accordance with the schedule of implementation provided for in the plan, Respondent shall notify MDEQ, in writing, on or before May 1, 2012, which alternatives for sludge excavation and dewatering Respondent will implement. After Respondent has commenced sludge/solids removal, the Respondent shall submit quarterly Status Reports to MDEQ that shall include, at a minimum, the hours of sludge removal operations performed, including the hours of dredging operations and ultimate disposal operations, the quantity of sludge/solids removed, the method(s) of disposal used, any operational setbacks experienced (weather, equipment failure, etc.), and an analysis of Respondent's progress to complete work under Option 2A on or before the December 31, 2017, deadline. In any event, Respondent, in accordance with the implementation schedule, shall remove all sludge not later than April 30, 2014 and shall dispose of all removed sludge no later than December 31, 2017.

2.

This Order Amendment shall not, and is not intended to, supersede Order No. 5823 10, or any previous amendment thereof, except to the limited extent described in Paragraph 1 above.

Except as amended by Paragraph 1 above, all terms and conditions of Order No. 5823 10, as previously amended on October 11, 2010, shall remain in full force and effect.

ORDERED, this the 29 day of September, 2011.

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

BY: _____
TRUDY D. FISHER
EXECUTIVE DIRECTOR
MISSISSIPPI DEPARTMENT
OF ENVIRONMENTAL QUALITY

APPENDIX B

BEFORE THE MISSISSIPPI COMMISSION
ON ENVIRONMENTAL QUALITY

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

COMPLAINANT

VS.

ORDER NO. 6005 11

JACKSON POTW, PRESIDENTIAL HILLS
PO BOX 17
JACKSON, MISSISSIPPI 39205

RESPONDENT

AGREED ORDER

COME NOW the Mississippi Commission on Environmental Quality (Commission), acting through the staff and Executive Director of the Mississippi Department of Environmental Quality (MDEQ), Complainant, and the City of Jackson, Respondent, in the above captioned cause and agree as follows:

1.

Respondent owns and operates the Jackson POTW, Presidential Hills facility, located in Hinds County. Complainant reviewed Discharge Monitoring Reports for NPDES Permit No. MS0030295 from December 2009 through September 2010. By letters dated August 4, 2010, November 30, 2010, January 12, 2011, March 8, 2011, and March 24, 2011, Respondent was contacted by Complainant and notified of the following violations:

A. The effluent BOD, 5-day limitation was exceeded during December 2009, January, August, and November 2010, and January – February 2011.

B. The effluent ammonia limitation was exceeded during January, February, April, June, August, and December 2010 and January – February 2011.

C. The effluent BOD percent removal limitation was not met during December 2009.

D. The effluent suspended solids percent removal was not met during December 2009 and September 2010.

Subsequent to Complainant's last correspondence regarding effluent violations, Respondent reviewed discharge monitoring reports for March 2011 and advised Complainant the facility exceeded the effluent BOD, 5-day and ammonia nitrogen effluent limitations.

2.

In lieu of a formal enforcement hearing concerning the violation(s) listed above, Complainant and Respondent agree to settle this matter as follows:

A. Respondent agrees to pay and Complainant agrees to accept a civil penalty in the amount of $22,500.00. Respondent shall pay this penalty to MDEQ within forty-five (45) days after this Agreed Order has been executed by the MDEQ Executive Director, or her designee. The settlement payment above shall be submitted to the following address:

Mississippi Department of Environmental Quality
Attn: Mona Varner
P.O. Box 2339
Jackson, MS 39225

B. On or before July 31, 2011, Respondent shall submit a report detailing the steps it intends to take to bring the wastewater treatment facility into compliance with its NPDES permit. The draft report shall be provided for review and comment by MDEQ prior to implementation. At a minimum, this report shall include the following:

1. A description of all viable options, including operational changes, equipment replacements or upgrades, and infrastructural changes or improvements, available to return the facility to compliance with its NPDES permit requirements.
2. A cost analysis (including capital improvement and operational and maintenance costs) and time lines for each of the viable options evaluated to bring the wastewater treatment facility into compliance.

3. The option(s) selected by Respondent to be implemented and a description of the basis for that selection.

C. Respondent shall implement its selected option as detailed in the report required by 2.B., or as otherwise modified and agreed upon by Complainant and Respondent. Within 10 days of completion of implementation, Respondent shall submit written documentation to MDEQ of completion.

D. On or before May 31, 2014, Respondent shall have either: (i) complied with the effluent limitations found in its NPDES permit for three consecutive months or (ii) ceased discharging from the Presidential Hills facility. Respondent shall demonstrate compliance through the submission of the required Discharge Monitoring Reports.

3.

Until such time that Respondent demonstrates compliance with its BOD, 5-day, ammonia nitrogen, BOD % removal, and total suspended solids % removal, but no later than May 31, 2014, Respondent shall comply with the following interim effluent limitations:

Parameter	Quantity/ Loading	Quantity/ Loading	Conc./ Quality	Conc./Quality	Frequency	Months
BOD, 5-day	94 lbs/day, Monthly Avg	141 lbs/day, Max Wkly Avg	15 mg/l, Monthly Avg	22.5 mg/l, Max Wkly Avg	Monthly	May - Oct
Ammonia Nitrogen	31 lbs/day Monthly Avg	47 lbs/day Max Wkly Avg	5 mg/l, Monthly Avg	8 mg/l, Max Wkly Avg	Monthly	May - Oct
BOD, 5-day	125 lbs/day, Monthly Avg	188 lbs/day, Max Wkly Avg	20 mg/l, Monthly Avg	30 mg/l, Max Wkly Avg	Monthly	Nov – Apr
Ammonia Nitrogen	125 lbs/day Monthly Avg	188 lbs/day Max Wkly Avg	20 mg/l, Monthly Avg	30 mg/l, Max Wkly Avg	Monthly	Nov – Apr
BOD, % Removal	*******	*******	65%, Minimum	*******	Monthly	Jan - Dec
TSS, % Removal	*******	*******	65%, Minimum	*******	Monthly	Jan - Dec

During the period that the interim limitations are applicable, Respondent agrees to pay to Complainant a stipulated penalty of $100 for each violation of an interim limitation.

4.

If the Respondent fails to comply with any of the requirements established in Paragraphs 2.B.-C. of this Agreed Order, the Respondent shall pay a stipulated penalty of $5,000 per day of violation of the relevant deadline. If the Respondent fails to achieve compliance as specified in Paragraph 2.D. of this Agreed Order, the Respondent shall pay a stipulated penalty of $20,000.

5.

The per-day stipulated penalties referenced in Paragraph 4 above shall apply and accrue for a period of 60 days from the relevant deadline, after which time the Commission reserves the right to conduct a separate enforcement action concerning any violation by Respondent of the requirements established in Paragraphs 2.B-C. of this Agreed Order. If the Commission conducts a separate enforcement action concerning a violation of any of the requirements established in Paragraphs 2.B.-C., the penalties sought and recovered in such separate enforcement action shall be in addition to any stipulated penalties which accrue during the 60-day period following the relevant deadline. In such separate enforcement action, the Commission may seek penalties, injunctive relief, or other appropriate relief different from or in the excess of the amount of stipulated penalties included in this Agreed Order, up to and including the statutory maximum penalty.

6.

Nothing in this Agreed Order shall limit the rights of MDEQ or the Commission in the event Respondent fails to comply with this Agreed Order. The Agreed Order shall be strictly construed to apply to those matters expressly resolved herein.

7.

Nothing contained in this Agreed Order shall limit the rights of MDEQ or the Commission to take enforcement or other actions against Respondent for violations not addressed herein and for future violations of environmental laws, rules, and regulations.

8.

Respondent understands and acknowledges that it is entitled to an evidentiary hearing before the Commission pursuant to Miss. Code Ann. Section 49-17-31 (Rev. 2003), and that it has made an informed waiver of that right.

ORDERED, this the 23 day of August, 2011.

MISSISSIPPI COMMISSION ON
ENVIRONMENTAL QUALITY

BY: _____
TRUDY D. FISHER
EXECUTIVE DIRECTOR
MISSISSIPPI DEPARTMENT
OF ENVIRONMENTAL QUALITY

AGREED, this the _____ day of _____, 2011.

JACKSON POTW, PRESIDENTIAL HILLS

BY: _____

TITLE: Mayor

STATE OF Mississippi

COUNTY OF Hinds

PERSONALLY appeared before me, the undersigned authority in and for the jurisdiction aforesaid, the within named Harvey Johnson Jr who first being duly sworn, did state upon his/her oath and acknowledge to me that he/she is the _____ of Jackson POTW, Presidential Hills and is authorized to sign and enter this Agreement.

SWORN AND SUBSCRIBED BEFORE ME, this the 12 day of August, 2011.

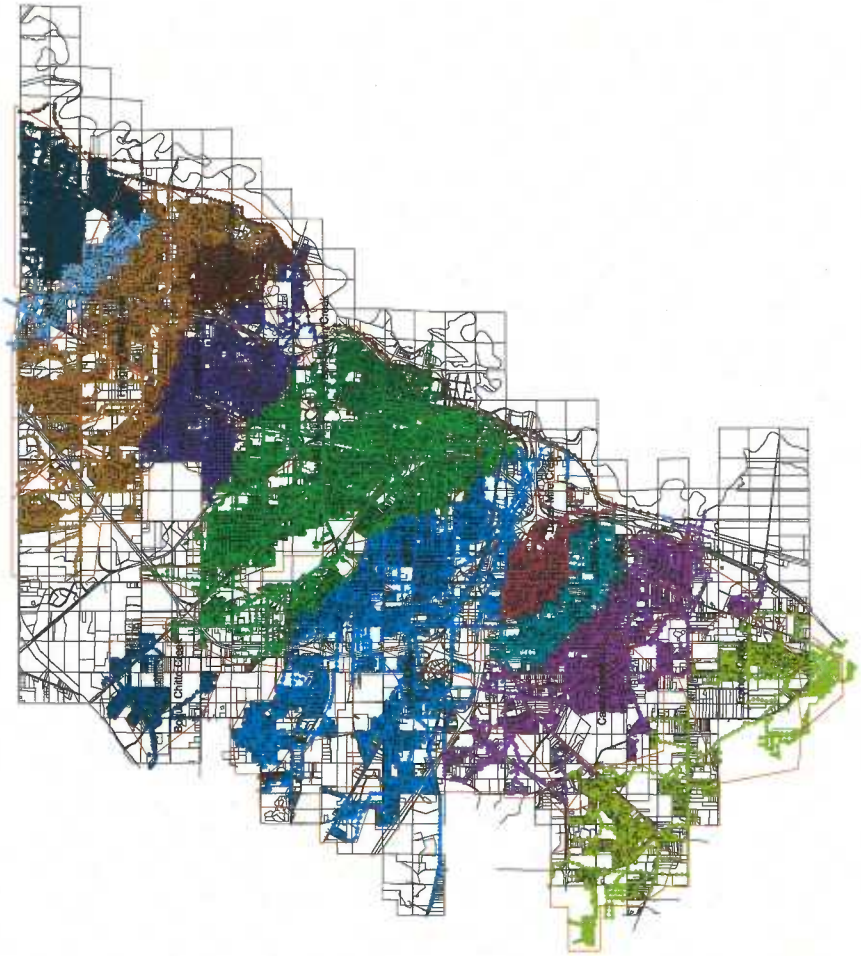
Brenda Pree
NOTARY PUBLIC

STATE OF MISSISSIPPI BRENDA PREE ID# 33859 NOTARY PUBLIC Comm. Expires Sept. 19, 2011 HINDS COUNTY

My Commission expires: _____

APPENDIX C

APPENDIX C



APPENDIX D

GUIDE FOR EVALUATING CAPACITY, MANAGEMENT, OPERATION, AND MAINTENANCE (CMOM) PROGRAMS AT SANITARY SEWER COLLECTION SYSTEMS

United States
Environmental Protection
Agency

Office of Enforcement and
Compliance Assurance (2224A)

EPA 305-B-05-002

www.epa.gov

January 2005

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CHAPTER 1. INTRODUCTION

1.1 Purpose of this Guide

This guide identifies some of the criteria used by EPA to evaluate a collection system's management, operation, and maintenance (CMOM) program activities. The guide is intended for use by EPA and state inspectors as well as the regulated community – owners or operators of sewer systems collecting domestic sewage as well as consultants or other third-party evaluators or compliance assistance providers. Collection system owners or operators can review their own systems by following the checklist in Chapter 3 to reduce the occurrence of sewer overflows and improve or maintain compliance. The guidance herein may also be taken a step further. If a federal or state reviewer observes a practice that does not effectively meet the elements of a CMOM program, he or she may make recommendations to educate the operator, inspector, case developer, or those involved in a settlement agreement. Additionally, having key board members (policy makers) read this guide will also allow them to better understand the benefits of investing in good CMOM programs.

The guide is applicable to small, medium, and large systems; both publicly and privately owned systems; and both regional and satellite collection systems. Regardless of size, each owner or operator will have an organization and practices unique to its collection system. While these specific characteristics will vary among systems, the CMOM concepts and best management practices are likely to apply to all types of systems. Where appropriate, this document provides guidance on the differences.

This document does not, however, substitute for the CWA or EPA's regulations, nor is it a regulation itself. Thus, the document does not and cannot impose legally binding requirements upon these circumstances. EPA and state decision-makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. EPA may change this guidance in the future.

Individuals reviewing a collection system are strongly encouraged to read the guidance portion of this document prior to conducting a review. Reviewers should use the checklist in Chapter 3 as the primary tool for questions during the paperwork and/or onsite review of the collection system.

While some sections or topics may not appear to relate directly to environmental performance, taken as a whole, they provide an indication of how well the utility is run.

1.2 Terminology

To provide a more user-friendly guidance and for clarification, the terminology for several terms has been modified. The following paragraphs list these terms and reasoning for the modifications.

Frequently, the term "COLLECTION SYSTEM OWNER OR OPERATOR", abbreviated as "OWNER OR OPERATOR," is used in this guide and refers to the entities responsible for the administration and oversight of the sewer system and its associated staff (in either a municipal or industrial context); capacity evaluation, management, operation, and maintenance programs; equipment; and facilities. The owner and operator may be two different entities. For example, the owner may own the infrastructure and be responsible for its maintenance while it designates responsibility for the day to day operation of

the system to the operator. It should be noted that the term used in EPA's CMOM Program Self Assessment Checklist is "MUNICIPAL WASTEWATER UTILITY OPERATORS" or "UTILITY" rather than "collection system owner or operator." Both refer to the same individual(s).
The term "REVIEW" is used in this document in place of "INSPECTION" or "AUDIT." Because "inspection" often refers to an evaluation conducted by the regulatory authority and "audit" has been used to refer to an evaluation with very specific requirements, "review" is more appropriately used to capture the wider universe of evaluations (e.g., those conducted by a regulatory authority, the system itself, and/or by a third-party).

Similarly, the term used to describe the person conducting the CMOM review is the "REVIEWER" – this could be either an inspector, a third party reviewer hired by the owner or operator, or personnel of the owner or operator performing a self-evaluation of the collection system.

The term "FACILITY" is used in this document to refer to the components of the collection system (e.g., pump stations, sewer lines).

1.3 How to Use the Guide

The guide and checklist provide a three-tiered approach to the CMOM review:

- Evaluation of the CMOM program, based on interviews with management and field personnel, as well as observation of routine activities and functions
- Review of pertinent records and information management systems
- Evaluation based on field/site review

Chapter 2 provides a breakdown and overview of each CMOM concept and what to look for when reviewing the system, defines the CMOM elements for the reviewer, and follows through with a discussion of the indicators or other clues about which the reviewer should be aware. Chapters 2 and 3 present detailed information on conducting reviews of collection systems. Chapter 3 contains the comprehensive reviewer checklist, supported by the information in Chapter 2. Appendix A presents a Collection System Performance Indicator Data Collection Form which provides examples of the types of information a reviewer should attempt to obtain while on-site.

The "one size does not fit all" approach to reviewing CMOM programs cannot be overstated. The principles covered in this guide are applicable to all wastewater collection systems, however, these principles may be implemented through different means depending on the system. Larger systems may have the resources and the need to implement more costly and complex means of meeting the CMOM program elements. In occasional cases a CMOM feature may not be implemented at all, due to characteristics of the system. A reviewer should be able to look at the system as a whole and determine whether certain key elements are present or should be present and to what extent the system incorporates the CMOM principles.

Reviewers will also find that the location or names of some documents, logs, or reports may vary from system to system. This guide tries to provide a general description of the materials the reviewer should request.

Although use of this guide cannot guarantee a collection system will avoid permit violations or discharge violations, generally, when owners or operators adequately practice the principles laid out in the guide, they should experience fewer problems and, therefore, fewer instances of noncompliance.

1.4 Overview of the Underlying Issues

Sanitary sewer collection systems are designed to remove wastewater from homes and other buildings and convey it to a wastewater treatment plant. The collection system is a critical element in the successful performance of the wastewater treatment process. EPA estimates that collection systems in the U.S. have a total replacement value between $1 to $2 trillion. Under certain conditions, poorly designed, built, managed, operated, and/or maintained systems can pose risks to public health, the environment, or both. These risks arise from sanitary sewer overflows (SSOs) from the collection system or by compromised performance of the wastewater treatment plant. Effective and continuous management, operation, and maintenance, as well as ensuring adequate capacity and rehabilitation when necessary, are critical to maintaining collection system capacity and performance while extending the life of the system.

EPA believes that every sanitary sewer system has the capacity to have an SSO. This may be due to a number of factors including, but not limited to:

- Blockages
- Structural, mechanical, or electrical failures
- Collapsed or broken sewer pipes
- Insufficient conveyance capacity
- Vandalism

SSOs include untreated discharges from sanitary sewer systems that reach waters of the United States (photo: US EPA).

Additionally, high levels of inflow and infiltration (I/I) during wet weather can cause SSOs. Many collection systems that were designed according to industry standards experience wet weather SSOs because levels of I/I may exceed levels originally expected; prevention of I/I has proven more difficult and costly than anticipated; or the capacity of the system has become inadequate due to an increase in service population without corresponding system upgrades (EPA 2004).

SSOs can cause or contribute to environmental and human health impacts (e.g., water quality standards violations, contamination of drinking water supplies, beach closures, etc.) which, in addition to flooded basements and overloaded wastewater treatment plants, are some symptoms of collection systems with inadequate capacity and improper management, operation, and maintenance. These problems create the need for both the owner or operator and the regulatory authority to conduct more thorough evaluations of sanitary sewer collection systems.

1.5 Purpose of CMOM Programs

CMOM programs incorporate many of the standard operation and maintenance activities that are routinely implemented by the owner or operator with a new set of information management requirements in order to:

- Better manage, operate, and maintain collection systems
- Investigate capacity constrained areas of the collection system
- Proactively prevent SSOs
- Respond to SSO events

The CMOM approach helps the owner or operator provide a high level of service to customers and reduce regulatory noncompliance. CMOM can help utilities optimize use of human and material resources by shifting maintenance activities from "reactive" to "proactive"–often leading to savings through avoided costs due to overtime, reduced emergency construction costs, lower insurance premiums, changes in financial performance goals, and fewer lawsuits. CMOM programs can also help improve communication relations with the public, other municipal works and regional planning organizations, and regulators.

It is important to note that the collection system board members or equivalent entity should ensure that the CMOM program is established as a matter of policy. The program should not be micro-managed, but an understanding of the resources required of the operating staff to implement and maintain the program is necessary.

In CMOM planning, the owner or operator selects performance goal targets, and designs CMOM activities to meet the goals. The CMOM planning framework covers operation and maintenance (O&M) planning, capacity assessment and assurance, capital improvement planning, and financial management planning. Information collection and management practices are used to track how the elements of the CMOM program are meeting performance goals, and whether overall system efficiency is improving.

On an periodic basis, utility activities should be reviewed and adjusted to better meet the performance goals. Once the long-term goal of the CMOM program is established, interim goals may be set. For instance, an initial goal may be to develop a geographic information system (GIS) of the system. Once the GIS is complete, a new goal might be to use the GIS to track emergency calls and use the information to improve maintenance planning.

An important component of a successful CMOM program is periodically collecting information on current systems and activities to develop a "snapshot-in-time" analysis. From this analysis, the owner or operator evaluates its performance and plans its CMOM program activities.

Maintaining the value of the investment is also important. Collection systems represent major capital investments for communities and are one of the communities' major capital assets. Equipment and facilities will deteriorate through normal use and age. Maintaining value of the capital asset is a major goal of the CMOM program. The infrastructure is what produces sales and service. Proper reinvestment in capital facilities maintains the ability to provide service and generate sales at the least cost possible and helps ensure compliance with environmental requirements. As a capital asset, this will result in the

need for ongoing investment in the collection system and treatment plant to ensure design capacity while maintaining existing facilities and equipment as well as extending the life of the system.

The performance of wastewater collection systems is directly linked to the effectiveness of its CMOM program. Performance characteristics of a system with an inadequate CMOM program include frequent blockages resulting in overflows and backups. Other major performance indicators include pump station reliability, equipment availability, and avoidance of catastrophic system failures such as a collapsed pipe.

A CMOM program is what an owner or operator should use to manage its assets; in this case, the collection system itself. The CMOM program consists of a set of best management practices that have been developed by the industry and are applied over the entire life cycle of the collection system and treatment plant. These practices include:

- Designing and constructing for O&M
- Knowing what comprises the system (inventory and physical attributes)
- Knowing where the system is (maps and location)
- Knowing the condition of the system (assessment)
- Planning and scheduling work based on condition and performance
- Repairing, replacing, and rehabilitating system components based on condition and performance
- Managing timely, relevant information to establish and prioritize appropriate CMOM activities
- Training of personnel

Sewer rehabilitation can include lining aging sewers (photo: NJ Department of Environmental Protection).

1.6 National Pollutant Discharge Elimination System Regulatory Requirement

The National Pollutant Discharge Elimination System (NPDES) program prohibits discharges of pollutants from any point source into the nation's waters except as authorized under an NPDES permit. EPA and state NPDES inspectors evaluate collection systems and treatment plants to determine compliance with permit conditions including proper O&M. Among others, these permit conditions are based on regulation in 40 CFR 122.41(e): "The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit."

When violations occur, the collection system or wastewater treatment plant owner or operator can face fines and requirements to implement programs to compensate residents and restore the environment. For example, in June 2004, the U.S. District Court for the Southern District of Ohio entered a consent decree resolving CSO, SSO, and wastewater treatment plant violations at the Hamilton County sewer system in Cincinnati, Ohio. In addition to a $1.2 million civil penalty, the settlement included programs to clean up residents' basements, compensate residents, and implement measures to prevent further basement backups. The settlement also includes over $5.3 million in supplemental environmental projects.

1.7 EPA Region 4 MOM Programs Project

EPA Region 4 created the "Publicly Owned Treatment Works MOM Programs Project" under which the Region invites permitted owners or operators, and contributing satellite systems, in watersheds it selects to perform a detailed self-assessment of the management, operation, and maintenance (MOM) programs associated with their collection system. Participants provide a report which includes the results of the review, any improvements that should be made, and schedules to make those improvements. Participants that identify and report a history of unpermitted discharges from their collection system, and a schedule for the necessary improvements, can be eligible for smaller civil penalties while under a remediation schedule.

EPA's Office of Compliance coordinated with EPA Region 4 on the development of this CMOM Guide. This guide is based in part on material obtained from the Region 4 MOM Programs Project. Some of the more specific items of the Region 4 program have been omitted in order to provide a more streamlined review framework. The fundamental concepts behind CMOM have been maintained in this guide. By combining elements of the Region's program with existing NPDES inspection guidance, this CMOM Guide provides a comprehensive framework for reviewers and regulated communities to evaluate the effectiveness of O&M throughout the collection system.

CHAPTER 2. COLLECTION SYSTEM CAPACITY, MANAGEMENT, OPERATION, AND MAINTENANCE PROGRAMS

This chapter provides an overview of the CMOM program elements. The information will help evaluate wastewater collection system operation and maintenance (O&M) practices. The key elements of the CMOM program, which are presented in detail in the following sections, include:

- Collection System Management
- Collection System Operation
- Collection System Maintenance
- Collection System Capacity Evaluation

In addition to this overview, there are several areas (e.g., 2.1.3 Internal Communications, 2.1.4 Customer Service, etc.) in this guide that go into greater depth regarding the operation and maintenance of a collection system. The intent of this detail is not only to provide the owner or operator with suggestions as to what to look for in their own program, but to provide the reviewer a complete overview of good operations, in general, regardless of a particular item resulting in poor performance or a violation.

For EPA and state inspectors or other reviewers, conducting an evaluation of collection system CMOM programs shares many similarities with other types of compliance reviews. Overall, the reviewer would examine records, interview staff and conduct field investigations, generally in that order although tailored, if necessary, to meet site-specific needs. Prior to performing the on-site interviews and evaluations, preliminary information may be requested that will provide an overall understanding of the organization to allow for a more focused approach for the review. This information also provides a basis for more detailed data gathering during on site activities. The information typically requested prior to the review should include a schematic map of the collection system (could be as-built drawings) and any written operations or maintenance procedures. Depending on the volume of information, the collection system owner or operator may need ample lead time to gather and copy these documents. Alternatively, the reviewer may offer to examine the documents and bring them back when doing the on-site review so that extra copies are not necessary. No matter which method is used, the importance of up-front preparation cannot be overemphasized. With the exception of pump stations and manholes, much of the collection system is not visible. Therefore, the more complete the reviewer's understanding of the system is prior to the review, the more successful the assessment will be.

The reviewer would then proceed with the on-site activities. Guidance for conducting compliance reviews is provided in the *NPDES Compliance Inspection Manual* (EPA 2004). The manual provides the general procedures for performing compliance reviews and is a valuable source of information on such topics as entry, legal authority, and responsibilities of the reviewer. Although CMOM evaluations are not specifically addressed in the manual, the general

review procedures can be applied to CMOM reviews. Another good reference for general review information is the *Multi-Media Investigations Manual, NEIC* (EPA 1992). Some issues with entry are specific to CMOM reviews. Some facilities may be on private property and the reviewer may need property owner consent for entry.

Documents to Review On-site Include:

- Organization chart(s)
- Staffing plans
- Job descriptions
- Sewer use ordinance
- Overall map of system showing facilities such as pump stations, treatment plants, major gravity sewers, and force mains
- O&M budget with cost centers[1] for wastewater collection
- Performance measures for inspections, cleaning, repair, and rehabilitation
- Recent annual report, if available
- Routine reports regarding system O&M activities
- Collection system master plan
- Capital improvement projects (CIP) plan
- Flow records or monitoring
- Safety manual
- Emergency response plan
- Management policies and procedures
- Detailed maps/schematics of the collection system and pump stations
- Work order management system
- O&M manuals
- Materials management program
- Vehicle management and maintenance records
- Procurement process
- Training plan for employees
- Employee work schedules
- Public complaint log
- Rate ordinance or resolution
- Financial report ("notes" section)
- As built plans
- Discharge monitoring reports (DMRs)

The above list is not all inclusive nor will all utilities necessarily have formal, written documentation for each of the items listed. The *Collection System Performance Indicator Data Collection Form*, included as Appendix A, provides examples of the types of information a reviewer should attempt to obtain while on-site.

Reviewer - Point to Note
A schedule should be established by the reviewer for the staff interviews and field assessments.

Interviews are generally conducted with line managers and supervisors who are responsible for the various O&M activities

[1] A cost center is any unit of activity, group of employees, line of products, etc., isolated or arranged in order to allocate and assign costs more easily.

and support services staff from engineering, construction, human resources, and purchasing, where appropriate. Appendix B presents an example agenda and schedule that would be used for a large collection system owner or operator. The collection system's size and physical characteristics will determine the length of time needed for the review. A guideline for the time required, given a two person review team, would be two days for a small system, and a week or more for large systems.

Field reviews are typically conducted after interviews. The following is a list of typical field sites the team should visit:

- Mechanical and electrical maintenance shop(s)
- Fleet maintenance facilities (vehicles and other rolling stock)
- Materials management facilities (warehouse, outside storage yards)
- Field maintenance equipment storage locations (i.e., crew trucks, mechanical and hydraulic cleaning equipment, construction and repair equipment, and television inspection equipment)
- Safety equipment storage locations
- Pump stations
- Dispatch and supervisory control and data acquisition (SCADA) systems
- Crew and training facilities
- Chemical application equipment and chemical storage areas (use of chemicals for root and grease control, hydrogen sulfide control [odors, corrosion])
- Site of SSOs, if applicable
- A small, but representative, selection of manholes

Collection system operators typically assist with manhole cover removal and other physical activities. The inspector should refrain from entering confined spaces. A confined space is defined by the Occupational Safety and Health Administration (OSHA) as a space that: (1) is large enough and so configured that an employee can bodily enter and perform assigned work; and (2) has limited or restricted means for entry or exit; and (3) is not designed for continuous employee occupancy [29 CFR 1910.146(b)]. A "permit-required confined space (permit space)" is a confined space that has one or more of the following characteristics: (1) contains or has a potential to contain a hazardous atmosphere; (2) contains a material that has the potential for engulfing an entrant; (3) has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or (4) contains any other recognized serious safety or health hazard [29 CFR 1910.146(b)].

Though OSHA has promulgated standards for confined spaces, those standards do not apply directly to municipalities, except in those states that have approved plans and have asserted jurisdiction under Section 18 of the OSHA Act. Contract operators and private facilities do have to comply with the OSHA requirements and the inspector may find that some municipalities elect to do so voluntarily. In sewer collection systems, the two most common confined spaces are the underground pumping station and manholes. The underground pumping station is typically entered through a relatively narrow metal or concrete shaft via a fixed ladder. Inspectors conducting the field evaluation component of the CMOM audit should be able to identify and

avoid permit-required confined spaces. Although most confined spaces are unmarked, confined spaces that may have signage posted near their entry containing the following language:

> **DANGER–PERMIT REQUIRED–CONFINED SPACE**
> **AUTHORIZED PERSONNEL ONLY**
>
> If confined space entry is absolutely necessary, inspectors should consult with the collection system owner or operator first, have appropriate training on confined space entry, and use the proper hazard detection and personal safety equipment. More information on confined space entry can be found in *Operation and Maintenance of Wastewater Collection Systems Volumes I and II* (California State University (CSU) Sacramento 1996; CSU Sacramento 1998).

2.1 Collection System Management

Collection system management activities form the backbone for operation and effective maintenance activities. The goals of a management program should include:

- Protection of public health and prevention of unnecessary property damage
- Minimization of infiltration, inflow and exfiltration, and maximum conveyance of wastewater to the wastewater treatment plant
- Provision of prompt response to service interruptions
- Efficient use of allocated funds
- Identification of and remedy solutions to design, construction, and operational deficiencies
- Performance of all activities in a safe manner to avoid injuries

Management Documents to Review

- Organization chart(s)
- Staffing plans–Number of people and classifications
- Job descriptions for each classification
- Sewer use ordinance
- Safety manual
- Training program documentation
- Notes to financial reports

Without the proper procedures, management and training systems, O&M activities may lack organization and precision, resulting in a potential risk to human health and environmental contamination of surrounding water bodies, lands, dwellings, or groundwater. The following sections discuss the common elements of a robust collection system management program.

2.1.1 Organizational Structure

Well-established organizational structure, which delineates responsibilities and authority for each position, is an important component of a CMOM program for a collection system. This information may take the form of an organizational chart or narrative description of roles and

responsibilities, or both. The organizational chart should show the overall personnel structure, including operation and maintenance staff. Additionally, up-to-date job descriptions should be available. Job descriptions should include the nature of the work performed, the minimum requirements for the position, the necessary special qualifications or certifications, examples of the types work, lists of licences required for the position, performance measures or promotion potential. Other items to note in regard to the organizational structure are the percent of staff positions currently vacant, on average, the length of time positions remain vacant, and the percent of collection system work that is contracted out.

Reviewer - Point to Note
The reviewer may want to note the turnover rate and current levels of staffing (i.e., how many vacant positions exist and for how long they have been vacant). This may provide some indication of potential understaffing, which can create response problems.

Reviewers should evaluate specific qualifications of personnel and determine if the tasks designated to individuals, crews, or teams match the job descriptions and training requirements spelled out in the organizational structure. From an evaluation standpoint, the reviewer might try to determine what type of work is performed by outside contractors and what specific work is reserved for collection system personnel. If much of the work is contracted, it is appropriate to review the contract and to look at the contractor's capabilities. If the contractor handles emergency response, the reviewer should examine the contract with the owner or operator to determine if the emergency response procedures and requirements are outlined.

The inclusion of job descriptions in the organizational structure ensures that all employees know their specific job responsibilities and have the proper credentials. Additionally, it is useful in the course of interviews to discuss staff management. The reviewer should note whether staff receive a satisfactory explanation of their job descriptions and responsibilities. In addition, when evaluating the CMOM program, job descriptions will help a reviewer determine who should be interviewed.

Reviewer - Point to Note
A reviewer should look for indications that responsibilities are understood by employees. Such indications may include training programs, meetings between management and staff, or policies and procedures.

When evaluating the organizational structure, the reviewer should look for the following:

- Except in very small systems, operation and maintenance personnel ideally should report to the same supervisor or director. The supervisor or director should have overall responsibility for the collection system.
- In some systems, maintenance may be carried out by a city-wide maintenance

organization, which may also be responsible for such diverse activities as road repair and maintenance of the water distribution system. This can be an effective approach, but only if adequate lines of responsibility and communication are established.

- In general, one supervisor should manage a team of individuals small enough that is safe and effective. However, the individuals on the team may have additional employees reporting to them. This prevents the top supervisors from having to track too many individuals. The employee-supervisor ratio at individual collection systems will vary depending on their need for supervisors.

In a utility with well-established organizational structure, staff and management should be able to articulate their job and position responsibilities. Personnel should be trained to deal with constantly changing situations and requirements, both regulatory and operational.

The system's personnel requirements vary in relation to the overall size and complexity of the collection system. In very small systems, these responsibilities may include operation of the treatment plant as well as the collection system. In many systems, collection system personnel are responsible for the stormwater as well as wastewater collection system. References providing staff guidelines or recommendations are available to help the reviewer determine if staffing is adequate for the collection system being reviewed. Following is a list of available references:

- *Manpower Requirements for Wastewater Collection Systems in Cities of 150,000 to 500,000 Population* (EPA 1974)
- *Manpower Requirements for Wastewater Collection Systems in Cities and Towns of up to 150,000 Population* (EPA 1973)
- *Operation and Maintenance of Wastewater Collection Systems*, Volume II (California State University (CSU) Sacramento 1998)

Volumes I and II of *Operations and Maintenance of Wastewater Collection Systems* can be obtained through:

Office of Water Programs
California State University Sacramento
6000 J Street
Sacramento, CA 95819-6025
phone: 916/278-6142
www.owp.csus.edu

The following tables have been taken from the two EPA documents listed above to provide the reviewer with guidance. However, these documents may not take into account technological advances that have occurred since their publication date that might reduce staffing requirements. For instance, advances in remote data acquisition and telemetry have likely reduced the number

of field inspection staff needed for systems with several pump stations. Other system-specific characteristics should also be accounted for when using these tables. An example of this might be collection systems that are not primarily constructed of brick will not require the masons the tables specify.

STAFF COMPLEMENTS FOR WASTEWATER COLLECTION SYSTEM MAINTENANCE
POPULATION SIZE
(Estimated Number of Personnel)

Occupational Title	5,000		10,000		25,000		50,000		100,000	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Superintendent	1	5	1	10	1	20	1	40	1	40
Assistant Superintendent										
Maintenance Supervisor							1	40	2	80
Foreman	1	15	1	20	1	20	1	40	1	40
Maintenance Man II	1	15	1	20	1	20	1	40	1	40
Maintenance Man I	1	15	1	20	2	60	3	120	5	200
Mason II							1	40	1	40
Mason I									1	40
Maint. Equipment Personnel					1	40	2	80	3	120
Construction Equipment Personnel	1	15	1	20	1	20	1	40	1	40
Auto. Equipment Personnel									1	40
Photo. Inspection Technician									1	40
Laborer	1	15	1	20	2	40	2	80	5	200
Dispatcher							1	40	2	80
Clerk Typist							1	20	1	20
Stock Clerk							1	40	1	40
Sewer Maint. Staff	6	80	6	110	9	220	16	620	27	1,060
Maintenance Mechanic II	see comment (c) below									
Maintenance Mechanic I	see comment (d) below									
Maintenance Mechanic Helper	see comment (d) below									
Construction Inspection Supervisor	see comments (e) and (f) below									
Total Staff										

(a) Estimated number of personnel.
(b) Estimated total man-hours per week.
(c) Multiply number of lift stations maintained by 8/3.
(d) Multiply number of lift station visits per week by 1.
(e) Multiply estimated construction site visits per week by 8/3.
(f) Determined by the number of Construction Inspectors employed and developed on a judgmental basis.

Unit processes included in this staffing table are:

1. Maintenance of sanitary sewer main lines & appurtenances (laterals not included).
2. Maintenance of storm sewer main lines.
3. Maintenance of lift stations.
4. Inspection of newly constructed sewer main lines and appurtenances.

(U.S. EPA 1973)

STAFF COMPLEMENTS FOR WASTEWATER COLLECTION SYSTEM MAINTENANCE
POPULATION SIZE
(Estimated Number of Personnel)

Occupational Title	150,000	200,000	300,000	400,000	500,000
Superintendent	1	1	1	1	1
Assistant Superintendent	1	1	1	1	1
Maintenance Supervisor II	1	1	1	1	1
Maintenance Supervisor I	1	2	2	3	3
Equipment Supervisor	1	1	1	1	1
TV Technician II	1	2	2	3	3
TV Technician I	1	2	2	3	3
Foreman	2	3	4	5	6
Maintenance Man II	3	5	6	8	9
Maintenance Man I	11	17	22	29	33
Mason II	1	2	2	3	3
Mason I	1	2	2	3	3
Maintenance Equipment Personnel	6	8	12	15	18
Construction Equipment Personnel	3	4	6	8	9
Auto. Equipment Personnel	2	3	4	5	6
Laborer	7	10	14	18	22
Dispatcher	2	2	2	3	3
Stock Clerk	1	2	2	3	3
Clerk Typist	2	2	2	3	3
Sewer Maintenance Staff	48	70	88	116	131
Maintenance Mechanic II	see comment (a) below				
Maintenance Mechanic I	see comment (b) below				
Maintenance Mechanic Helper	see comment (b) below				
Electrician	see comment (c) below				
Construction Inspector Supervisor	see comment (d) below				
Construction Inspector	see comment (e) below				
Total Staff					

(a) Divide number of lift stations maintained by 15.
(b) Divide number of lift station visits per week by 40
(c) Divide number of lift stations maintained by 15.
(d) Determined by the number of Construction Inspectors employed and developed on a judgmental basis.
(e) Divide estimated daily construction site visits by 2.

Unit processes included in this staffing table are:

1. Maintenance of sanitary sewer main lines & appurtenances (laterals not included).
2. Maintenance of storm sewer main lines.
3. Maintenance of lift stations.
4. Inspection of newly constructed main lines and appurtenances.

(U.S. EPA 1974)

2.1.2 Training

The commitment of management to training is key to a successful program. It is important to recognize training as a budget expense item. A guideline for the typical amount of funding for training is three to five percent of the gross budget for the collection system. However, in large collection systems or those undergoing extensive construction this percentage may be considerably lower, and, in systems with a high turnover, training costs may be higher due to orienting new employees. Other changes, such as incorporation of new technology, will have a short-term impact on training costs. Although training is not explicitly required under current regulations, a collection system with untrained or poorly trained collection system personnel runs a greater risk of experiencing noncompliance.

The following elements are essential for an effective training program:

- Fundamental mission, goals, and policies of the collection system are addressed
- Mandatory training requirements are identified for key employees
- On-the-job training progress and performance are measured
- Effectiveness of the training is assessed including periodic testing, drills, or demonstrations
- New employees receive training

The owner or operator should generally provide training in the following areas:

- Routine line maintenance (may be on-the-job training only)
- Safety during confined space entry (every system should also have a strict policy and permit program)
- Traffic control (where applicable)
- Record keeping
- Pump station O&M
- Electrical and instrumentation (may be a combination of formal and on-the-job training)
- Public relations and customer service
- SSO/Emergency response
- Pump station operations and maintenance
- Pipe repair; bursting or cured in place pipe (CIPP); or closed circuit TV and trench/shoring (where these activities are not outsourced)

Sources of Training

Training is required to safely perform inspections, follow replacement procedures, and lubricate and clean parts and equipment. Following are the many sources of maintenance training:

- Manufacturer
- In-house
- On-the-job (OJT)
- Industry-wide (e.g., consultants, regulatory authorities, professional associations, or educational institutions)

The training program should identify the types of training required and offered. Types of training vary, but may include general environmental awareness, specific equipment, policies and

procedures, and conducting maintenance activities. If the owner or operator is carrying out its own training, the reviewer should evaluate one or more examples of training materials to answer the following questions: are the materials appropriate to the training topic and the level of those being trained; and are they likely to accomplish the intended goal?

Owner or Operator - Point to Note
The owner or operator should routinely assess the effectiveness of training through periodic testing, drills, demonstrations, or informal reviews, and improve training based on this assessment.

2.1.3 Internal Communication

Communication is essential to ensuring that collection systems run efficiently and effectively. It is especially important that an effective communication link exists between wastewater treatment plant operators and collection system crews as well as with other municipal departments.

Effective communication requires the top-down, bottom-up, and lateral exchange of information amongst staff. Examples of top-down communication are bulletin board posters, paycheck inserts, regular staff meetings, e-mail or informal brown-bag lunch discussions. Examples of bottom-up communication may include the establishing environmental committees, confidential hotlines, e-mail, or direct open discussions. Collection system owners or operators may also offer incentives to employees for performance, and encourage them to submit suggestions for ways to improve the performance of the collection system. "Front line" employees are often an excellent source of ideas, issues, and information about how to improve performance at the work site. In this context, the reviewer can check for morale-boosting activities or reward programs, such as "Employee of the Month" and "Employee of the Year."

The reviewer should attempt to determine lines of internal communication to ensure all employees receive information and have an appropriate forum to provide feedback. The reviewer should assess the level of communication by interviewing several levels of staff or by simply observing collection system teams on work assignments. The owner or operator should have procedures and be able to demonstrate internal communication between the various levels and functions of the collection system regarding its management, operation, and maintenance programs.

2.1.4 Customer Service

The community often knows very little about the wastewater treatment and collection services performed for them. The community may only be aware of the collection system and its owner or operator through articles in local newspapers, public radio and television announcements, or only when there is an SSO. Collection system representatives should talk to schools and universities, make presentations to local officials and businesses about the wastewater field. Formal presentations can also be given to citizens, building inspectors, public utility officials,

and members of the media.

An effective customer service and public relations program ensures that the owner or operator addresses all incoming inquiries, requests, and complaints in a timely fashion. From this information, owners or operators may further develop or revise programs to better address areas of concern. The reviewer should examine customer service records for the following:

- Personnel who received the complaint or request
- Date and nature of the complaint or request
- Location of the problem
- Name, address, and telephone number of the customer
- Cause of the problem
- To whom the follow-up action was assigned
- The initial date of the follow-up action
- Date the complaint or request was resolved
- Total days to end the problem
- Feedback to the customer

Awareness of past issues, population served, compliance history, and other elements help a reviewer determine whether the amount and types of inquiries, requests, or complaints are increasing or decreasing. For example, there may have been many complaints during only a certain week. The reviewer can examine those records to determine if there were specific circumstances (e.g., a large precipitation event) that caused the increase in inquiries or complaints.

Reviewer - Point to Note
To fully understand the context of customer inquiries, requests, or complaints, a reviewer should understand the history, topography, boundaries, and demographics of the collection system's jurisdiction before site evaluations are conducted.

Employees who handle customer service should be specifically trained to handle complaints, requests, or inquiries. These employees should be provided with sample correspondence, Q/A's, or "scripts" to help guide them through written or oral responses to customers. The reviewer should look for procedures on how to answer the telephone, e-mail, and other communication used by personnel. A reviewer may evaluate staff telephone responses by evaluating:

- The number of persons available to answer calls
- The number of repeat callers
- The average length of calls
- The volume of calls per day

Collection system field crews and their activities are the most visible segment of any wastewater treatment organization. Workers project a public image for their system on city and town streets. For this reason, personnel need to be trained in what to expect in public situations. For example,

collection system supervisory staff should be familiar with the areas around public rights-of-way and easements to which their field crews must gain access to service facilities. Additionally, crew leaders should know how to deal with the public when approached.

Collection systems field crews influence the public's confidence in the collection system owner or operator. Reviewers should observe whether personnel wear uniforms or not, and if vehicles and equipment are identifiable as utility property and kept in good working order. Vehicles should be equipped with adequate emergency lighting and flashers, traffic control signs and barriers, etc. Before major construction or maintenance work begins, owners or operators should notify homeowners where properties may be affected. Methods of notification may include door hangers, newspaper notices, fliers, signs, or public radio or television announcements. Information should also be provided to residents on cleanup and safety procedures following basement backups and other overflows.

2.1.5 Management Information Systems

The ability of the owner or operator to effectively manage its collection system is directly related to its ability to maintain access to the most current information concerning the facilities. Maintenance of this current information is an effort involving all members of the collection system from the staff answering the telephone to the worker in the street. Operational information informs and clarifies financial information. This will make the financial information more useful for the policy makers, leading to better decisions. A satisfactory management information system should provide the owner or operator with the following advantages:

A growing number of sewer systems have shifted to computer-based collection system management [photo: Milwaukee Metropolitan Sewerage District (MMSD)].

- Maintain preventive maintenance and inspection schedules
- Offer budgetary justification
- Track repairs and work orders
- Organize capital replacement plans
- Manage tools and equipment inventories
- Create purchase orders
- Record customer service inquiries, complaints, or requests
- Provide measurement of effectiveness of program and O&M activities

Owners and operators have been shifting to computer-based systems to manage data. Only the smaller collection system owners or operators may still rely on paper management systems.

Computer-based Maintenance Management Systems (CMMSs) are designed to manage the data needed to track the collection system's O&M performance. Geographic Information Systems (GIS) are used to map and locate facilities and because of computer-based compatibility, can often easily be integrated with a CMMS. The computer-based system however, can only be as accurate as the data used to develop it, which was most likely paper files.

Types of Management Information Tracking

- Customer service
- Safety incident
- Emergency response
- Process change
- Inspection scheduling and tracking
- Monitoring and/or sampling schedules
- Compliance
- Planned maintenance (schedules and work orders)
- Parts inventory

Regardless of the information management style chosen, the collection system should have written instructions regarding the use of the management information systems. These procedures may include operating the system, upgrading the system, accessing data and information, and generating and printing reports. The system should be kept current with accurate information. Work reports from the field crews should be complete, accurate, and legible.

The reviewer may select some number of complaints and see how well they can be tracked through the system to an ultimate conclusion. Work reports generated by the field crew should be randomly chosen and scanned for legibility and completeness. The reviewer should do a random check of the timeliness and accuracy of data entry. Additionally, the reviewer should obtain selected original data sources (such as field reports) and compare them to the appropriate database output to determine how long entry takes. This will provide a check on how current the database is and what data entry backlog exists.

2.1.6 SSO Notification Program

The owner or operator should maintain a written procedure indicating the entities, (e.g., drinking water purveyors, the public, public health officials, and the regulatory authority) that should be notified in the event of an SSO. The procedure should clearly indicate the chain of communication used to notify the proper personnel of an SSO event for reporting and remediation. The procedure should include the names, titles, phone numbers, and responsibility of all personnel involved. The reviewer should verify that the personnel listed in the procedure are still in the position listed and are aware of their responsibilities.

Reviewer - Point to Note
To verify the effectiveness of the notification program, the reviewer should walk an overflow occurrence report through the chain of events that would occur from the time of initial notification.

The procedure may allow for different levels of response for different types of SSOs. For example, the regulatory authority may request that SSOs due to sewer line obstructions be

reported on a monthly basis. Therefore, the procedure may simply be to gather this information from the maintenance information system and have the appropriate personnel put together a reporting form. A chronic SSO at a pump station that discharges when overloaded during wet weather may require a more complex notification procedure, including immediate telephone notification to specified authorities.

To verify the effectiveness of the notification program, the reviewer should walk an overflow occurrence report through the chain of events that would occur from the time of initial notification. This can be done by choosing several random overflow events from the complaint records and observing whether they are handled as procedures dictate. The minimum information that should be reported for an SSO includes the date, time, location, cause, volume of the overflow (which may be estimated), how it was stopped, and any remediation methods taken. The reviewer should not only verify that the SSO notification procedures are appropriate, but also verify that the owner or operator has reliable methods for the detection of overflows and a phone number or hotline for the public to report observed overflow events.

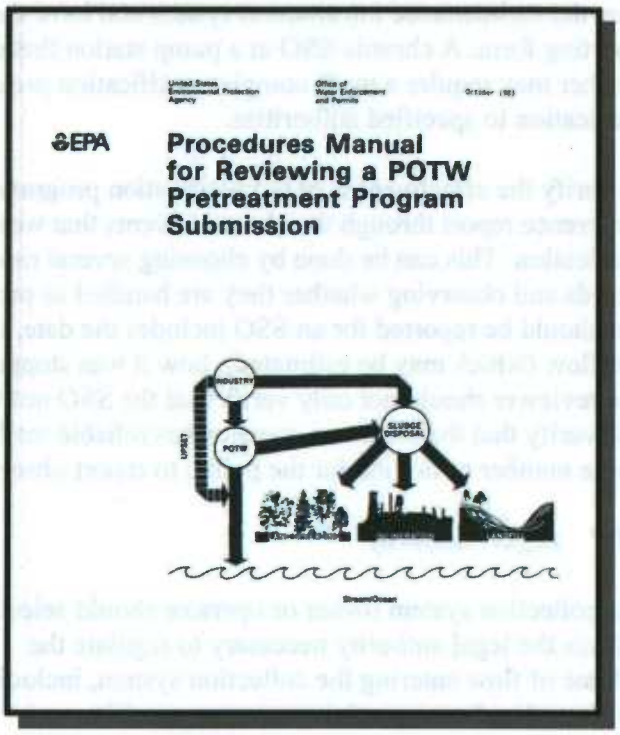
2.1.7 Legal Authority

The collection system owner or operator should select and enforce the legal authority necessary to regulate the volume of flow entering the collection system, including residential and commercial customers, satellite communities and industrial users. The legal authority may take the form of sewer use ordinances, contracts, service agreements, and other legally binding documents.

A **satellite community** is a collection systems which does not own the treatment facility to which it discharges.

The pretreatment program seeks to prevent the discharge of materials into the sewer system (by non-domestic users) that interfere with proper operation of the wastewater treatment plant or may pass through the plant untreated. At the time the operator of a wastewater treatment plant submits its pretreatment program to the regulatory authority for approval, the plant operator must include a statement from the city solicitor or other legal authority that the plant has the authority to carry out the program [40 CFR 403.9(a)(1)]. The reviewer should verify the existence of this statement and inquire as to whether any significant changes have occurred in the program such that the legal authority may need further review. Additionally, some owners or operators may have a pretreatment program approved by the state, through which discharge permits are issued to industrial users and enforcement is conducted. Further information on legal authority under the pretreatment program may be found in *Procedures Manual for Reviewing a POTW Pretreatment Program Submission* (EPA 1983).

The owner or operator should have the authority to ensure that new and rehabilitated sewers and connections have been properly designed, constructed, and tested before being put into service. This authority could take the form of design and performance specifications in a sewer use ordinance or other legal document such as a statute or series of contracts or joint powers agreements. The ordinance or legal document should contain, at a minimum, general prohibitions, adequate grease control requirements and measures, prohibitions on stormwater inflow, infiltration from laterals, and new construction standards.



The grease control section of the document should contain the requirement to install grease traps at appropriate facilities (e.g., restaurants). Additionally, these facilities should be required to properly maintain the grease traps and pump them out on a regular basis. The document should also address periodic inspections of grease traps by collection system personnel and the ability to enforce (i.e., levy fines on persistent offenders).

General Prohibitions

- Fire and explosion hazards
- Corrosive and obstructive materials
- Material which may cause interference at the wastewater treatment plant
- Heat which may inhibit biological activity at the wastewater treatment plant
- Oils or petroleum products which may cause interference or pass through the wastewater treatment plant

The owner or operator should maintain strict control over the connection of private sewer laterals to sewer mains. These connections have significant potential as sources of infiltration. Standards for new connections should be clearly specified. The sewer use ordinance should contain provisions for inspection, approval of new connections, and a program to implement the requirements. A method to maintain control over existing connections is to require an inspection of the lateral prior to sale of a property. It is important to note that implementing this type of program may require a change to the local ordinance or code.

The owner or operator should also have the legal authority to prohibit stormwater connections to the sanitary sewer. Stormwater connections may include catch basins; roof, cellar and yard drains; sump pumps; direct connections between the storm and sanitary sewers; leaking manhole covers; uncapped cleanouts; and the direct entrance of streams into the collection system. This practice is now discouraged. Direct stormwater connections to a separate sanitary sewer system are known as inflow. Inflow can severely impact the ability of the collection system to transport flows to the treatment plant during wet weather, leading to overflows and noncompliance with the wastewater treatment plant's NPDES permit.

Sources of stormwater in the collection system may include building downspouts connected directly to the system (photo: MMSD).

Satellite communities should not be allowed to contribute excessive flows that cause or contribute to overflows, flooding, or noncompliance at the wastewater treatment plant. Should any of these situations exist, it is not sufficient for the owner or operator to charge the satellite community for the excess flow. The owner or operator must be able to prohibit the contribution of the excess flow. This may be done through a legal inter-jurisdictional agreement between the wastewater treatment plant owner or operator and the satellite community that addresses allowable flows and sets requirements. The reviewer should examine all contracts between systems and their satellites (unless too numerous, then select representative contracts). Contracts should have a date of termination and allow for renewal under renegotiated terms. Contracts should limit flow from satellite communities and limit peak wet weather flow rates.

Owner or Operator - Point to Note
The owner or operator should have a comprehensive program which addresses flows from satellite communities.

2.2 Collection System Operation

Collection systems have little of what is traditionally referred to as "operability" as compared to a wastewater treatment plant (i.e., the number of ways to route the wastewater is typically limited). However, the design of some collection systems does allow flow to be diverted or routed from one pipe to another or even to different treatment plants. This can be accomplished by redirecting flow at a pump station from one discharge point to another or opening and closing valves on gravity sewers and force mains.

Owner or Operator - Point to Note
There should be detailed, written procedures available to guide owners or operators through flow routing activities. Also, there should be operating procedures for mechanical equipment such as pump station pump on/off and service rotation settings or in-line grit removal (grit trap) operations.

There are many reasons why the owner or operator may want to divert flows; among them, to relieve overloading on a system of piping or the wastewater treatment plant or to add more flow to piping serving an area not yet fully developed to maintain a cleansing velocity.

2.2.1 Budgeting

The budget is one of the most important variables in the CMOM program. Although an adequate budget is not a guarantee of a well operated collection system, an inadequate budget will make attaining this goal difficult. Funding can come from a variety of sources, including user fees or appropriations from the state or local government.

Reviewer - Point to Note
Reviewers need to determine the source of the funding for the collection system and who controls it. Reviewers should also request budget documents, summaries, or pie charts to learn more about the systems' budget.

A key element of the operation budget program is the tracking of costs in order to have accurate records each time the annual operating budget is developed. Having an annual baseline provides documentation for future budget considerations and provides justification for future rate increases. Collection system management should be aware of the procedures for calculating user rates and for recommending and making user rate changes.

Collection system and wastewater treatment plant costs may be combined into one budget, or budget line items may be divided into each of two individual budgets. For example, electrical and mechanical maintenance work performed by plant staff on a pump station may be carried as an O&M cost in the treatment plant budget, although pumping stations are generally considered to be a collection system component.

Examples of O&M Budget Items

- Labor (usually at least 50% of total budget)
- Utilities
- Capital
- Maintenance materials and supplies
- Chemicals
- Motor vehicles
- Contracted services

The cost of preventive and corrective maintenance and major collection system repairs and alterations are key items in the annual operating budget. The collection system owner or operator should keep adequate records of all maintenance costs, both in-house and contracted, plus the costs for spare parts. This will assist in the preparation of the following year's budget. In general, there should be an annual (12-month cycle) budget of discretionary and non-discretionary items. There may also be a Capital Improvement Plan (CIP) which may encompass small projects (one to two year cycles) or larger projects (three to five year cycles). Larger projects may include items such as equipment, labor, training, or root cause failure analysis.

The major categories of operating costs are labor, utilities, and supplies. Cost accounting for

these categories should include information on unit costs, total costs, and the amount and/or quantities used. The reviewer should evaluate the current and proposed budget, and current year balance sheets. In examining current and proposed expenditure levels, the reviewer should consider:

- Whether the budgets include contributions to capital reserve (sinking) funds. These funds are savings for replacement of system components once they reach their service life.
- Whether all income from water and sewer billings supports those functions, or if it goes into the general fund.
- Whether raising user fees is a feasible option to meet budget needs based on recent expenditure history.

2.2.2 Monitoring

The collection system owner or operator may be responsible for fulfilling some water quality or other monitoring requirements. Responsibilities may include:

- Monitoring discharges into the collection system from industrial users
- Monitoring to determine the effects of SSOs on receiving waters
- Monitoring required as part of an NPDES permit, a 308 letter, administrative order, or consent decree

The owner or operator should maintain written procedures to ensure that sampling is carried out in a safe, effective, and consistent manner. The procedures should specify, at a minimum the following:

- Sampling location(s)
- Sample volumes, preservatives, and holding times
- Instructions for the operation of any automatic sampling and/or field monitoring (e.g., pH or dissolved oxygen) equipment
- Sampling frequency
- Sampling and analytical methodologies
- Laboratory QA/QC

Records should be maintained of sampling events. These records should at a minimum include the following:

- Date, time, and location of sampling
- Sample parameters
- Date shipped or delivered to the laboratory

2.2.3 Hydrogen Sulfide Monitoring and Control

The collection system owner or operator should have a program under which they monitor areas of the collection system which may be vulnerable to the adverse effects of hydrogen sulfide. It may be possible to perform visual inspections of these areas. The records should note such items as the condition of metal components, the presence of exposed rebar (metal reinforcement in concrete), copper sulfate coating on copper pipes and electrical components, and loss of concrete from the pipe crown or walls.

Areas Subject to Generation of Hydrogen Sulfide:

- Sewers with low velocity conditions and/or long detention times
- Sewers subject to solids deposition
- Pump stations
- Turbulent areas, such as drop manholes or force main discharge points
- Inverted siphon discharges

As mentioned in Section 2.4.2, the collection system owner or operator should be carrying out routine manhole inspections. The hydrogen sulfide readings generated as a result of these inspections should be added to the records of potential areas of corrosion. A quick check of the pH of the pipe crown or structure enables early indication of potential hydrogen sulfide corrosion. A pH of less than four indicates further investigation is warranted. "Coupons" may be installed in structures or pipelines believed to be potentially subject to corrosion. Coupons are small pieces of steel inserted into the area and measured periodically to determine whether corrosion is occurring.

Reviewer - Point to Note
The reviewer should be aware that a system in which infiltration and inflow (I/I) has successfully been reduced may actually face an increased risk of corrosion. The reviewer should pay particular attention to the hydrogen sulfide monitoring program in these systems.

The reduction of flow through the pipes allows room for hydrogen sulfide gases to rise into the airway portion of the sewer pipe and react with the bacteria and moisture on the pipe walls to form sulfuric acid. Sulfuric acid corrodes ferrous metals and concrete.

There are several methods to prevent or control hydrogen sulfide corrosion. The first is proper design. Design considerations are beyond the scope of this manual but may be found in the *Design Manual: Odor and Corrosion Control in Sanitary Sewerage Systems and Treatment Plants* (EPA 1985). The level of dissolved sulfide in the wastewater may also be reduced by chemical or physical means such as aeration, or the addition of chlorine, hydrogen peroxide, potassium permanganate, iron salts, or sodium hydroxide. Whenever chemical control agents are used, the owner or operator should have procedures for their application and maintain records of the dosages of the various chemicals. Alternatively, sewer cleaning to remove deposited solids reduces hydrogen sulfide generation. Also, air relief valves may be installed at the high points of the force main system. The valve allows air to exit thus avoiding air space at the crown of the pipe where acid can form. The reviewer should examine the records to see that these valves are

receiving periodic maintenance.

Collection systems vary widely in their vulnerability to hydrogen sulfide corrosion. Vitrified clay and plastic pipes are very resistant to hydrogen sulfide corrosion while concrete, steel, and iron pipes are more susceptible. The physical aspects of the collection system are also important. Sewage in pipes on a decline that moves the wastewater at a higher velocity will have less hydrogen sulfide than sewage in pipes where the wastewater may experience longer detention times. Therefore, some systems may need a more comprehensive corrosion control program while some might limit observations to vulnerable points.

2.2.4 Safety

The reasons for development of a safety program should be obvious for any collection system owner or operator. The purpose of the program is to define the principles under which the work is to be accomplished, to make the employees aware of safe working procedures, and to establish and enforce specific regulations and procedures. The program should be in writing (e.g., procedures, policies, and training courses) and training should be well documented.

Point to Note
Although a safety program may not be explicitly required under current NPDES regulations, an excessive injury rate among personnel increases the likelihood of collection system noncompliance with other requirements. Furthermore, when good safety practices are not followed, there may be a risk to the public or to collection system workers.

The purpose of safety training is to stress the importance of safety to employees. Safety training can be accomplished through the use of manuals, meetings, posters, and a safety suggestion program. One of the most common reasons for injury and fatalities in wastewater collection systems is the failure of victims to recognize hazards. Safety training cuts across all job descriptions and should emphasize the need to recognize and address hazardous situations. Safety programs should be in place for the following areas:

- Confined spaces
- Chemical handling
- Trenching and excavations
- Material Safety Data Sheets (MSDS)
- Biological hazards in wastewater
- Traffic control and work site safety
- Lockout/Tagout
- Electrical and mechanical safety
- Pneumatic or hydraulic systems safety

The collection system owner or operator should have written procedures which address all of the

above issues and are made available to employees. In addition to training, safety programs should incorporate procedures to enforce the program. For example, this could include periodic tests or "pop" quizzes to monitor performance and/or compliance and follow-up on safety related incidents.

Reviewer - Point to Note
The reviewer should, in the course of interviewing personnel, determine their familiarity with health and safety procedures according to their job description.

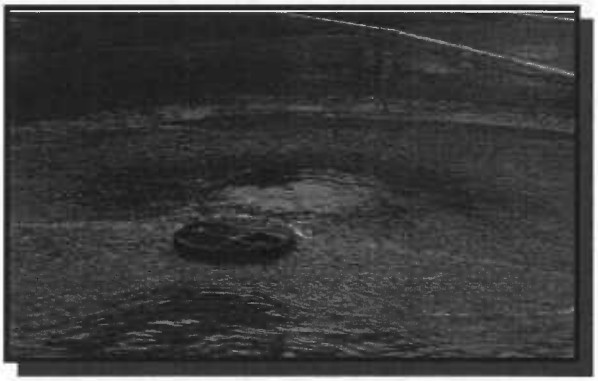
The owner or operator should maintain all of the safety equipment necessary for system staff to perform their daily activities and also undertake any emergency repairs. This equipment should include, at minimum:

- Atmospheric gas testing equipment
- Respirators and/or self-contained breathing apparatus
- Full body harness
- Tripods or non-entry rescue equipment
- Hard hats
- Safety glasses
- Rubber boots
- Rubber and/or disposable gloves
- Antibacterial soap
- First aid kit
- Protective clothing
- Confined space ventilation equipment
- Traffic and/or public access control equipment
- Hazardous gas meter

Each field crew vehicle should have adequate health and safety supplies. If the reviewer has access to the municipal vehicle storage area, he or she might choose to check actual vehicle stocks, not just supplies in storage.

2.2.5 Emergency Preparedness and Response

The collection system owner or operator should have a comprehensive plan in place for dealing with both routine and catastrophic emergencies. Routine emergencies include situations such as overflowing manholes, line breaks, localized electrical failure, and power outages at pump stations. Catastrophic emergencies include floods, tornados, earthquakes, other natural events, serious chemical spills, or widespread electrical



SSOs can include overflows out of manholes onto city streets, sidewalks, and surrounding areas (photo: U.S. EPA).

failure. Ideally, this plan is written, reviewed, and adjusted as needed at periodic intervals.

The reviewer should determine if the emergency response plan generally follows the guidelines described below. The location where the plan is housed may vary but, in general, such a document should be available in the yard office or other building commonly accessible to and frequented by collection system personnel. The emergency preparedness and response procedures may be contained in the collection system's O&M manual, or may be reflected in the descriptions of equipment and unit operations. Putting emergency procedures in a stand-alone document, rather than combining it with other information in the O&M manual, makes it easier for collection system personnel to find information.

The plan should utilize the most current information on the collection system. For larger systems, a structured analysis, or *risk assessment*, should be made of the collection system, treatment plant, and the community. The risk assessment should identify areas where the collection system is vulnerable to failure and determine the effect and relative severity to collection systems operations, equipment and public safety, and health of such a failure. The risk assessment should concentrate on such factors as topography, weather, sewer system size, and other site-specific factors which reflect the unique characteristics of the system. Once the areas of vulnerability are known, the collection system owner or operator should have appropriate plans in place to ensure collection system operations continue for the duration of the emergency.

The plans must clearly identify the steps staff should take in the event of emergency situations. Plans should include information on when it is appropriate to initiate and cease emergency operations. The plans should be very specific as to the collection system or repair equipment involved. Instructions should be available which explain how to operate equipment or systems during an emergency event when they are not functioning as intended but are not fully inoperable. The plan should also include specific procedures for reporting events that result in an overflow or other noncompliance event to the appropriate authorities.

The owner or operator should track emergency situations to become better prepared for future emergencies and to assist with reporting and maintaining compliance with emergency-related requirements. Typical components of an emergency program may include:

- General information regarding emergencies, such as telephone numbers of collection system personnel, fire department, and ambulance.
- Identification of hazards (e.g., chlorine storage areas) and use of universal classification system for hazards: combustible material, flammable liquids, energized electrical circuits, and hazardous materials.
- Vulnerability analysis that identifies the various types of emergencies that could occur, such as natural disasters, power outages, or equipment failures.
- Emergency response procedures.
- Methods to reduce risk of emergencies.
- Responsibilities of staff and management.

- Continuous training.

Procedures for emergency response plans should be understood and practiced by all personnel in order to ensure safety of the public and the collection system personnel responding. Procedures should be specific to the type of emergency that could occur. It is important to keep detailed records of all past emergencies in order to constantly improve response training, as well as the method and timing of future responses. The ability to deal with emergencies depends on the knowledge and skill of the responding crews, in addition to availability of equipment. The crew should be able to rapidly diagnose problems in the field under stress and select the right equipment needed to correct the problem. If resources are limited, consideration should be given to contracting other departments or private industries to respond to some emergency situations, for example, those rare emergencies that would exceed the capacity of staff.

2.2.6 Modeling

Computer programs (modeling programs) are available that are capable of simulating the different flows within the collection system. The purpose of modeling is to determine system capacity requirements with respect to sewer design and structural conditions. Therefore the input of accurate data on sizes, location, elevation, and condition of sewer system components such as pipes, manholes, and pump stations is necessary. When possible, flow monitoring data should be used to calibrate the model.

Reviewer - Point to Note
The reviewer should determine whether a model used by the owner or operator:

- Has user support
- Has adequate documentation such as a user's manual that describes data input requirements, output to be expected, model capabilities and limitations, and hardware

Modeling is also useful in examining effects before and after rehabilitation. For example, models can be applied to "before" and "after" scenarios to estimate the effects of repairs. If a collection system is not experiencing any capacity related issues (i.e., overflows, bypasses, basement backups, street flooding, hydraulic overload at the treatment plant, etc.) then maintenance of a model may be optional for that system, although most medium and large systems should maintain a model of the larger diameter portion of their system. If any of the mentioned conditions are occurring then development and maintenance of a model is essential to performing a capacity assessment in the problem areas.

Computer modeling is a specialized and complex subject. The reviewer may not have a comprehensive knowledge of modeling. If this is the case the he or she should obtain the following basic information:

- Is the owner or operator using a model?
- What areas of the collection system are being modeled and why?
- What model (including the version) is being used? Who developed the model and when?

- How are the modeling results being used?

2.2.7 Mapping

The importance of maintaining accurate, current maps of the collection system cannot be overstated. Efficient collection system maintenance and repairs are unlikely if mapping is not adequate. Collection system maps should clearly indicate the information that personnel need to carry out their assignments. The collection system maps should contain information on the following:

- Main, trunk and interceptor sewers
- Building/house laterals
- Manholes
- Cleanouts
- Force mains
- Pump stations
- Service area boundaries
- Other landmarks (roads, water bodies, etc.)

Collection system maps should have a numbering system which uniquely identifies all manholes and sewer cleanouts. The system should be simple and easy to understand. Manholes and sewer cleanouts should have permanently assigned numbers and never be renumbered. Maps should also indicate the property served and reference its cleanout.

Sewer line maps should indicate the diameter, the length between the centers of manholes, and the slope or direction of flow. The dimensions of easements and property lines should be included on the maps. Other information that should be included on maps are access and overflow points, a scale, and a north arrow. All maps should have the date the map was drafted and the date of the last revision. Although optional, maps often include materials of pipe construction. Maps may come in different sizes and scales to be used for different purposes. Detailed local maps may be used by maintenance or repair crews to perform the duties. However, these detailed local maps should be keyed to one overall map that shows the entire system.

Key Design Characteristics

- Line locations, grades, depths, and capacities
- Maximum manhole spacing and size
- Minimum pipe size
- Pumping Station dimensions and capacities
- Drop manholes
- Flow velocities and calculations (peak flow and low-flow)
- Accessibility features
- Other technical specifications (e.g., materials, equipment)

Geographic Information System (GIS) technology have made the mapping and map updating process considerably more efficient. GIS is a computerized mapping program capable of combining mapping with detailed information about the physical

structures within the collection system. If a GIS program is being used by the owner or operator, the reviewer should ask if the program is capable of accepting information from the owner or operator's management program.

Specific procedures should be established for correction of errors and updating maps and drawings. Field personnel should be properly trained to recognize discrepancies between field conditions and map data and record changes necessary to correct the existing mapping system. Reviewers should check to see that maps and plans are available to the personnel in the office and to field personnel or contractors involved in all engineering endeavors.

2.2.8 New Construction

The owner or operator should maintain strict control over the introduction of flows into the system from new construction. New construction may be public (i.e., an expansion of the collection system) or private (i.e., a developer constructing sewers for a new development). Quality sanitary sewer designs keep costs and problems associated with operations, maintenance, and construction to a minimum. Design flaws are difficult to correct once construction is complete. The reviewer should be aware that this has historically not been adequately addressed in some collection systems. The owner or operator should have standards for new construction, procedures for reviewing designs and protocols for inspection, start-up, testing, and approval of new construction. The procedures should provide documentation of all activities, especially inspection. Reviewers should examine construction inspection records and be able to answer the following:

- Does the volume of records seem reasonable given system size?
- Do records reflect that the public works inspectors are complying with procedures?

The state or other regulatory authority may also maintain standards for new construction. The standards held by the owner or operator should be at least as stringent. Start-up and testing should be in accordance with the manufacturers' recommendation where applicable and with recognized industry practices. Each step of the review, start-up, testing, and approval procedures should be documented.

The owner or operator approval procedure should reflect future ease of maintenance concerns. After construction is complete, a procedure for construction testing and inspection should be used. Construction supervision should be provided by qualified personnel such as a registered professional engineer.

2.2.9 Pump Stations

Proper operation, maintenance, and repair of pump stations typically requires special electrical, hydraulic, and mechanical knowledge. Pump station failure may damage equipment, the environment, or endanger public health. Variation in equipment types, pump station

configuration, and geographical factors determine pump station design and O&M requirements.

The reviewer should verify that the O&M manual contains procedures in writing for the following:

- Are pumps rotated manually or automatically? If manually, how frequently?
- Are wet well operating levels set to limit pump starts and stops?
- Is there a procedure for manipulating pump operations (manually or automatically) during wet weather to increase in-line storage of wet weather flows?
- Is flow monitoring provided? How is the data collected used?
- Does the pump station have capacity-related overflows? Maintenance related overflows? Is overflow monitoring provided?
- Is there a history of power outages? Is there a source of emergency power? If the emergency power source is a generator, is it regularly exercised under load?

2.3 Equipment and Collection System Maintenance

Every collection system owner or operator should have a well-planned, systematic, and comprehensive maintenance program. The goals of a maintenance program should include:

- Prevention of overflows
- Maximization of service and system reliability at minimum cost
- Assurance of infrastructure sustainability (i.e., ensure all components reach their service life)

There should then be procedures which describe the maintenance approach for various systems. In addition, there should be detailed instructions for the maintenance and repair of individual facilities. These instructions should provide a level of detail such that any qualified collection system personnel or repair technician could perform the repair or maintenance activity.

Maintenance may be planned or unplanned. There are essentially two types of planned maintenance; predictive and preventive. Predictive maintenance is a method that tries to look for early warning signs of equipment failure such that emergency maintenance is avoided. Preventive maintenance consists of scheduled maintenance activities performed on a regular basis. There are two types of unplanned maintenance, corrective and emergency. Corrective maintenance consists of scheduled repairs to problems identified under planned or predictive maintenance. Emergency maintenance are activities (typically repairs) performed in response to a serious equipment or line failure where action must be taken immediately. The goal of every owner or operator should be to reduce corrective and emergency maintenance through the use of planned and predictive maintenance. The reviewer should evaluate the progress of the owner or operator in achieving that goal. The goals of the reviewer in assessment of the maintenance program are:

- Identify SSOs caused by inadequate maintenance
- Determine maintenance trends (i.e., frequent emergency maintenance performed as opposed to predictive maintenance)
- Identify sustainability issues (i.e., inadequate maintenance to allow system components to reach service life and/or many components nearing or at service life)

2.3.1 Maintenance Budgeting

The cost of a maintenance program is a significant part of the annual operating budget. The collection system owner or operator should track all maintenance costs incurred throughout the year, both by internal staff and contractors, to ensure that the budget is based on representative costs from past years. Budgets should be developed from past cost records which usually are categorized according to preventive maintenance, corrective maintenance, and projected and actual major repair requirements. Annual costs should be compared to the budget periodically to control maintenance expenditures.

The reviewer should evaluate the maintenance budget keeping in mind the system's characteristics, such as age. Costs for emergency repairs should be a relatively small percentage of the budget; five to ten percent would not be considered excessive. The establishment of an "emergency reserve" may also be included as part of the maintenance budget. This is especially useful where full replacement is not funded. The budget should also be considered in light of maintenance work order backlog. The labor budget should be evaluated for consistency with local pay rates and staffing needs and the reviewer should compare local pay rates and staffing needs according to the tables in Section 2.1.1.

2.3.2 Planned and Unplanned Maintenance

A planned maintenance program is a systematic approach to performing maintenance activities so that equipment failure is avoided. Planned maintenance is composed of predictive and preventive maintenance. In the end, a good planned maintenance program should reduce material and capital repair and replacement costs, improve personnel utilization and morale, reduce SSOs, and sustain public confidence.

Examples of predictive maintenance includes monitoring equipment for early warning signs of impending failure, such as excess vibration, heat, dirty oil, and leakage. Assessment and inspection activities can be classified as predictive maintenance. Vibration and lubrication analyses, thermography, and ultrasonics are among the more common predictive maintenance tools. Predictive maintenance also takes into account historical information about the system as all systems will deteriorate over time. A predictive maintenance program strives to identify potential problem areas and

Reviewer - Point to Note
The reviewer should inquire as to whether tools such as vibration and lubrication analysis, thermography, or ultrasonics are used, and obtain information on the extent of the programs.

uncover trends that could affect equipment performance. Predictive maintenance offers an early warning. It allows collection system personnel to detect early signs of increasing rates of wear and therefore failure, and thus shift a "corrective" task into a "planned" task. To be truly effective predictive, however, maintenance should not spur personnel into doing the work too soon and wasting useful life and value of the equipment in question.

The basis of a good predictive maintenance program is recordkeeping. Only with accurate recordkeeping can baseline conditions be established, problem areas identified, and a proactive approach taken to repairs and replacement.

Effective preventive maintenance minimizes system costs and environmental impacts by reducing breakdowns and thus the need for corrective or emergency maintenance, improves reliability by minimizing the time equipment is out of service, increases the useful life of equipment thus avoiding costly premature replacement, and avoids potential noncompliance situations. An effective preventive maintenance program includes:

- Trained personnel
- Scheduling based on system specific knowledge
- Detailed instructions related to the maintenance of various pieces of equipment
- A system for recordkeeping
- System knowledge in the form of maps, historical knowledge and records

An effective preventive maintenance program builds on the inspection activities and predictive maintenance described in Sections 2.4.1 to 2.4.4, and includes a well thought-out schedule for these activities.

Lubrication

Lubrication is probably one of the most important maintenance activities for mechanical systems, such as pumps and motors. Frequency of lubrication, choice of lubricant and lubrication procedure are all important factors in this activity. These items should closely follow manufacturer instructions, but may be modified to fit site-specific conditions and particular equipment applications.

The basis of the schedule for mechanical equipment maintenance (i.e., pump station components) should be the manufacturers' recommended activities and frequencies. This schedule may then be augmented by the knowledge and experience of collection system personnel to reflect the site-specific requirements. The schedule for sewer line cleaning, inspection, root removal, and repair activities should be based on periodic inspection data. In most systems, uniform frequencies for sewer line cleaning, inspection, and root removal are not necessary and inefficient. In many systems, a relatively small percentage of the pipe generates most of the problems. Efficient use of inspection data allows the owner or operator to implement a schedule in the most constructive manner. In rare cases it may be appropriate to reduce maintenance frequency for a particular piece of equipment. An example of a scheduling code and maintenance schedule for a pump is shown below:

Rotary Pump Maintenance Schedule	
Frequency	**Maintenance Required**
D	Check packing gland assembly
D	Check discharge pressure
S	Inspect and lubricate bearings
A	Flush bearings and replace lubricant

D = Daily A = Annually
S = Semiannually

Typically, there is a maintenance card or record for each piece of equipment within the collection system. These records should contain maintenance recommendations, schedule, and instructions on conducting the specific maintenance activity. The records should include documentation regarding any maintenance activities conducted to date and other observations related to that piece of equipment or system. Maintenance records are generally kept where maintenance personnel have easy access to them. The reviewer should examine the full series of periodic work orders (i.e. weekly, monthly, semiannually, and annually) for a selection of system components (e.g., a few pump stations, several line segments). The reviewer should then compare the recommended maintenance frequency to that which is actually performed. He or she should also look at the backlog of work; not focusing solely on the number of backlogged work orders, but on what that number represents in time. A very large system can have a hundred orders backlogged and only be one week behind. In a computerized system, a listing of all open work orders is usually very simple for collection system personnel to generate. The owner or operator should be able to explain their system for prioritizing work orders.

The reviewer needs to clearly understand the following:

- How the maintenance data management system works
- How work orders are generated and distributed
- How field crews use the work orders
- How data from the field is collected and returned
- How and on whose authority work orders are closed out

The reviewer should check to see if data entry is timely and up to date.

Unplanned maintenance is that which takes place in response to equipment breakdowns or emergencies. Unplanned maintenance may be corrective or emergency maintenance. Corrective maintenance could occur as a result of preventive or predictive maintenance activities which identified a problem situation. A work order should be issued so that the request for corrective maintenance is directed to the proper personnel. An example of non-emergency corrective maintenance could be a broken belt on a belt driven pump. The worn belt was not detected and

replaced through preventive maintenance and therefore the pump is out of service until corrective maintenance can be performed. Although the pump station may function with one pump out of service, should another pump fail, the situation may become critical during peak flow periods.

If the information can be easily generated the reviewer should select a sampling of work orders and compare them to the corrective maintenance database to determine if repairs are being made in a timely manner. Reviewers should note the current backlog of corrective maintenance work orders. A corrective maintenance backlog of two weeks or less would indicate an owner or operator in control of corrective maintenance. The owner or operator should be able to explain corrective maintenance work orders that have not been completed within six months.

Corrective maintenance takes resources away from predictive and preventive maintenance. When corrective maintenance becomes a predominant activity, personnel may not be able to perform planned maintenance, thus leading to more corrective maintenance and emergency situations. Emergency maintenance occurs when a piece of equipment or system fails, creating a threat to public health, the environment, or associated equipment. This type of maintenance involves repairs, on short notice, of malfunctioning equipment or sewers. A broken force main, totally non-functional pump station, and street cave-ins are all examples of emergency situations.

Types of Portable Emergency Equipment

- Bypass pumps
- Portable generator
- Air compressor, trailer-mounted
- Manhole lifters and gas testing equipment
- Sewer rodder and/or flushing machine
- Portable lights and hand tools
- Chemical spray units (for insects and rodent control)
- Truck (1-ton) and trailers
- Vacuum truck
- Repair equipment for excavation (backhoe, shoring equipment, concrete mixers, gasoline operated saws, traffic control equipment, etc.)
- Confined space entry gear

Emergency crews should be geared to a 24-hour-a-day, year-round operation. Most large systems have staffed 24-hour crews; many small systems have an "on-call" system. The owner or operator should be able to produce written procedures which spell out the type of action to take in a particular type of emergency and the equipment and personnel requirements necessary to carry out the action. The crews should have copies of these procedures and be familiar with them. Equipment must be located in an easily accessible area and be ready to move in a short period of time. Vehicles and equipment must be ready to perform, under extreme climatic conditions if necessary. The emergency crew

Reviewer - Point to Note
The reviewer should note the presence of supplies during the review of the yard where equipment and spare parts are maintained and personnel are dispatched.

may need materials such as piping, pipe fittings, bedding materials and concrete. The owner or operator should have supplies on hand to allow for two point (i.e. segment, fitting, or appurtenance) repairs of any part of its system.

Pump stations should be subject to inspection and preventive maintenance on a regular schedule. The frequency of inspection may vary from once a week, for a reliable pump station equipped with a telemetry system, to continuous staffing at a large pump station. The basic inspection should include verification that alarm systems are operating properly, wet well levels are properly set, all indicator lights and voltage readings are within acceptable limits, suction and discharge pressures are within normal limits, that the pumps are running without excessive heat or vibration and have the required amount of lubrication, and that the emergency generator is ready if needed. Less frequent inspections may include such items as vibration analysis and internal inspection of pump components.

Owner or Operator - Point to Note
Occasionally a supervisor should perform an unscheduled inspection to confirm that tasks have been performed as expected.

Observations and tasks performed should be recorded in a log book or on a checklist at the pump station. It is important to note how this data returns to the central maintenance data management system. At the time of the inspection, collection system personnel may perform minor repairs if necessary. If non-emergency repairs are required that are beyond the staff's training, it will probably be necessary to prepare a work order which routs a request though the proper channels to initiate the repair action. During the review the reviewer should check a random number of work orders to see how they move through the system. The reviewer should note whether repairs are being carried out promptly. In pump stations, for critical equipment (pumps, drives, power equipment, and control equipment), there should not be much backlog, unless the staff is waiting for parts.

During the review, the reviewer should also make on-site observations of a representative pump stations. The reviewer should plan at least half an hour to look at the simplest two-pump prefabricated station, and one to two hours to look at a larger station. In large systems, drive time between stations may be significant. The reviewer should strive to see a range of pump station sizes and types (i.e., the largest, smallest, most remote and any that review of work orders has indicated might be problematic).

Overall, the pump station should be clean, in good structural condition and exhibit minimal odor. The reviewer should note the settings of the pumps (i.e., which are operating, which are on stand-by, and which are not operating and why). The operating pumps should be observed for noise, heat, and excessive vibration. The settings in the wet well should be noted (as indicated on the controls, as direct observation of the reviewer in the wet well is not recommended) and the presence of any flashing alarm lights. The reviewer is reminded of the atmospheric hazards in a pump station (make sure ventilation has been running prior to arrival) and to avoid confined

space entry. If the pump station has an overflow its outlet should be observed, if possible, for signs of any recent overflows such as floatable materials or toilet paper. The reviewer should check the log book and/or checklist kept at the pump station to ensure that records are current and all maintenance activities have been performed. Below is a listing of items that indicate inadequate maintenance:

- Overall poor housekeeping and cleanliness
- Excessive grease accumulation in wet well
- Excessive corrosion on railings, ladders, and other metal components
- Sagging, worn, improperly sized, or inadequate belts
- Excessive equipment out of service for repair or any equipment for which repair has not been ordered (i.e., a work order issued)
- Pumps running with excessive heat, vibration, or noise
- Peeling paint and/or dirty equipment (the care given to equipment's outer surfaces often, but not always, mirrors internal condition)
- Check valves not closing when pumps shut off
- Inoperative instrumentation, alarms, and recording equipment
- "Jury-rigged" repairs (i.e., "temporary" repairs using inappropriate materials)
- Leakage from pumps, piping, or valves (some types of pump seals are designed to "leak" seal water)
- Inadequate lighting or ineffective/inoperative ventilation equipment

2.3.3 Sewer Cleaning

The purpose of sewer cleaning is to remove accumulated material from the sewer. Cleaning helps to prevent blockages and is also used to prepare the sewer for inspections. Stoppages in gravity sewers are usually caused by a structural defect, poor design, poor construction, an accumulation of material in the pipe (especially grease), or root intrusion. Protruding traps (lateral sewer connections incorrectly installed so that they protrude into the main sewer) may catch debris which then causes a further buildup of solids that eventually block the sewer. If the flow is less than approximately 1.0 to 1.4 feet per second, grit and solids can accumulate leading to a potential blockage.

Results of Various Flow Velocities

Velocity	Result
2.0 ft/sec	Very little material buildup in pipe
1.4-2.0 ft/sec	Heavier grit (sand and gravel) begin to accumulate
1.0-1.4 ft/sec	Inorganic grit and solids accumulate
Below 1.0 ft/sec	Significant amounts of organic and inorganic solids accumulate

(EPA 1974)

There are three major methods of sewer cleaning: hydraulic, mechanical, and chemical.

Hydraulic cleaning (also referred to as flushing) refers to any application of water to clean the pipe. Mechanical cleaning uses physical devices to scrape, cut, or pull material from the sewer. Chemical cleaning can facilitate the control of odors, grease buildup, root growth, corrosion, and insect and rodent infestation. For additional information on sewer cleaning methods refer to Volumes I and II of *Operation and Maintenance of Wastewater Collection Systems* (CSU Sacramento 1996 and 1998).

Sewer Cleaning Records

- Date, time, and location of stoppage or routine cleaning activity
- Method of cleaning used
- Cause of stoppage
- Identity of cleaning crew
- Further actions necessary and/or initiated
- Weather conditions

The backbone of an effective sewer cleaning program is accurate recordkeeping. Accurate recordkeeping provides the collection system owner or operator with information on the areas of the collection system susceptible to stoppages such that all portions of the system can be on an appropriate schedule. The reviewer should examine the records for legibility and completeness. He or she should then review the database to determine if entry of the field notes is current and accurate.

Root and grease buildup can cause blockages in a sewer system [photo: North Carolina Department of Natural Research (NCDNR)].

Sewers vary widely in their need for preventive cleaning. The collection system in a restaurant district may require cleaning every six months in order to prevent grease blockages. An area of the sewer system with new PVC piping and no significant grease contribution with reasonable and consistent slopes (i.e., no sags) may be able to go five years with no problems.

The owner or operator should be able to identify problem collection system areas, preferably on a map. Potential problem areas identified should include those due to grease or industrial discharges, hydraulic bottlenecks in the collection system, areas of poor design (e.g., insufficiently sloped sewers), areas prone to root intrusion, sags, and displacements. The connection between problem areas in the collection system and the preventive maintenance cleaning schedule should be clear. The owner or operator should also be able to identify the number of stoppages experienced per mile of sewer pipe. If the system is experiencing a steady increase in stoppages, the reviewer should try to determine the cause (i.e., lack of preventive maintenance funding, deterioration of the sewers due to age, an increase in grease producing activities, etc).

2.3.4 Parts and Equipment Inventory

An inventory of spare parts, equipment, and supplies should be maintained by the collection system owner or operator. The inventory should be based on equipment manufacturer's recommendations, supplemented by historical experience with maintenance and equipment problems. Without such an inventory, the collection system may experience long down times or periods of inefficient operation in the event of a breakdown or malfunction.

Basic Equipment Inventory

- Type, age, and description of the equipment
- Manufacturer
- Fuel type and other special requirements
- Operating costs and repair history

Files should be maintained on all pieces of equipment and major tools. The owner or operator should have a system to assure that each crew always has adequate tools. Tools should be subject to sign out procedures to provide accountability. Tools and equipment should be replaced at the end of their useful life. The reviewer should inquire as to how this is determined and how funds are made available to ensure this is the case. In addition, the reviewer should look at the tools and note their condition.

The owner or operator should maintain a yard where equipment, supplies, and spare parts are maintained and personnel are dispatched. Very large systems may maintain more than one yard. In this case, the reviewer should perform a visual survey at the main yard. In small to medium size systems, collection system operations may share the yard with the department of public works, water department, or other municipal agencies. In this case the reviewer should determine what percentage is being allotted for collection system items. The most important features of the yard are convenience and accessibility.

The reviewer should observe a random sampling of inspection and maintenance crew vehicles for equipment as described above. A review of the equipment and manufacturer's manuals aids in determining what spare parts should be maintained. The owner or operator should then consider the frequency of usage of the part, how critical the part is, and finally how difficult the part is to obtain when determining how many of the part to keep in stock. Spare parts should be kept in a clean, well-protected stock room. Critical parts are those which are essential to the operation of the collection system. Similar to equipment and tools management, a tracking system should be in place, including procedures on logging out materials, when maintenance personnel must use them. The owner or operator should be able to produce the spare parts inventory and clearly identify those parts deemed critical. The reviewer should evaluate the inventory and selected items in the stockroom to determine whether the specified number of these parts are being maintained.

Owner or Operator - Point to Note
The owner or operator should have a procedure for determining which spare parts are critical.

2.4 Sewer System Capacity Evaluation - Testing and Inspection

The collection system owner or operator should have a program in place to periodically evaluate the capacity of the sewer system in both wet and dry weather flows and ensure the capacity is maintained as it was designed. The capacity evaluation program builds upon ongoing activities and the everyday preventive maintenance that takes place in a system. The capacity evaluation begins with an inventory and characterization of the system components. The inventory should include the following basic information about the system:

- Population served
- Total system size (feet or miles)
- Inventory of pipe length, size, material and age, and interior and exterior condition as available
- Inventory of appurtenances such as bypasses, siphons, diversions, pump stations, tide or flood gates and manholes, etc., including size or capacity, material and age, and condition as available
- Force main locations, length, size and materials, and condition as available
- Pipe slopes and inverts
- Location of house laterals - both upper and lower

The system then undergoes general inspection (described below in Sections 2.4.1 to 2.4.4) which serves to continuously update and add to the inventory information.

The next step in the capacity evaluation is to identify the location of wet weather related SSOs, surcharged lines, basement backups, and any other areas of known capacity limitations. These areas warrant further investigation in the form of flow and rainfall monitoring and inspection procedures to identify and quantify the problem. The reviewer should determine that the capacity evaluation includes an estimate peak flows experienced in the system, an estimate of the capacity of key system components, and identifies the major sources of I/I that contribute to hydraulic overloading events. The capacity evaluation should also make use of a hydraulic model, if any, to identify areas with hydraulic limitations and evaluate alternatives to alleviate capacity limitations. Short and long term alternatives to address hydraulic deficiencies should be identified, prioritized, and scheduled for implementation.

A sewer inspection is an important part of a sewer system capacity evaluation (photo: N.J. Department of Environmental Protection).

2.4.1 Flow Monitoring

Fundamental information about the collection system is obtained by flow monitoring. Flow monitoring provides information on dry weather flows as well as areas of the collection system potentially affected by I/I. Flow measurement may also be performed for billing purposes, to assess the need for new sewers in a certain area, or to calibrate a model. There are three techniques commonly used for monitoring flow rates: (1) permanent and long-term, (2) temporary, and (3) instantaneous. Permanent installations are done at key points in the collection system such as the discharge point of a satellite collection system, pump stations, and key junctions. Temporary monitoring consists of flow meters typically installed for 30-90 days. Instantaneous flow metering is performed by collection system personnel, one reading is taken and then the measuring device is removed. The collection system owner or operator should have a flow monitoring plan that describes their flow monitoring strategy or should at least be able to provide the following information:

- Purpose of the flow monitoring
- Location of all flow meters
- Type of flow meters
- Flow meter inspection and calibration frequency

A flow monitoring plan should provide for routine inspection, service, and calibration checks (as opposed to actual calibration). In some cases, the data is calibrated rather than the flow meter. Checks should include taking independent water level (and ideally velocity readings), cleaning accumulated debris and silt from the flow meter area, downloading data (sometimes only once per month), and checking the desiccant and battery state. Records of each inspection should be maintained.

Flow measurements performed for the purpose of quantifying I/I are typically separated into three components: base flow, infiltration, and inflow. Base flow is generally taken to mean the wastewater generated without any I/I component. Infiltration is the seepage of groundwater into pipes or manholes through defects such as cracks, broken joints, etc. Inflow is the water which enters the sewer through direct connections such as roof leaders, direct connections from storm drains or yard, area, and foundation drains, the holes in and around the rim of manhole covers, etc. Many collection system owners or operators add a third classification: rainfall induced infiltration (RII). RII is stormwater that enters the collection system through defects that lie so close to the ground surface that they are easily reached. Although not from piped sources, RII tends to act more like inflow than infiltration.

In addition to the use of flow meters, which may be expensive for a small owner or operator, other methods of inspecting flows may be employed such as visually monitoring manholes during low-flow periods to determine areas with excessive I/I. For a very small system, this technique may be an effective and low-cost means of identifying problem areas in the system which require further investigation.

The owner or operator should have in place a program for the efficient identification of excessive I/I. The program should look at the wastewater treatment plant, pump stations, permanent meter flows, and rainfall data to characterize peaking factors for the whole system and major drainage basins. The reviewer should evaluate the program including procedures and records associated with the flow monitoring plan. Temporary meters should be used on a "roving" basis to identify areas with high wet weather flows. Areas with high wet weather flows should then be subject to inspection and rehabilitation activities.

2.4.2 Sewer System Testing

Sewer system testing techniques are often used to identify leaks which allow unwanted infiltration into the sewer system and determine the location of illicit connections and other sources of stormwater inflow. Two commonly implemented techniques include smoke testing and dyed water testing. Regardless of the program(s) implemented by the owner or operator, the reviewer should evaluate any procedures and records that have been established for these programs. The reviewer should also evaluate any public relations program and assess how the owner or operator communicates with the public during these tests (i.e., when there is a possibility of smoke entering a home or building).

Smoke testing is a relatively inexpensive and quick method of detecting sources of inflow in sewer systems, such as down spouts, or driveway and yard drains and works best suited for detecting cross connections and point source inflow leaks. Smoke testing is not typically used on a routine basis, but rather when evidence of excessive I/I already exists. With each end of the sewer of interest plugged, smoke is introduced into the test section, usually via a manhole. Sources of inflow can then be identified when smoke escapes through them.

Areas Usually Smoke Tested

- Drainage paths
- Ponding areas
- Roof leaders
- Cellars
- Yard and area drains
- Fountain drains
- Abandoned building sewers
- Faulty service connections

If the collection system owner or operator implements a regular program of smoke testing, the program should include a public notification procedure. The owner or operator should also have procedures to define:

- How line segments are isolated
- The maximum amount of line to be smoked at one time
- The weather conditions in which smoke testing is conducted (i.e., no rain or snow, little wind and daylight only)

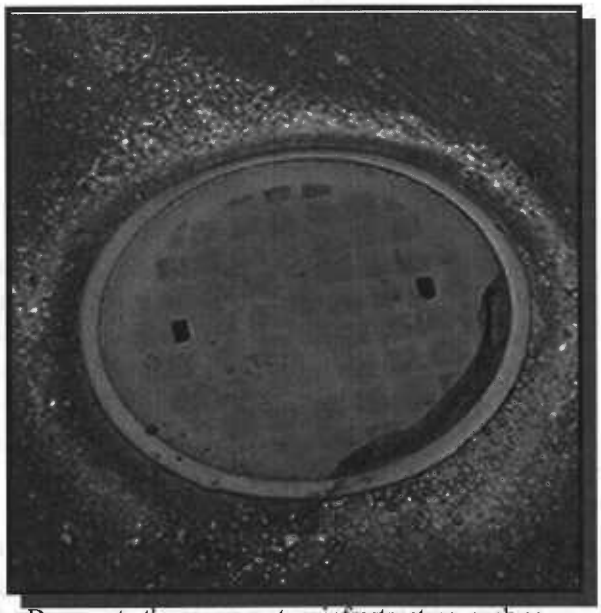
The results of positive smoke tests should be documented with carefully labeled photographs. Building inspections are sometimes conducted as part of a smoke testing program and, in some cases, may be the only way to find illegal connections. If properly connected to the sanitary sewer system, smoke should exit the vent stacks of the surrounding properties. If traces of the

smoke or its odor enter the building, it is an indication that gases from the sewer system may also be entering. Building inspections can be labor intensive and require advanced preparation and communication with the public.

Dyed water testing may be used to establish the connection of a fixture or appurtenance to the sewer. It is often used to confirm smoke testing or to test fixtures that did not smoke. As is the case with smoke testing, it is not used on a routine basis but rather in areas that have displayed high wet weather flows. Dyed water testing can be used to identify structurally damaged manholes that might create potential I/I problems. This is accomplished by flooding the area close to the suspected manholes with dyed water and checking for entry of dyed water at the frame-chimney area, cone/corbel, and walls of the manhole.

2.4.3 Sewer System Inspection

Visual inspection of manholes and pipelines are the first line of defense in the identification of existing or potential problem areas. Visual inspections should take place on both a scheduled basis and as part of any preventive or corrective maintenance activity. Visual inspections provide additional information concerning the accuracy of system mapping, the presence and degree of I/I problems, and the physical state-of-repair of the system. By observing the manhole directly and the incoming and outgoing lines with a mirror, it is possible to determine structural condition, the presence of roots, condition of joints, depth of debris in the line, and depth of flow. The reviewer should examine the records of visual inspections to ensure that the following information is recorded:



Damage to the sewer system infrastructure, such as this broken manhole cover allows stormwater into the sewer system (photo: Limno-Tech, Inc.)

- Manhole identification number and location
- Cracks or breaks in the manhole or pipe (inspection sheets and/or logs should record details on defects)
- Accumulations of grease, debris, or grit
- Wastewater flow characteristics (e.g., flowing freely or backed up)
- Inflow
- Infiltration (presence of clear water in or flowing through the manhole)
- Presence of corrosion
- Offsets or misalignments
- Condition of the frame
- Evidence of surcharge
- Atmospheric hazard measurements (especially hydrogen sulfide)
- If repair is necessary, a notation as to whether a work order has been issued

Manholes should undergo routine inspection typically every one to five years. There should be a baseline for manhole inspections (e.g., once every two years) with problematic manholes being inspected more frequently. The reviewer should conduct visual observation at a small but representative number of manholes for the items listed above.

There are various pipeline inspection techniques, the most common include: lamping, camera inspection, sonar, and CCTV. These will be explained further in the following sections.

2.4.3.1 Sewer System Inspection Techniques

Sewer inspection is an important component of any maintenance program. There are a number of inspection techniques that may be employed to inspect a sewer system. The reviewer should determine if a inspection program includes frequency and schedule of inspections and procedures to record the results. Sewer system cleaning should always be considered before inspection is performed in order to provide adequate clearance and inspection results. Additionally, a reviewer should evaluate records maintained for inspection activities including if information is maintained on standardized logs and should include:

- Location and identification of line being inspected
- Pipe size and type
- Name of personnel performing inspection
- Distance inspected
- Cleanliness of the line
- Condition of the manhole with pipe defects identified by footage from the starting manhole
- Results of inspection, including estimates of I/I

Lamping involves lowering a still camera into a manhole. The camera is lined up with the centerline of the junction of the manhole frame and sewer. A picture is the taken down the pipe with a strobe-like flash. A disadvantage of this technique is that only the first 10-12 feet of the pipe can be inspected upstream and downstream of the access point. Additionally, it has limited use in small diameter sewers. The benefits of this technique include not requiring confined space entry and little equipment and set-up time is required.

Camera inspection is more comprehensive then lamping in that more of the sewer can be viewed. A still camera is mounted on a floatable raft and released into a pipe. The camera takes pictures with a strobe-like flash as it floats through the sewer pipe. This technique is often employed in larger lines where access points are far apart. Similarly to lamping, portions of the pipe may still be missed using this technique. Obviously, there also must be flow in the pipe for the raft to float. This technique also does not fully capture the invert of the pipe and its condition.

Sonar is a newer technology deployed similarly to CCTV cameras, described in more detail below. The sonar emits a pulse which bounces off the walls of the sewer. The time it takes for

this pulse to bounce back provides data providing an image of the interior of the pipe including its structural condition. A benefit of this technique is that it can be used in flooded or inaccessible sections of the sewer. The drawback is that the technique requires heavy and expensive equipment.

Sewer scanner and evaluation is an experimental technology where a 360 degree scanner produces a full digital picture of the interior of the pipe. This technique is similar to sonar in that a more complete image of a pipe can be made than with CCTV, but not all types of sewer defects may be identified as readily (i.e., infiltration, corrosion).

Closed Circuit Television (CCTV) inspections are a helpful tool for early detection of potential problems. This technique involves a closed-circuit camera with a light which is self-propelled or pulled down the pipe. As it moves it records the interior of the pipe. CCTV inspections may be done on a routine basis as part of the preventive maintenance program as well as part of an investigation into the cause of I/I. CCTV, however, eliminates the hazards associated with confined space entry. The output is displayed on a monitor and videotaped. A benefit of CCTV inspection is that a permanent visual record is captured for subsequent reviews.

2.5 Sewer System Rehabilitation

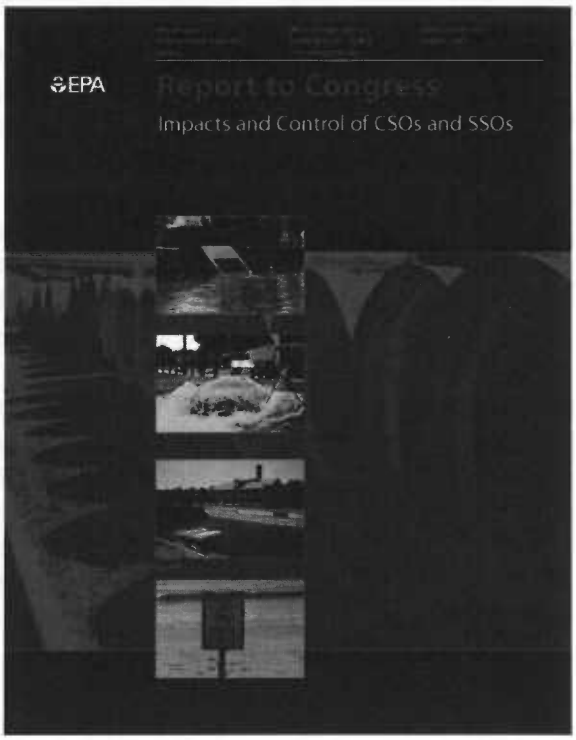
The collection system owner or operator should have a sewer rehabilitation program. The objective of sewer rehabilitation is to maintain the overall viability of a collection system. This is done in three ways: (1) ensuring its structural integrity; (2) limiting the loss of conveyance and wastewater treatment capacity due to excessive I/I; and (3) limiting the potential for groundwater contamination by controlling exfiltration from the pipe network. The rehabilitation program should build on information obtained as a result of all forms of maintenance and observations made as part of the capacity evaluation and asset inventory to assure the continued ability of the system to provide sales and service at the least cost. The reviewer should try to gain a sense of how rehabilitation is prioritorized. Priorities may be stated in the written program or may be determined through interviews with system personnel.

There are many rehabilitation methods. The choice of methods depends on pipe size, type, location, dimensional changes, sewer flow, material deposition, surface conditions, severity of I/I, and other physical factors. Non-structural repairs typically involve the sealing of leaking joints in otherwise sound pipe.

Structural repairs involve either the replacement of all or a portion of a sewer line, or the lining of the sewer. These repairs can be carried out by excavating usually for repairs limited to one or two pipe segments (these are known as point repairs) or by trenchless technologies (in which repair is carried out via existing manholes or a limited number of access excavations).

The rehabilitation program should identify the methods that have been used in the past, their success rating and methods to be used in the future. An reviewer who wants further guidance on methods of rehabilitation may consult:

- Technology Description from 2004 Report to Congress (EPA 2004)
- *Operation and Maintenance of Wastewater Collection Systems,* Volumes I and II (CSU Sacramento 1996 and 1998)
- *Existing Sewer Evaluation and Rehabilitation* (WEF 1994)



The reviewer should determine the owner's or operator's policies regarding service lateral rehabilitation since service laterals can constitute a serious source of I/I. Manholes should not be neglected in the rehabilitation program. Manhole covers can allow significant inflow to enter the system because they are often located in the path of surface runoff. Manholes themselves can also be a significant source of infiltration from cracks in the barrel of the manhole.

The owner or operator should be able to produce documentation on the location and methods used for sewer rehabilitation. The reviewer should compare the rehabilitation accomplished with that recommended by the capacity evaluation program. When examining the collection system rehabilitation program, the reviewer should be able to answer the following questions:

- Is rehabilitation taking place before it becomes emergency maintenance?
- Are recommendations made as a result of the previously described inspections?
- Does the rehabilitation program take into account the age and condition of the sewers?

CHAPTER 3. CHECKLIST FOR CONDUCTING EVALUATIONS OF WASTEWATER COLLECTION SYSTEM CAPACITY, MANAGEMENT, OPERATION, AND MAINTENANCE (CMOM) PROGRAMS

The following is a comprehensive checklist available for use in the review process. The checklist consists of a series of questions organized by major categories and sub-categories. The major category is followed by a brief statement describing the category. Following the sub-category is a brief clarifying statement. References are then given.

Questions are provided in a table format that includes the question, response, and documentation available.

Response is completed by using information and data acquired from the data and information request, onsite interviews, and site reviews. An alternative to this process is to transmit the entire checklist to the collection system owner or operator to complete and return electronically.

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I. General Information - Collection System Description

Question	Response	Documentation Available	
		Yes	No
Size of service area (acres).			
Population of service area.			
Number of pump stations.			
Feet (or miles) of sewer.			
Age of system (e.g., 30% over 30 years, 20% over 50 years, etc.).			

Comments:

II. Continuing Sewer Assessment Plan

Question	Response	Documentation Available	
		Yes	No
Does the collection system experience problems related to I/I? How do these problems manifest themselves? (Manhole overflows, basement flooding, structure, SSOs)			
How does the owner or operator prioritize investigation, repairs and rehabilitation related to I/I?			
What methods are considered to remedy hydraulic deficiencies?			
Does the plan include a schedule for investigative activities?			
Is the plan regularly updated?			

Comments:

III. A. Collection System Management: Organizational Structure

Question	Response	Documentation Available	
		Yes	No
Is an organizational chart available that shows the overall personnel structure for the collection system, including operation and maintenance staff?			
Are there organizational charts that show functional groups and classifications?			
Are up to date job descriptions available that delineate responsibilities and authority for each position?			
Are the following items discussed in the job descriptions: ☐ nature of work to be performed, ☐ minimum requirements for the position, ☐ necessary special qualifications or certifications, ☐ examples of the types of work, ☐ list of licences required for the position, ☐ performance measures or promotional potential?			
Does the organizational chart indicate how many positions are budgeted as opposed to actually filled?			
On average, how long do positions remain vacant?			
Are collection system staff responsible for any other duties, (e.g., road repair or maintenance, O&M of the storm water collection system)?			

Comments:

III. B. Collection System Management: Training

Question	Response	Documentation Available	
		Yes	No
Is there a documented formal training program?			
Does the training program address the fundamental mission, goals, and policies of the collection system owner or operator?			
Does the owner or operator provide training in the following areas: ☐ safety, ☐ routine line maintenance, ☐ confined space entry, ☐ traffic control, ☐ record keeping, ☐ electrical and instrumentation, ☐ pipe repair, ☐ bursting CIPP, ☐ public relations, ☐ SSO/emergency response, ☐ pump station operations and maintenance, ☐ CCTV and trench/shoring, ☐ other?			
Which of these programs have formal curriculums?			
Does On-the-Job (OJT) training use Standard Operating and Standard Maintenance Procedures (SOPs & SMPs)?			
Is OJT progress and performance measured?			
Does the owner or operator have mandatory training requirements identified for key employees?			
What percentage of employees met or exceeded their annual training goals during the past year?			
Which of the following methods are used to assess the effectiveness of the training: ☐ periodic testing, ☐ drills, ☐ demonstration, ☐ none?			
What percentage of the training offered by the owner or operator is in the form of the following: manufacturer training, on-the-job training, in-house classroom training, industry-wide training?			

Comments:

III. C. Collection System Management: Communication and Customer Service

Question	Response	Documentation Available	
		Yes	No
What type of public education/outreach programs does the owner or operator have about user rates?			
Do these programs include communication with groups such as local governments, community groups, the media, schools, youth organizations, senior citizens? List applicable groups.			
Is there a public relations program in place?			
Are the employees of the collection system trained in public relations?			
Are there sample correspondence or "scripts" to help guide staff through written or oral responses to customers?			
What methods are used to notify the public of major construction or maintenance work: ☐ door hangers, ☐ newspaper, ☐ fliers, ☐ signs, ☐ other, ☐ none?			
Is the homeowner notified prior to construction that his/her property may be affected?			
Is information provided to residents on cleanup procedures following basement backups and overflows from manholes when they occur?			
Which of the following methods are used to communicate with system staff: ☐ regular meetings, ☐ bulletin boards, ☐ e-mail, ☐ other?			
How often are staff meetings held (e.g., daily, weekly, monthly)?			
Are incentives offered to employees for performance improvements?			
Does the owner or operator have an "Employee of the Month/Quarter/Year" program?			

Question	Response	Documentation Available	
		Yes	No
How often are performance reviews conducted (e.g., semi-annually, annually, etc.)?			
Does the owner or operator regularly communicate with other municipal departments?			
Does the owner or operator have a formal procedure in place to evaluate and respond to complaints?			
What are the common complaints received?			
Does the owner or operator have a process for customer evaluation of the services provided?			
Do customer service records include the following information: ☐ personnel who received the complaint or request, ☐ nature of complaint or request, ☐ to whom the follow-up action was assigned, ☐ date of the complaint or request, ☐ date the complaint or request was resolved, ☐ customer contact information, ☐ location of the problem, ☐ date the follow-up action was assigned, ☐ cause of the problem, ☐ feedback to customer?			
Does the owner or operator have a goal for how quickly customer complaints (or emergency calls) are resolved?			
What percentage of customer complaints (or emergency calls) are resolved within the timeline goals?			
How are complaint records maintained? (i.e., computerized) Is this information used as the basis for other activities such as routine preventative maintenance?			

Comments:

III. D. Collection System Management: Management Information Systems

Question	Response	Documentation Available	
		Yes	No
What types of work reports are prepared by the O&M Staff?			
Do the work reports include enough information? (See example report forms)			
How are records kept?			
Are records maintained for a period of at least three years?			
Are the records able to distinguish activities taken in response to an overflow event?			
Does the owner or operator use computer technology for its management information system? (Computer Based Maintenance Management Systems, spreadsheets, data bases, SCADA, etc). If so, what type of system(s) is used?			
Are there written instructions for managing and tracking the following information: ☐ complaint work orders, ☐ scheduled work orders, ☐ customer service, ☐ scheduled preventative maintenance, ☐ scheduled inspections, ☐ sewer system inventory, ☐ safety incidents, ☐ scheduled monitoring/sampling, ☐ compliance/overflow tracking, ☐ equipment/tools tracking, ☐ parts inventory?			
Do the written instructions for tracking procedures include the following information: ☐ accessing data and information, ☐ instructions for using the tracking system, ☐ updating the MIS, ☐ developing and printing reports?			
How often is the management information system updated (immediately, within one week of the incident, monthly as time permits)?			

Comments:

III. E. Collection System Management: SSO Notification Program

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have standard procedures for notifying state agencies, health agencies, the regulatory authority, and the drinking water purveyor of overflow events?			
Are above notification procedures dependent on the size or location of the overflow? If so, describe this procedure.			
Is there a Standard form for recording overflow events? Does it include location, type, receiving water, estimated volume, cause?			
Are chronic SSO locations posted?			

Comments:

III. F. Collection System Management: Legal Authority

Question	Response	Documentation Available	
		Yes	No
Does the collection system receive flow from satellite communities?			
What is the total area from satellite communities that contribute flow to the collection system (acres or square miles)?			
Does the owner or operator require satellite communities to enter into an agreement?			
Does the agreement include the requirements listed in the sewer use ordinance (SUO)?			
Do the agreements have a date of termination and allow for renewal under different terms?			
Does the owner or operator maintain the legal authority to control the maximum flow introduced into the collection system from satellite communities?			
Are standards, inspections, and approval for new connections clearly documented in a SUO?			
Does the SUO require satellite communities to adopt the same industrial and commercial regulator discharge limits as the owner or operator?			
Does the SUO require satellite communities to adopt the same inspection and sampling schedules as required by the pretreatment ordinance?			
Does the SUO require the satellite communities or the owner or operator to issue control permits for significant industrial users?			
Does the SUO contain provisions for addressing overstrength wastewater from satellite communities?			
Does the SUO contain procedures for the following: inspection standards, pretreatment requirements, building/sewer permit issues?			

Does the SUO contain general prohibitions of the following materials: ☐ fire and explosion hazards, ☐ oils or petroleum, ☐ corrosive materials, ☐ materials which may cause interference at the wastewater treatment plant, ☐ obstructive materials?			
Does the SUO contain procedures and enforcement actions for the following: ☐ fats, oils, and grease (FOG); ☐ I/I; building structures over the sewer lines; ☐ storm water connections to sanitary lines; ☐ defects in service laterals located on private property; ☐ sump pumps, air conditioner?			

Comments:

IV. A. Collection System Operation: Budgeting

Question	Response	Documentation Available	
		Yes	No
What are the owner or operator's current rates?			
What is the average annual fee for residential users?			
How are user rates calculated?			
How often are user charges evaluated and adjusted based on that evaluation?			
How many rate changes have there been in the last 10 years and what were they?			
Does the owner or operator receive sufficient funding from its revenues?			
Are collection system enterprise funds used for non-enterprise fund activities?			
Is there a budget for annual operating costs?			
Does the budget provide sufficient line item detail for labor, materials and equipment?			
Are costs for collection system O&M separated from other utility services, i.e., water, storm water and treatment plants?			
Do O&M managers have current O&M budget data?			
What is the collection system's average annual O&M budget?			
What percentage of the collection system's overall budget is allocated to maintenance of the collection system?			
Does the owner or operator have a Capital Improvement Plan (CIP) that provides for system repair/replacement on a prioritized basis?			
What is the collection system's average annual CIP budget?			

Question	Response	Documentation Available	
		Yes	No
What percentage of the maintenance budget is allotted to the following maintenance: Predictive maintenance (tracking design, life span, and scheduled parts replacement), preventative maintenance (identifying and fixing system weakness which, if left unaddressed, could lead to overflows), corrective maintenance (fixing system components that are functioning but not at 100% capacity/efficiency), emergency maintenance (reactive maintenance, overflows, equipment breakdowns).			
Does the owner or operator have a budgeted program for the replacement of under-capacity pipes?			
Does the owner or operator have a budgeted program for the replacement of over-capacity pipes?			
Are O&M staff involved in O&M budget preparation?			
How are priorities determined for budgeting for O&M during the budget process?			
Does the owner or operator maintain a fund for future equipment and infrastructure replacement?			
How is new work typically financed?			

Comments:

IV. B. Collection System Operation: Compliance

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have inter-jurisdictional or inter-municipal agreements?	Already asked		
Is there a sewer-use and a grease ordinance?			
Is there a process in place for enforcing sewer and grease ordinances?			
Are all grease traps inspected regularly?			
How does the owner or operator learn of new or existing unknown grease traps?			
Who is responsible for enforcing the sewer ordinance and grease ordinance? Does this party communicate with the utility department on a regular basis?			
Are there any significant industrial dischargers to the system?			
Is there a pretreatment program in place? If so, please describe.			
Is there an ordinance dealing with private service laterals?			
Is there an ordinance dealing with storm water connections or requirements to remove storm water connections?			

Comments:

IV. C. Collection System Operation: Water Quality Monitoring

Question	Response	Documentation Available	
		Yes	No
Is there a water quality monitoring program in the service areas?			
If so, who performs the monitoring?			
How many locations are monitored?			
What parameters are monitored and how often?			
Is water quality monitored after an SSO event?			
Are there written standard sampling procedures available?			
Is analysis performed in-house or by a contract laboratory?			
Are chain-of-custody forms used?			

Comments:

IV. D. Collection System Operation: Hydrogen Sulfide Monitoring and Control

Question	Response	Documentation Available	
		Yes	No
Are odors a frequent source of complaints? How many?			
Are the locations of the frequent odor complaints documented?			
What is the typical sewer slope? Does the owner or operator take hydrogen sulfide corrosion into consideration when designing sewers?			
Does the collection system owner or operator have a hydrogen sulfide problem, and if so, does it have in place corrosion control programs? What are the major elements of the program?			
Does the owner or operator have written procedures for the application of chemical dosages?			
Are chemical dosages, dates, and locations documented?			
Does the owner or operator have a program in place for renewing or replacing severely corroded sewer lines to prevent collapse?			
Are the following methods used for hydrogen sulfide control: ☐ aeration, ☐ iron salts, ☐ enzymes, ☐ activated charcoal canisters, ☐ chlorine, ☐ sodium hydroxide, ☐ hydrogen peroxide, ☐ potassium permanganate, ☐ biofiltration, ☐ others?			
Does the system contain air relief valves at the high points of the force main system?			
How often are th valves maintained and inspected (weekly, monthly, etc.)?			
Does the owner or operator enforce pretreatment requirements?			

Comments:

IV. E. Collection System Operation: Safety

Question	Response	Documentation Available	
		Yes	No
Is there a documented safety program supported by the top administration official?			
Is there a Safety Department that provides training, equipment, and an evaluation of procedures?			
If not, who provides safety training?			
Does the owner or operator have written procedures for the following: ☐ lockout/tagout, ☐ MSDS, ☐ chemical handling, ☐ confined spaces permit program, ☐ trenching and excavations, ☐ biological hazards in wastewater, ☐ traffic control and work site safety, ☐ electrical and mechanical systems, ☐ pneumatic and hydraulic systems safety?			
What is the agency's lost-time injury rate(percent or in hours)?			
Is there a permit required confined space entry procedure for manholes, wetwells, etc.? Are confined spaces clearly marked?			
Are the following equipment items available and in adequate supply: ☐ rubber/disposable gloves; ☐ confined space ventilation equipment; ☐ hard hats, ☐ safety glasses, ☐ rubber boots; ☐ antibacterial soap and first aid kit; ☐ tripods or non-entry rescue equipment; ☐ fire extinguishers; ☐ equipment to enter manholes; ☐ portable crane/hoist; ☐ atmospheric testing equipment and gas detectors; ☐ oxygen sensors; ☐ H_2S monitors; ☐ full body harness; ☐ protective clothing; ☐ traffic/public access control equipment; ☐ 5-minute escape breathing devices; ☐ life preservers for lagoons; ☐ safety buoy at activated sludge plants; ☐ fiberglass or wooden ladders for electrical work; ☐ respirators and/or self-contained breathing apparatus; ☐ methane gas or OVA analyzer; ☐ LEL metering?			
Are safety monitors clearly identified?			
How often are safety procedures reviewed and revised?			

Question	Response	Documentation Available	
		Yes	No
Are workplace accidents investigated?			
How does the Administration communicate with field personnel on safety procedures; memo, direct communication, video, etc.?			
Is there a Safety Committee with participation by O&M staff? How often does it meet?			
Is there a formal Safety Training Program? Are records of training maintained?			

Comments:

IV. F. Collection System Operation: Emergency Preparedness and Response

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have an emergency response plan? A contingency plan?			
How often is the plan reviewed and updated? What was the date it was last updated?			
Does the plan take into consideration vulnerable points in the system, severe natural events, failure of critical system components, vandalism or other third party events, and a root cause analysis protocol?			
Are staff trained and drilled to respond to emergency situations? Are responsibilities detailed for all personnel who respond to emergencies?			
Are there emergency operation procedures for equipment and processes?			
Does the owner or operator have standard procedures for notifying state agencies, local health departments, the regulatory authority, and drinking water authorities of significant overflow events?			
Does the procedure include an up-to-date list of the names, titles, phone numbers, and responsibilities of all personnel involved?			
Do work crews have immediate access to tools and equipment during emergencies?			
Is there a public notification plan? If so, does it cover both regular business hours and off-hours?			
Does the owner or operator have procedures to limit public access to and contact with areas affected with SSOs?			
Does the owner or operator use containment techniques to protect the storm drainage systems?			

Do the overflow records include the following information: ☐ date and time, ☐ cause(s), ☐ names of affected receiving water(s), ☐ location, ☐ how it was stopped, ☐ any remediation efforts, ☐ estimated flow/volume discharged, ☐ duration of overflow?			
Does the owner or operator have signage to keep public from affected area?			
Is there a hazard classification system? Where is it located?			
Does the owner or operator conduct vulnerability analyses?			
Are risk assessments performed? How often?			

Comments:

IV. G. Collection System Operation: Modeling

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have a hydraulic model of the collection system including pump stations? What model is used?			
What uses does the model serve (predicting flow capacity, peak flows, force main pressures, etc.)?			
Does the model produce results consistent with observed conditions?			
Is the model kept up to date with respect to new construction and repairs that may affect hydraulic capacity?			

Comments:

IV. H. Collection System Operation: Engineering - System Mapping and As-built Plans (Record Drawings)

Question	Response	Documentation Available	
		Yes	No
What type of mapping/inventory system is used?			
Is the mapping tied to a GPS system?			
Are "as-built" plans (record drawings) or maps available for use by field crews in the office and in the field?			
Do field crews record changes or inaccuracies and is there a process in place to update "as built" plans (record drawings)?			
Do the maps show the date the map was drafted and the date of the last revision?			
Do the sewer line maps include the following: ☐ scale; ☐ north arrow; ☐ date the map was drafted; ☐ date of the last revision; ☐ service area boundaries; ☐ property lines; ☐ other landmarks; ☐ manhole and other access points; ☐ location of building laterals; ☐ street names; ☐ SSOs/CSOs; ☐ flow monitors; ☐ force mains; ☐ pump stations; ☐ lined sewers; ☐ main, trunk, and interceptor sewers; ☐ easement lines and dimensions; ☐ pipe material; ☐ pipe diameter; ☐ pipe diameter; ☐ installation date; ☐ slope; ☐ manhole rim elevation; ☐ manhole coordinates; ☐ manhole invert elevation; ☐ distance between manholes?			
Are the following sewer attributes recorded: ☐ size, ☐ shape, ☐ invert elevation, ☐ material, ☐ separate/combined sewer, ☐ installation date?			
Are the following manhole attributes recorded: ☐ shape, ☐ type, ☐ depth, ☐ age, ☐ material?			
Is there a systematic numbering and identification method/system established to identify sewer system manhole, sewer lines, and other items (pump stations, etc.)?			

Comments:

IV. I. Collection System Operation: Engineering - Design

Question	Response	Documentation Available	
		Yes	No
Is there a document which details design criteria and standard construction details?			
Is life cycle cost analysis performed as part of the design process?			
Is there a document that describes the procedures that the owner or operator follows in conducting design review? Are there any standard forms that are used as a guide?			
Are O&M staff involved in the design review process?			
Does the owner or operator have documentation on private service lateral design and inspection standards?			
Does the owner or operator attempt to standardize equipment and sewer system components?			

Comments:

IV. J. Collection System Operation: Engineering - Capacity

Question	Response	Documentation Available	
		Yes	No
What procedures are used in determining whether the capacity of existing gravity sewer system, pump stations and force mains are adequate for new connections?			
Is any metering of flow performed prior to allowing new connections?			
Is there a hydraulic model of the system used to predict the effects of new connections?			
Is there any certification as to the adequacy of the sewer system to carry additional flow from new connections required?			

Comments:

IV. K. Collection System Operation: Engineering - Construction

Question	Response	Documentation Available	
		Yes	No
Who constructs new sewers? If other than the owner or operator, does the owner or operator review and approve the design?			
Is there a document that describes the procedures that the owner or operator follows in conducting their construction inspection and testing program?			
Are there any standard forms that guide the owner or operator in conducting their construction inspection and testing program?			
Is new construction inspected by the owner or operator or others?			
What are the qualifications of the inspector(s)?			
What percentage of time is a construction inspector on site?			
Is inspection supervision provided by a registered professional engineer?			
How is the new gravity sewer construction tested? (Air, water, weirs, etc.)			
Are new manholes tested for inflow and infiltration?			
Are new gravity sewers televised?			
What tests are performed on pump stations?			
What tests are performed on force mains?			
Is new construction built to standard specifications established by the owner or operator and/or the State?			
Is there a warranty for new construction? If so, is there a warranty inspection done at the end of this period?			

Comments:

IV. L. Collection System Operation: Pump Station Operation

Question	Response	Documentation Available	
		Yes	No
How many pump stations are in the system? How many have backup power sources?			
Are enough trained personnel assigned to properly maintain pump stations?			
Are these personnel assigned full-time or part-time to pump station duties?			
Are there manned and un-manned pump stations in the system? How many of each?			
Is there a procedure for manipulating pump operations (manually or automatically during wet weather to increase in-line storage of wet weather flows?			
Are well-operating levels set to limit pump start/stops?			
Are the lead, lag, and backup pumps rotated regularly?			

Comments:

IV. L. 1. Collection System Operation: Pump Stations - Inspection

Question	Response	Documentation Available	
		Yes	No
How often are pump stations inspected?			
What work is accomplished during inspections?			
Is there a checklist?			
Are records maintained for each inspection?			
What are the average annual labor hours spent on pump station inspections?			
Are there Standard Operating Procedures (SOPs) and Standard Maintenance Procedures (SMPs) for each station?			
What are the critical operating characteristics maintained for each station? Are the stations maintained within these criteria?			

Comments:

IV. L. 2. Collection System Operation: Pump Stations - Emergencies

Question	Response	Documentation Available	
		Yes	No
Is there an Emergency Operating Procedure for each pump station?			
Is there sufficient redundancy of equipment in all pump stations?			
Who responds to lift station failures and overflows? How are they notified?			
How is loss of power at a station dealt with? (i.e. on-site electrical generators, alternate power source, portable electric generator(s))			
What equipment is available for pump station bypass?			
What process is used to investigate the cause of pump station failure and take necessary action to prevent future failures?			

Comments:

IV. L. 3. Collection System Operation: Pump Stations - Emergency Response and Monitoring

Question	Response	Documentation Available	
		Yes	No
How are lift stations monitored?			
If a SCADA system is used, what parameters are monitored?			

Comments:

IV. K. Collection System Operation: Engineering - Construction

Question	Response	Documentation Available	
		Yes	No
Who constructs new sewers? If other than the owner or operator, does the owner or operator review and approve the design?			
Is there a document that describes the procedures that the owner or operator follows in conducting their construction inspection and testing program?			
Are there any standard forms that guide the owner or operator in conducting their construction inspection and testing program?			
Is new construction inspected by the owner or operator or others?			
What are the qualifications of the inspector(s)?			
What percentage of time is a construction inspector on site?			
Is inspection supervision provided by a registered professional engineer?			
How is the new gravity sewer construction tested? (Air, water, weirs, etc.)			
Are new manholes tested for inflow and infiltration?			
Are new gravity sewers televised?			
What tests are performed on pump stations?			
What tests are performed on force mains?			
Is new construction built to standard specifications established by the owner or operator and/or the State?			
Is there a warranty for new construction? If so, is there a warranty inspection done at the end of this period?			

Comments:

IV. L. Collection System Operation: Pump Station Operation

Question	Response	Documentation Available	
		Yes	No
How many pump stations are in the system? How many have backup power sources?			
Are enough trained personnel assigned to properly maintain pump stations?			
Are these personnel assigned full-time or part-time to pump station duties?			
Are there manned and un-manned pump stations in the system? How many of each?			
Is there a procedure for manipulating pump operations (manually or automatically during wet weather to increase in-line storage of wet weather flows?			
Are well-operating levels set to limit pump start/stops?			
Are the lead, lag, and backup pumps rotated regularly?			

Comments:

IV. L. 1. Collection System Operation: Pump Stations - Inspection

Question	Response	Documentation Available	
		Yes	No
How often are pump stations inspected?			
What work is accomplished during inspections?			
Is there a checklist?			
Are records maintained for each inspection?			
What are the average annual labor hours spent on pump station inspections?			
Are there Standard Operating Procedures (SOPs) and Standard Maintenance Procedures (SMPs) for each station?			
What are the critical operating characteristics maintained for each station? Are the stations maintained within these criteria?			

Comments:

IV. L. 2. Collection System Operation: Pump Stations - Emergencies

Question	Response	Documentation Available	
		Yes	No
Is there an Emergency Operating Procedure for each pump station?			
Is there sufficient redundancy of equipment in all pump stations?			
Who responds to lift station failures and overflows? How are they notified?			
How is loss of power at a station dealt with? (i.e. on-site electrical generators, alternate power source, portable electric generator(s))			
What equipment is available for pump station bypass?			
What process is used to investigate the cause of pump station failure and take necessary action to prevent future failures?			

Comments:

IV. L. 3. Collection System Operation: Pump Stations - Emergency Response and Monitoring

Question	Response	Documentation Available	
		Yes	No
How are lift stations monitored?			
If a SCADA system is used, what parameters are monitored?			

Comments:

IV. L. 4. Collection System Operation: Pump Stations - Recordkeeping

Question	Response	Documentation Available	
		Yes	No
Are operations logs maintained for all pump stations?			
Are manufacturer's specifications and equipment manuals available for all equipment?			
Are pump run times maintained for all pumps?			
Are elapsed time meters used to assess performance?			

Comments:

IV. L. 5. Collection System Operation: Pump Stations - Force Mains and Air/Vacuum Valves

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator regularly inspect the route of force mains?			
Does the owner or operator have a program to regularly assess force main condition?			
Is there a process in place to investigate the cause of force main failures?			
Does the owner or operator have a regular maintenance/inspection program for air/vacuum valves?			
Have force main failures been caused by water hammer?			

Comments:

V. A. Equipment and Collection System Maintenance: Maintenance Budgeting

Question	Response	Documentation Available	
		Yes	No
How does the collection system owner or operator track yearly maintenance costs?			
Is there a maintenance cost control system?			
Are maintenance costs developed from past cost records?			
How does the owner or operator categorize costs? Preventive? Corrective? Projected Costs? Projected Repair?			
How does the owner or operator control expenditures?			

Comments:

V. B. Equipment and Collection System Maintenance: Planned Maintenance

Question	Response	Documentation Available	
		Yes	No
Are preventive maintenance tasks and frequencies established for all pump stations and equipment?			
How were preventive maintenance frequencies established?			
What percentage of the operator's time is devoted to planned as opposed to unplanned maintenance?			
What predictive maintenance techniques are used as part of PM program?			
Is there a formal procedure to repair or replace pump stations and equipment when useful life is reached?			
Has an energy audit been performed on pump station electrical usage?			
Is an adequate parts inventory maintained for all equipment?			
Is there a sufficient number of trained personnel to properly maintain all stations?			
Who performs mechanical and electrical maintenance?			
Are there Standard Maintenance Procedures (SMPs) for each station?			

Comments:

V. C. Equipment and Collection System Maintenance: Maintenance Scheduling

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator plan and schedule preventive and corrective maintenance activities?			
Is there an established priority system? Who sets priorities for maintenance?			
Is a maintenance card or record kept for each piece of mechanical equipment within the collection system?			
Do equipment maintenance records include the following information: ☐ maintenance recommendations, ☐ instructions on conducting the specific maintenance activity, ☐ other observations on the equipment, ☐ maintenance schedule, ☐ a record of maintenance on the equipment to date.			
Are dated tags used to show out-of-service equipment?			
Is maintenance backlog tracked?			
How is O&M performance tracked and measured?			
What percent of repair finds are spent on emergency repairs?			
Are corrective repair work orders backlogged more than six months?			
Is maintenance performed for other public works divisions?			
How are priorities determined for this work?			
How is this work funded?			
Are maintenance logs maintained for all pump stations?			

Comments:

V. D. Equipment and Collection System Maintenance: Maintenance Right-of-Way

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator perform scheduled maintenance on Rights-of-Way and Easements?			
Does the owner or operator monitor street paving projects?			
Does the owner or operator have a program to locate and raise manholes (air valves, etc) as needed?			
How are priorities determined?			
How is the effectiveness of the maintenance schedule measured?			

Comments:

V. E. Equipment and Collection System Maintenance: Sewer Cleaning

Question	Response	Documentation Available	
		Yes	No
Is there a routine schedule for cleaning sewer lines on a system wide basis, *e.g.*, at the rate of once every seven to twelve years or a rate of between 8% and 14% per year?			
What is the owner or operator's goals for annual system cleaning?			
What percent of the sewer lines are cleaned, even high/repeat cleaning trouble spots, during the past year?			
Is there a program to identify sewer line segments that have chronic problems and should be cleaned on a more frequent schedule?			
What is the average number of stoppages experienced per mile of sewer pipe per year?			
Has the number of stoppages increased, decreased, or stayed the same over the past five years?			
Are stoppages diagnosed to determine the cause?			
Are stoppages plotted on maps and correlated with other data such as pipe size and material, or location?			
Do the sewer cleaning records include the following information: ☐ date and time, ☐ cause of stoppage, ☐ method of cleaning, location of stoppage or routine cleaning activity, ☐ identity of cleaning crew, ☐ further actions necessary/initiated?			
If sewer cleaning is done by a contractor are videos taken of before and after cleaning?			

Comments:

V. E. 1. Equipment and Collection System Maintenance: Sewer Cleaning - Cleaning Equipment

Question	Response	Documentation Available	
		Yes	No
What type of cleaning equipment does the owner or operator use?			
How many cleaning units of each type does the owner or operator have? What is the age of each?			
How many cleaning crews and shifts does the owner or operator employ?			
How many cleaning crews are dedicated to preventive maintenance cleaning?			
How many cleaning crews are dedicated to corrective maintenance cleaning?			
What has the owner or operator's experience been regarding pipe damage caused by mechanical equipment?			
Where is the equipment stationed?			

Comments:

V. E. 2. Equipment and Collection System Maintenance: Sewer Cleaning - Chemical Cleaning and Root Removal

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have a root control program?			
Does the owner or operator have a FOG program?			
Are chemical cleaners used?			
What types of chemical cleaners are used?			
How often are they applied?			
How are the chemical cleaners applied?			
What results are achieved through the use of chemical cleaners?			

Comments:

V. F. Equipment and Collection System Maintenance: Parts Inventory

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have a central location for the storage of spare parts?			
Have critical spare parts been identified?			
Are adequate supplies on hand to allow for two point repairs in any part if the system?			
Is there a parts standardization policy in place?			
Does the owner or operator maintain a stock of spare parts on its maintenance vehicles?			
What method(s) does the owner or operator employ to keep track of the location, usage, and ordering of spare parts? Are parts logged out when taken by maintenance personnel for use?			
Does the owner or operator salvage specific equipment parts when equipment is placed out-of-service and not replaced?			
How often does the owner or operator conduct a check of the inventory of parts to ensure that their tracking system is working?			
Who has the responsibility of tracking the inventory?			
For those parts which are not kept in inventory, does the owner or operator have a readily available source or supplier?			

Comments:

V. G. Equipment and Collection System Maintenance: Equipment and Tools Management

Question	Response	Documentation Available	
		Yes	No
Is there a list of equipment and tools used for operation and maintenance?			
Do personnel feel they have access to the necessary equipment and tools to do all aspects of operation and maintenance of the collection system?			
Is there access to suitable equipment if the owner or operator's equipment is down for repair?			
Does the owner or operator own or have access to portable generators?			
Where does the owner or operator store its equipment?			
Is a detailed equipment maintenance log kept?			
Are written equipment maintenance procedures available?			
What is the procedure for equipment replacement?			
Are the services of an in-house vehicle and equipment maintenance services used?			
What is the typical turnaround time for equipment and vehicle maintenance?			

Comments:

VI. Management Information Systems: Performance Indicators

Question	Response	Documentation Available	
		Yes	No
How many sanitary sewer overflows (SSOs) have occurred in the last 5 years? How many less than 1,000 gallons?			
Does the owner or operator document and report all SSOs regardless of size?			
Does the owner or operator document basement backups?			
Are there areas that experience basement or street flooding?			
How many SSOs have reached "Waters of the US"? Is there a record?			
Approximately, what percent of SSOs discharge were from each of the following in the last 5 years: manholes, pump stations, main and trunk sewers, lateral and branch sewers, structural bypasses?			
What is the per capita wastewater flow for the maximum month and maximum week or day?			
What is average annual influent BOD?			
What is the ratio of maximum wet weather flow to average dry weather flow?			
Approximately, what percent of SSO discharge were caused by the following in the last 5 years: debris buildup, collapsed pipe, root intrusion, capacity limitations, excessive infiltration and inflow, FOG, vandalism?			
What percent of SSOs were released to: soil; surface water; basements; paved areas; coastal, ocean, or beach areas; rivers, lakes or streams?			
For surface water releases, what percent are to surface waters that could affect: contact recreation, shellfish growing areas, drinking water sources?			
How many chronic SSO locations are in the collection system?			

Are pipes with chronic SSOs being monitored for sufficient capacity and/or structural condition?			
Prior to collapse, are structurally deteriorating pipelines being monitored for renewal or replacement?			
What is the annual number of mainline sewer cave-ins? What was the cause (i.e. pipe corrosion, leaks, etc.)			
What other types of performance indicators does the owner or operator use?			

Comments:

VII. A. Sewer System Capacity Evaluation (SSES): Internal TV Inspection

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator use internal T.V. inspection? If so please describe the program.			
Do the internal TV record logs include the following: ☐ pipe size, type, length, and joint spacing; ☐ distance recorded by internal TV; ☐ results of the internal TV inspection; ☐ internal TV operator name; ☐ cleanliness of the line; ☐ location and identification of line being televised by manholes?			
Is a rating system used to determine the severity of the defects found during the inspection process?			
Is there documentation explaining the codes used for internal TV results reporting?			
Approximately what percent of the total defects determined by TV inspection during the past 5 years were the following:			
Are main line and lateral repairs checked by internal TV inspection after the repair(s) have been made?			

Comments:

VII. B. SSES: Survey and Rehabilitation (general)

Question	Response	Documentation Available	
		Yes	No
Have SSES's been performed in the past? If so, is documentation available?			
Has any sewer rehabilitation work been done in the past 15 years? If so, please describe?			
Does the owner or operator have standard procedures for performing SSES work?			
Do the SSES reports include recommendations for rehabilitation, replacement, and repair?			
Were defects identified in the SSES repaired?			
Does the owner or operator have a multi-year Capital Improvements Program that includes rehabilitation, replacement, and repair?			
How are priorities established for rehabilitation, replacement, and repair?			
Has the owner or operator established schedules for performing recommended rehabilitation, both short term and long term?			
Has funding been approved for the recommended rehabilitation?			
Is post rehabilitation flow monitoring used to assess the success of the rehabilitation?			

Comments:

VII. C. SSES: Sewer Cleaning Related to I/I Reduction

Question	Response	Documentation Available	
		Yes	No
Are sewers cleaned prior to flow monitoring?			
Are sewers cleaned prior to internal T.V. inspection?			
When cleaning, is debris removed from the system?			

Comments:

VII. D. SSES: Flow Monitoring

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have a flow monitoring program? If so, please describe.			
Does the owner or operator have a comprehensive capacity assessment and planning program?			
Are flows measured prior to allowing new connections?			
Number of permanent meters? Number of temporary meters?			
What type(s) of meters are used?			
Number of rain gauges?			
How frequently are flow meters checked?			
Do the flow meter checks include: ☐ independent water level, ☐ checking the desiccant, ☐ velocity reading, ☐ cleaning away debris, ☐ downloading data, ☐ battery condition?			
Are records maintained for each inspection?			
Do the flow monitoring records include: ☐ descriptive location of flow meter, ☐ type of flow meter, ☐ frequency of flow meter inspection, ☐ frequency of flow meter calibration?			
Are flow data used for billing, capacity analysis, and/or I/I investigations?			
What is the ratio of peak wet weather flow to average dry weather flow at the wastewater treatment plant?			
Does the owner or operator have any wet weather capacity problems?			
Are low points or flood-plain areas monitored during rain events?			
Does the owner or operator have any dry weather capacity problems?			

VII. E. SSES: Smoke Testing and Dyed Water Flooding

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have a smoke testing program to identify sources of inflow and infiltration into the system including private service laterals and illegal connections? If so please describe.			
Are there written procedures for the frequency and schedule of smoke testing?			
Is there a documented procedure for isolating line segments?			
Is there a documented procedure for notifying local residents that smoke testing will be conducted in the area?			
What is the guideline for the maximum amount of line to be tested at one time?			
Are there guidelines for the weather conditions under which smoke testing should be conducted?			
Do the written records contain location, address, and description of the smoking element that produced a positive result?			
What follow-up occurs as a result of positive results for smoke or dye testing?			
Is there a goal for the percent of the system smoke tested each year?			
What percent of the system has been smoke tested over the past year?			
Does the owner or operator have a dyed water flooding program If so please describe.			
Is there a goal for the percent of the system dye tested each year?			
What percent of the system has been dye tested over the past year?			
Does the owner or operator share smoke and dye testing equipment with another owner or operator?			

Comments:

VII. F. SSES: Manhole Inspection

Question	Response	Documentation Available	
		Yes	No
Does the owner or operator have a routine manhole inspection and assessment program?			
What is the purpose of the inspection program?			
Does the owner or operator have a goal for the number of manholes inspected annually?			
How many manholes were inspected during the past year?			
Do the records for manhole/pipe inspection include the following: ☐ conditions of the frame and cover; ☐ evidence of surcharge; offsets or misalignments; ☐ atmospheric hazards measurements; ☐ details on the root cause of cracks or breaks in the manhole or pope including blockages; ☐ recording conditions of corbel, walls, bench, trough, and pipe seals; ☐ presence of corrosion, if repair is necessary; ☐ manhole identifying number/location; wastewater flow characteristics; ☐ accumulations of grease, debris, or grit; ☐ presence of infiltration, location, and estimated quantity; ☐ inflow from manhole covers?			
Are manholes susceptible to inflow identified and inspected on a regular frequency?			
Is there a data management system for tracking manhole inspection activities?			
What triggers whether a manhole needs rehabilitation?			
Does the owner or operator have a multi-year Capital Improvements Program that includes rehabilitation, replacement, and repair of manholes?			
How are priorities established for rehabilitation, replacement, and repair of manholes?			
Has the owner or operator established schedules for performing rehabilitation, both short term and long term of manholes?			

Question	Response	Documentation Available	
		Yes	No
Has funding been approved for the rehabilitation of manholes?			
Does the owner or operator have a grouting program?			

Comments:

VIII. A. Rehabilitation: Manhole Repairs

Question	Response	Documentation Available	
		Yes	No
What rehabilitation techniques are used for manhole repairs?			
How are priorities determined for manhole repairs?			
What type of documentation is kept?			
Does the owner or operator use manhole inserts?			
Are they used system wide or only on low lying manholes?			

Comments:

VIII. B. Rehabilitation: Mainline Sewers

Question	Response	Documentation Available	
		Yes	No
What type of main line repairs has the owner or operator used in the past?			
Does the owner or operator currently use any of above techniques for main line repairs? What other techniques is the owner or operator presently using?			
How are priorities established for main line repairs?			
What type of follow-up is performed after the repair (e.g., CCTV)?			

Comments:

Appendix A

EXAMPLE
COLLECTION SYSTEM PERFORMANCE
INDICATOR DATA
COLLECTION FORM

EXAMPLE
COLLECTION SYSTEM PERFORMANCE INDICATOR DATA COLLECTION FORM

I. General Information

A. Agency Name _____

B. Agency Address
Street _____
City _____ State _____ Zip _____

C. Contact Person _____

D. Telephone: Voice _____ Fax _____ Email _____

E. Data provided for latest fiscal/calendar year, 20___

II. Collection System Description

A. Service Area _____ Square miles

B. Population Served _____

C. System Inventory

Miles of gravity sewer	Miles of force main	Number of maintenance access structures	Number of pump stations	Number of siphons	Number of air, vacuum, or air/vacuum relief valves

D. Number of Service Connections:
Residential _____ Commercial _____ Industrial _____ Total _____

E. Lateral Responsibility (check one)
1. At main line connection only _____
2. From main line to property line or easement/cleanout _____
3. Beyond property line/cleanout _____
4. Other _____

F. System combined (storm and sanitary)? Yes ___ No ___ If yes, % combined ____

G. Average Annual Precipitation _____ inches

H. System Flow Characteristics (total for service area)

Peak Dry Weather Flow (MGD)	Peak Wet Weather Flow (MGD)	Average Daily Flow (MGD)

III. Special Conditions

A. Indicate local conditions that are accounted for during design, construction, operation, and maintenance of the collection system.

1. Precipitation: Yes ____ No ____ If yes, provide brief explanation _____
   _____
   _____

2. Terrain: Yes ____ No ____ If yes, provide brief explanation_____
   _____

3. Soils: Yes ____ No ____ If yes, provide brief explanation _____
   _____

4. Temperature: Yes ____ No ____ If yes, provide brief explanation _____
   _____

5. Groundwater: Yes ____ No ____ If yes, provide brief explanation _____
   _____

6. Geology: Yes ____ No ____ If yes, provide brief explanation _____
   _____

7. Other: _____
   _____

B. Is corrosion a significant problem? Yes ___ No ___
   - Is there a corrosion control program in place? Yes ___ No ___

C. Is odor a significant problem? Yes ___ No ___
   - Is there an odor control program in place? Yes ___ No ___

D. Is grease a significant problem? Yes ___ No ___
   - Is there a grease control program in place? Yes ___ No ___

E. Are roots a significant problem? Yes ___ No ___
   - Is there a root control program in place? Yes ___ No ___

IV. Age Distribution of Collection System

Age	Gravity Sewer, miles	Force Mains, miles or feet	Number of Pump Stations
0 - 25 years			
26 - 50 years			
51 - 75 years			
> 76 years			

V. Size Distribution of Collection System

Diameter in inches	Gravity Sewer, miles	Force Mains, miles or feet
8 inches or less		
9 - 18 inches		
19 - 36 inches		
> 36 inches		

VI. Distribution of Gravity Sewer By Material

A. Vitrified Clay Pipe (VCP) _____ Miles
B. Reinforced Concrete Pipe (RCP) _____ Miles
C. Unreinforced Concrete Pipe (CP) _____ Miles
D. Plastic (all types) _____ Miles
E. Brick _____ Miles
F. Other _____ Miles
G. Other _____ Miles
H. Other _____ Miles

VII. Distribution of Force Mains By Material

(circle one)

A. Reinforced Concrete Pipe (RCP) _____ miles or feet
B. Prestressed Concrete Cylinder Pipe (PCCP) _____ miles or feet
C. Asbestos Cement Pipe (ACP) _____ miles or feet
D. Polyvinyl Chloride (PVC) _____ miles or feet
E. Steel _____ miles or feet
F. Ductile Iron _____ miles or feet
G. Cast Iron _____ miles or feet
H. Techite (RPMP) _____ miles or feet
I. High Density Polyethylene (HDPE) _____ miles or feet
J. Fiberglass Reinforced Plastic (FRP) _____ miles or feet
K. Other _____ miles or feet

VIII. Preventive Maintenance of System

A. Physical Inspection of Collection System, Preventive Maintenance

Inspection Activity	Total Annual Labor Hours Expended for This Activity	Total Completed (Miles of Pipe or Manholes Inspected Annually)	Crew Size (s)
CCTV			
Visual Manhole Inspection, Surface Only			
Visual Manhole Inspection, Remove Cover			
Visual Gravity Line Inspection, Surface Only			
Visual Force Main Inspection, Surface Only			
Other (Sonar, etc.)			

B. Mechanical and Hydraulic Cleaning, Preventive Maintenance

Cleaning Activity	Total Annual Labor Hours Expended for This Activity	Total Annual Labor Hours Expended for Scheduled PM	Total Miles Cleaned Annually	Crew Size (s)	Range of Pipe Diameters Cleaned
Hydraulic Jet					
Bails, Kites, Scooters					
Combination Machines					
Rod Machines					
Hand Rodding					
Bucket Machines					
Chemical Root Control					
Chemical or Biological Grease Control					

IX. Dry Weather Stoppages

A. Number of stoppages, annually _____
B. Average time to clear stoppage _____
C. Number of stoppages resulting in overflows and/or backups annually _____
D. Total quantity of overflow(s) _____
E. Is there an established procedure for problem diagnosis? Yes ____ No ____
F. Are future preventive measures initiated based on diagnosis? Yes ____ No ____
G. What equipment is available for emergency response? _____

X. Repairs and Rehabilitation, Proactive

A. Number of annual spot repairs identified _____
B. Number of annual spot repairs completed _____
C. Percent of spot repairs contracted _____
D. Number of manholes identified for rehabilitation _____
E. Number of manholes rehabilitated annually _____
F. Percent of manhole repairs contracted _____
G. Feet of main line needing rehabilitation _____
H. Feet of main line rehabilitated _____
I. Percent of main line rehabilitation contracted _____
J. Number of manholes scheduled for rehabilitation under Capital Improvement Program (s) _____
K. Feet of main line scheduled for rehabilitation under Capital Improvement Program (s) _____

XI. Repairs and Rehabilitation, Reactive

A. Number of annual line features _____
B. Number of line repairs _____

XII. Pump Stations

A. Number of pump stations inspected _____
   - Frequency of inspections _____ (daily, every other day, weekly)
B. Number of inpsection crews _____
C. Crew size _____
D. Number of pump stations with pump capacity redundancy _____
E. Number of pump stations with backup power sources _____
F. Number of pump stations with dry weather capacity limitations _____
G. Number of pump stations with wet weather capacity limitations _____
H. Number of pump stations calibrated annually _____
I. Number of pump stations with permanent flowmeters _____
J. Number of pump stations with remote status monitoring _____
K. Number of pump stations with running time meters _____
L. Number of mechanical maintenance staff assigned to mechanical maintenance _____
M. Number of electrical maintenance staff assigned to electrical maintenance _____
N. Total labor hours scheduled annually for electrical and mechanical PM tasks _____
O. Total labor hours expended annually for electrical and mechanical PM tasks _____

XIII. Pump Station Failures, Dry Weather

A. Number of failures resulting in overflows/bypass or backup, annually _____
B. Total quantity of overflow/bypass _____ Gallons or MG
C. Average time to restore operational capability _____ hours
D. Total labor hours expended for electrical and mechanical corrective maintenance tasks _____
E. Is failure mode and effect diagnosed? Yes ___ No ___
F. Are future preventive measures initiated based on diagnosis? Yes ___ No ___
G. What equipment is available for emergency response? _____

XIV. Force Mains

A. Force mains inspected annually _____ miles or feet (visual surface inspection of alignment)
B. Force mains monitored annually _____ miles or feet (pressure profile, capacity)
C. Number of force main failures annually _____
D. Cause(s) of force main failures _____
_____

XV. Air Relief/Vacuum Valves

A. What is frequency of valve inspections? _____
B. What is frequency of PM (backflushing, etc)? _____
C. Number of annual valve failures _____
D. Cause(s) of valve failures _____
_____

XVI. System Operation and Maintenance Efficiency

A. Total full time or full time equivalent staff assigned to O & M (excluding administration staff but including line managers, supervisors) _____
B. Total estimated labor hours actually expended for active O & M tasks (this is the total above less hours for sick, vacation, holidays, training, breaks, etc., not directly related to performing O & M tasks) _____

XVII. Level of Service

A. Average annual rate for residential users _____
B. Rate based on: water consumption _____ Flat rate _____ Other _____
C. Number of complaints annually _____
D. Number of complaints that are agency responsibility _____
E. Number of public health or other warnings issued annually _____
F. Number of claims for damages due to backups annually _____
G. Total cost of claims settled annually _____

XVIII. Financial

A. Total annual revenue received from wastewater _____
1. % of revenue for long-term debt _____
2. % of revenue for treatment and disposal _____
3. % of revenue for collection and conveyance _____
B. Current value of collection system assets _____
C. Annual O & M expenditure _____
D. Annual CIP expenditure for repair, replacement, or rehabilitation _____
E. Annual O & M training budget _____
F. Total number of O & M personnel (including administrative in O & M department) _____
G. Number of personnel with collection system certification _____
H. Number of personnel qualified for collection system certification _____
I. Amount of O & M budget allocated for contracted services _____
J. Hydroflush cost per foot _____
K. Rodding cost per foot _____
L. Bucketing cost per foot _____
M. CCTV cost per foot _____
N. Spot repairs, cost each _____

XIX. Safety

A. Total labor hours assigned to O & M _____
B. Number of lost time injuries _____
C. Total lost time days _____
D. Total cost of lost time injuries _____

XX. Regulatory

A. Total number of violations issued annually _____
B. Total cost of fines paid annually _____
C. What is minimum reportable quantity in gallons? _____
D. What is time reporting requirement? _____
E. Number of annual WWTP upsets due to wet weather flow _____

XXI. General

A. Has SSES been performed on system? Yes _____ No _____
B. Total O & M positions currently budgetd _____
C. Total O & M positions currently filled _____
D. Is computerized maintenance management system (s) used for O & M managing? Yes ___ No ___

E. Is GIS system used for O & M managing? Yes _____ No _____

XXII. Procedures or Other Documentation Available

A. Overflow, bypass and containment Yes _____ No _____
B. Problem evaluation and solution Yes _____ No _____
C. Cleanup procedure Yes _____ No _____
D. Failure mode and effect procedure Yes _____ No _____
E. O & M budget process Yes _____ No _____
F. O & M budget with line item detail Yes _____ No _____
G. Long-range CIP planning for system expansion, rehabilitation, and replacement Yes ____ No ___
H. Is there a written procedure for cleanup to mitigate effect of overflow? Yes _____ No _____
I. Is there a written procedure for containing overflows and bypasses? Yes _____ No _____
J. Is there an established procedure for containing overflows and bypasses? Yes _____ No _____
K. Is there an established procedure for problem evaluation and solution? Yes _____ No _____
L. Is there an established procedure for cleanup to mitigate effect of overflow? Yes _____ No ____
M. Is there a grease control program? Yes _____ No _____
N. Is there a pretreatment program? Yes _____ No _____
O. Is there a private source I/I reduction program? Yes _____ No _____
P. Do you have chronic O & M problems that are designed into your system? Yes _____ No _____
If yes, provide brief description _____
_____

Q. Do you have chronic O & M problems that are constructed into your system? Yes _____ No ____
If yes, provide brief description _____
_____

R. How would you rate your construction inspection program?
Very effective _____ Needs improvement _____ Poor _____

XXIII. Definitions/Clarifications

A. Maintenance access structures, most commonly manholes, in your system that are incorporated into your O & M program.

B. Pump capacity redundancy is the ability to maintain pumping at design capacity with the largest pump out of service.

C. Remote status monitoring is any remote monitoring system such as alarm telemetry or SCADA that provides remote pump station status information.

D. You will notice that in the section on stoppages and pump station failures, we are asking for dry weather incidents only. Dry weather system performance is a good indicator or effectiveness of O & M program. If you have wet weather information that you wish to provide also, please do.

E. Under the Special Conditions sections we are identifying conditions that are present in your system that require consideration during design, construction, and O & M of your system.

F. Any of the questions dealing with labor hours are designed to determine total labor hours irrespective of crew size or crews that are only assigned to cleaning, for example, less than full time.

G. Our goal is to obtain data that can be or are standardized and that are accurate. We also realize that some data may not be available; however, data can be accurately estimated. If you estimate data please follow with an (E).

H. If data is not available please indicate "NA." If data does not apply to your system, please indicate by "DNA."

I. Failure mode and effect refers to any established procedure you have to diagnose system failures to determine the cause and effect of the failure. This can apply to crews clearing stoppages or to pump station failures.

J. Pump station inspection (XII) means scheduled inspection by operators to verify station operation and perform PM. It excludes electrical or mechanical craft maintenance.

K. Stoppage in section IX refers only to stoppages other than pump stations. Pump stations are covered in Section XIII. Backup in this case refers to a basement or other structure backup as opposed to main line sewer backup.

XXIV. Additional Comments

Appendix B

EXAMPLE INTERVIEW SCHEDULE AND TOPICS

EXAMPLE INTERVIEW SCHEDULE AND TOPICS

Days 1 and 2 Interviews

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time, and Location
Senior Management	Discuss project expectations, report review and comment process. Overview of organizational structure and "culture". Identify sensitive issues and how to approach. Schedule			
Project Kick off Meeting	Overview and purpose of project. Interview and field assessment process. Report content and review process. Questions and answers	None		
Physical Inspection and Testing – Gravity sewer system	Visual Inspection, pipe alignment. CCTV Smoke and Dye Testing Other	Reports, inspection forms, performance data, inspection strategy, crew assignments and schedules, equipment available, current expenditures and budgeted amounts, area maps, Standard Operating Procedures, field maps.		

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time, and Location
Preventive Maintenance - Mechanical and hydraulic cleaning	High velocity jets and combination machines. Other hydraulic methods Rodding Machines Bucket Machines	Reports, performance data, preventive maintenance cleaning strategy, crew assignments and schedules, equipment available, current and budgeted, problem areas, Standard Operating Procedures, Standard Maintenance Procedures, problem diagnosis		
Chemical and biological cleaning	Root control Grease control Odor control Corrosion control	Grease control ordinance, enforcement, odor and corrosion control strategy, root control program, design for O&M considerations, materials used (MSDS), reports, performance data, preventive maintenance cleaning strategy, crew assignments and schedules, equipment available, current and budgeted, problem areas, Standard Operating Procedures, Standard Maintenance Procedures, problem diagnosis, public education, enforcement		
Pump Stations	Routine inspection Electrical and mechanical maintenance SCADA Standby/emergency systems Valves Forcemains	Logs, inspection sheets, Standard Maintenance Procedures, Standard Operating procedures, pump station inventory and attribute data base, spares inventory, Reports, performance data, preventive maintenance strategy, crew assignments and schedules, equipment available, current and budgeted, critical pump stations, Standard Operating Procedures, Standard Maintenance Procedures, problem diagnosis, preventive and predictive maintenance methods, maintenance tasks and frequencies, O&M manuals, capacity issues		

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time, and Location
Training and Certification	Training program, technical, supervisory and management. Certification program	Knowledge, skills and abilities, basic skills, career paths, minimum qualifications, certification, educational assistance program, internal and external training, OJT, training budget		
Work Management	Planning and scheduling work Materials management Priority Backlog management Procurement Manual or Computer Maintenance Management System (CMMS)	Complaints and emergencies normal hours and after hours. Corrective, preventive and predictive maintenance work orders, work backlog, labor utilization, reports,		

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time, and Location
Safety	Safety committee Safety meetings Safety enforcement Documentation of comprehensive safety training Compliance with safety regulations Documentation of effectiveness of safety program (e.g., reduction of accidents) Documentation of attendance and learning at safety training sessions	Policy and procedures for trenching, confined space, lockout tagout, PPE. Safety manual, formal training, tracking, accident investigation		
Financial	Annual O&M Budget Rates CIP for rehabilitation/rehab Non-enterprise fund allocations	O&M budget process, line item accounts, five year CIP plan, repair, rehabilitation, replacement strategy for pipes and pump stations		

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time, and Location
Construction and Repair	Emergency repair Spot repairs, gravity system Rehabilitation Lateral installation Inspection New Construction Testing	Reports, inspection forms, performance data, inspection strategy, crew assignments and schedules, equipment available, current and budgeted, area maps, Standard Operating Procedures, field maps,		
Fleet Management	Maintenance Replacement Availability Budgeting	Inventory, repair and replacement process, maintenance turn around time, preventive maintenance, Standard Operating Procedures, Standard Maintenance Procedures, CMMS,		

Day 3 - Field

Pump Stations

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time and Location
Pump Station Maintenance	Submersible Cast in place wet well dry well Prefabricated Grinder/Low Pressure System	Logs, O&M manuals, on-site procedures, vehicles and equipment, SCADA, Supervisory controls, electrical systems, flow meters, HVAC, variable speed systems, chronic problems, pumps and hydraulic systems.		

Day 4 – Field

Facilities and Crews

Work Practice or Maintenance Function	Description	Examples of Discussion Topics and Supporting Documents	Name	Interview Date, Time and Location
Facilities	Electrical and mechanical repair shops and equipment Warehouse and equipment storage areas Vehicle maintenance shops Crew areas; locker rooms, training areas, dispatch areas	Logs, O&M manuals, on-site procedures, vehicles and equipment, SCADA, Supervisory controls, electrical systems, flow meters, HVAC, variable speed systems, chronic problems, pumps and hydraulic systems,		
Crews Exit Interview	CCTV Cleaning Construction Repair Overview of findings for week	N/A None		

Appendix C

INFORMATION SOURCES

Information Sources
(Updated November 2004)

WEBSITES (water and/or wastewater-oriented; financial related)

EPA National Compliance Assistance Clearinghouse	www.epa.gov/clearinghouse
Compliance Assistance Centers	http://www.assistancecenters.net
Construction Industry Compliance Assistance Center	www.cicacenter.org
EPA NPDES website	http://www.epa.gov/npdes
EPA Operator On-Site Technical Assistance Program–104(g) (hands-on assistance to small municipal WWTP operators at no cost to community)	www.epa.gov/owm/mab/smcomm/104g/sstc.htm
EPA Office of Wastewater Management	www.epa.gov/owm
EPA Clean Water Tribal Grant Program	www.epa.gov/owm/mab/indian/cwisa.htm
EPA Colonias Program	www.epa.gov/owm/mab/mexican
EPA Clean Water State Revolving Loan Fund Program	www.epa.gov/owm/cwfinance/cwsrf
EPA Website (Headquarters & Regions)	www.epa.gov/
EPA Small Business Gateway	http://www.epa.gov/smallbusiness
Environmental Finance Center	http://sspa.boisestate.edu/efc
National Environmental Services Center/WV University	www.nesc.wvu.edu
Local Govt. Environmental Assistance Network	www.lgean.org
Rural Community Assistance Program (RCAP)	www.rcap.org
Water Environment Federation (WEF)	www.wef.org
AMSA	www.amsa-cleanwater.org/pubs/
American Water Works Assoc. (AWWA)	http://www.awwa.org/
National Association of Towns & Townships (NATAT)	http://www.natat.org/

PUBLICATIONS /TRAINING VIDEOS /NEWSLETTERS, etc.

EPA National Service Center For Environmental Publications (NSCEP)
USEPA/NSCEP
PO Box 42419
Cincinnati, OH 45242
Tele: 1-800-490-9198 or 513-489-8190 (fax: 513-489-8695)

EPA Office of Water Resource Center
Tele: 202-566-1729 (24 hours)
center.water-resources@epa.gov

National Environmental Services Center (formerly the National Small Flows Clearinghouse)
West Virginia University Small Business Gateway
P.O. Box 6064
Morgantown, WV 26506
Tele: 1-800-624-8301

California State University - Sacremento
Tele: 916-278-6142
(training videos, etc.)

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U.S. EPA Office of Water. 1983. *Procedures Manual for Reviewing a POTW Pretreatment Program Submission. EPA*-833-B-83-200.

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EPA Region 4
Guide to
Collection and Transmission System
Management, Operation, and Maintenance Programs

Version 1.1

PURPOSE & DISCLAIMER

This document is the work product of the EPA Region 4, Water Protection Division, Clean Water Enforcement Branch (CWEB) and supercedes a previous draft dated September 2003 (Version 1.0). This document serves as an introduction for new Region 4 inspectors in the CWEB Municipal Infrastructure Enforcement Program and contains descriptive information for utilities conducting self-assessments in the Region 4 Management, Operation, and Maintenance (MOM) Programs Project.

The MOM Programs Project is conducted in compliance with EPA Policy, EPA Guidance, and Rules and Regulations promulgated under the Clean Water Act. If some statement or part of the document is not in compliance with the Act, EPA Policy, EPA Guidance or the Rules and Regulations, then it should not be construed as conveying rights not conveyed by the Clean Water Act, EPA Policy, or the Rules and Regulations.

October 2011

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INTRODUCTION

A utility should develop an appropriate, comprehensive Management, Operation and Maintenance (MOM) Program for the sewerage infrastructure (sewer system and wastewater treatment plant) which it owns and operates. A comprehensive MOM Program is comprised of individual management, operation, and maintenance programs, each of which:

- is specific to, and tailored for, the utility's infrastructure;
- has a written purpose explaining why the program is needed; has specific written goal(s) establishing the accomplishment(s) desired for the current fiscal year;
- has the details of the activities and procedures that are followed to implement the program written down in the form of Standard Management Procedures (SP), Standard Operating Procedures (SOP), and/or Standard Maintenance Procedures (SMP) that are used by the utility's personnel;
- is implemented by well-trained personnel; has established appropriate performance measures which are tracked by management; and,
- has a written procedure requiring periodic review, evaluation, and any necessary revision.

An important concept is that MOM programs are utility-specific. Most, if not all, of the programs described in this guide are based on actual programs observed at proactive utilities. However, utilities may have different titles for the various MOM programs described in this guide and may have them organized very differently. Some utilities may be organized in a way that they consolidate some of the MOM programs described in this guide, or they may exclude part of a program described in this guide because of justifiable circumstances. Utilities may also have additional MOM programs that are not contained in this guide.

Tailored to the Utility

The utility should have programs tailored to match its geographic, physical, and climatic conditions; level of complexity; infrastructure configuration; and level of sophistication. Utilities may also have a number of their MOM programs implemented through a managed contract rather than by their own trained personnel.

Program Purpose

The purpose of a given MOM program is the reason why the program is needed and why it exists.

> *Example*: The purpose our utility's smoke testing program is to identify sources of inflow our sewer system that need to be eliminated so that we can regain some of our peak flow capacity.

Program Goal

The individual program goal(s) establishes the accomplishments desired for the given MOM program during the upcoming fiscal year.

> *Example*: The goal our smoke testing program for this fiscal year is to reclaim system peak

capacity, and to reduce treatment plant hydraulic loading by identifying sources of inflow to the system by conducting investigations in the ABC and DEF sewersheds. This goal will be accomplished in a cost-effective manner using our personnel and by using a contractor.

Program Documentation

The program documentation specifies, in writing, the specific details of the activities and procedures that personnel follow to implement the program. Program documentation should be maintained in a central location and made available to all personnel.

> *Example*: Our utility has a long-term, ongoing, smoke testing program. The program priorities and standard operating procedures are contained in a manual entitled "Smoke Testing Program for Utility X."

Implemented by Trained Personnel

Training programs are established and followed to ensure that utility personnel are well-trained to implement each program and successfully achieve each program's goals.

> *Example*: All personnel assigned to our smoke testing activity receive three hours of basic training followed by eighty (80) hours of on-the-job training to assure competency. Our contract with outside sources to conduct smoke testing requires the contractor to follow our standard operating procedures.

Performance Measures

Appropriate performance measures should be established for each program and reviewed at minimum on an annual basis.

> *Example*: During this fiscal year, the performance goal is to smoke test 200,000 lineal feet of gravity sewer in two sewersheds selected according to our priority procedures. Last year, we exceeded our performance goal of 178,000 lineal feet of gravity sewer by smoke testing 193,000 lineal feet. As a result, 623 defects were identified and passed on to our rehabilitation and private service lateral programs for correction.

Periodic Evaluation

An evaluation by utility management should occur for each program, annually at minimum, to evaluate how well a program accomplished the program goals established at the beginning of the period and to determine whether the program, as presently implemented, is using the most efficient approach. Remedies should be identified and scheduled to correct any deficiencies. Questions the evaluation should answer are:

- Are there program design, resource or implementation deficiencies that keep the program from achieving its performance measures?
- Are these program deficiencies leading to sanitary sewer overflows, permit violations or other

Clean Water Act violations?

- Are there program deficiencies leading to decreased customer service and/or unwarranted deterioration of utility assets?
- Are there changes that should be made to the program that will make its implementation more efficient, thereby conserving resources for better implementation of other programs?

Example: The smoke testing program has yielded good results during the past four years. Following our priority criteria, most of the significant inflow problems have been eliminated. Next year the program will be reduced by 25% and the resources applied to our maintenance of way program. Peak flows will be monitored at key locations to determine if this reduction in the smoke testing program will need to be reversed in the future. Additionally, we are conducting a cost analysis to determine whether we should contract out for all smoke testing work in the future.

SYSTEM PROFILE AND PERFORMANCE SUMMARY

A proactive utility will maintain a profile of its system as a basis for explaining its situation to regulatory agencies, the public, and when networking with other utilities. A profile typically contains basic population and inventory information as well as a recent system performance summary. An example of a system performance summary is provided on the following page.

Population Served: .....

Number of Customers: .....

Number of Treatment Plants: .....

Total Wastewater Design Treatment Capacity:

Total Volume of Wastewater Treated: .....

Miles of Gravity Sewers: .....

Number of Manholes: .....

Number of Inverted Siphons: .....

Number of Pump Stations: .....

Miles of Force Main: .....

Number of Employees: .....

Annual Capital Improvement Budget: .....

Annual Operation and Maintenance Budget: ...

Total Annual Operating Budget: .....

System-Wide MOM Programs Recent Performance Summary														
Performance Measures for Previous 12 Months	Year / Month													
A. Number of Customer Complaints														
B. Number of NPDES Permit Violations														
C. Number of Capacity-Related Overflows														
D. Number of Maintenance-Related Overflows														
E. Number of Operations-Related Overflows														
F. Number of Blockages														
G. Number of Cave-Ins														
H. Number of Pump Station Failures														
I. Peak Flow Factor at Treatment Plant (1 hour high/dry month avg.)														
J. Monthly Average Treatment Plant Flow Rate (gal/capita/day)														
K. Monthly High One Day Treatment Flow Rate (gal/capita/day)														
L. Number of By-Passes at Treatment Plant														
M. Volume of Treatment Plant By-Passes (gal)														
N. WWTP Weekly Average Influent BOD (mg/L)														

MANAGEMENT PROGRAMS

1. Organization

a. Organizational Chart

An organizational chart clearly depicts all units in the organization, the lines of authority between the various organization units, a description of the functions of each of the organization units, the title and duties of each position in the organization units and an indication of whether or not each position is currently budgeted and filled.

b. Relation to Other Municipal Functions

An organizational chart clearly depicts the relationship of the sewerage utility to other municipal functions such as public works, streets and drainage, building inspection, building permits, and public health. There is a mechanism for updating the chart in manner timely to changes which may occur in the organization.

2. Training

a. Technical Training Program

This program specifies requirements (curriculum) for initial and refresher training to ensure each employee has a level of knowledge, commensurate with duties, of the overall functions of the utility's infrastructure. This program also includes outside technical training and networking opportunities, such as conferences and seminars, that are made available to employees.

The program includes the extent to which employee certification, at either the State or the utility's organization level, is required as a basis for obtaining or maintaining a position. Records of technical training are maintained and the degree to which completed technical training is tied to promotion and pay is specified. Finally, the program specifies the technical training required before an employee is permitted to undertake specific work assignments or tasks.

b. Skills Training Program

This program specifies requirements (curriculum) for initial and refresher training to ensure each employee has a level of knowledge, commensurate with duties, of the specific equipment to be used and the procedures to be followed in carrying out duties. This program should include outside skills training opportunities, such as manufacturers' or vendors' training workshops, that are made available to employees.

The program includes the extent to which employee certification, at either the State or the utility's organization level, is required as a basis for obtaining or maintaining a position. Records of skills training, whether formal or on-the-job apprenticeship, are maintained and the degree to which completed training is tied to promotion and pay is specified. Finally, the program specifies the skills and on-the-job training required before an employee is permitted to undertake specific work assignments or tasks.

c. Safety Training Program

This program specifies requirements (curriculum) for initial and refresher training to ensure each employee has an adequate level of knowledge regarding on-the-job safety. The program includes the extent to which employee safety certification at the State or at the utility's organization level is required as a basis for obtaining or maintaining a position. Records of safety training, including on-the-job safety meetings, are maintained. Finally, the program specifies the safety training required before an employee is permitted to undertake specific work assignments or tasks.

3. Safety

a. Safety Authority

A Safety Authority (whether a safety department, safety committee, safety officer, or similar mechanism) is present to establish utility safety policy, oversee compliance, and maintain the overall Safety Program. Program maintenance includes specifying safety resources needed for utility activities, assuring record of appropriate standard reporting forms, and establishing a Safety Review Board if appropriate.

b. Confined Space Program

This program provides marking for confined spaces, and uses a permitting system and written standard procedures for confined space entry.

c. General Safety Procedures Program

This program provides instruction in defensive driving, first aid, CPR, personal sanitation, personal protection clothing, and similar general work- related safety issues.

d. Traffic Management Procedures Program

This program provides for standard traffic management techniques, off-hour scheduling of line work, and coordination with law enforcement.

e. Lock-Out/Tag-Out Program

This program provides signs on equipment involved in the program, limitation to authorized personnel, required tag information, and permit requirements.

f. Safety Equipment Program

This program assures the availability of appropriate safety equipment such as tripods and hoists, well-calibrated atmospheric testing equipment, self-contained breathing apparatuses, lights and barricades, exhaust fans, and personal protective clothing.

g. Safety Performance Program

This program tracks parameters such as number of injuries, lost days, and workman's compensation claims to be used by management to assess Safety Program effectiveness.

4. Information Management Systems (IMS)

a. Management Programs IMS

This information management system enables utility management to adequately evaluate operation, maintenance, customer service (complaint response), and system rehabilitation activities so that overall system performance can be determined and utility planning can be conducted.

b. Operation Programs IMS

This information management system is used to track scheduled operational activities and to enhance operational performance. The system ensures timely production of operating reports and standardized data collection methods are used by field personnel (e.g., forms or PDA files). The system requires data review by the field supervisor and securely preserves operating records. While the system need not be computer-based, it should be capable of feeding information to the Management Programs IMS.

c. Maintenance Programs IMS

This information management system is used to track scheduled maintenance activities and to enhance maintenance performance. The system ensures timely production of maintenance reports and standardized data collection methods are used by field personnel (e.g., forms or PDA files). The system requires data review by the field supervisor and securely preserves maintenance records. While the system need not be computer-based, it should be capable of feeding information to the Management Programs IMS.

d. Customer Service IMS

This information management system is used to track reactive activities (i.e., emergencies or customer complaints) and to enhance customer service. The system ensures timely production of complaint reports and standardized data collection methods are used by field personnel (e.g., work order forms or PDA files). The system requires data review by the field supervisor and securely preserves service records. While the system need not be computer-based, it should be capable of feeding information into the Management Programs IMS.

5. Engineering

a. Collection and Transmission System Plans Program

This program ensures a full set of as-built plans for the collection and transmission system are available, field crews have ready access to the plans, and a written standard procedure is present to account changes, update the plans, and supply revised versions to field crews in a timely manner.

b. System Inventory Program

This program ensures an inventory of the utility's collection and transmission system is present, updated, and cataloged by service area or sewershed. The inventory lists the system components with their attributes and characteristics (e.g., pipe age, pipe size, pipe material, invert elevation, pump sizes, location of inverted siphons, pump stations, manholes, etc.).

c. Mapping Program

This program ensures adequately detailed maps are available to be used in conjunction with the utility's MOM programs. At minimum, the maps depict the location of gravity sewer lines, force mains, air valves, manholes (by identifying numbers), pump stations, major appurtenances, and the size of pipes.

d. Sewer System Design Program

This program ensures all new sewer system construction will be adequately designed and constructed using specifications that assure the integrity of the infrastructure. The program includes documented design criteria (e.g., slope and bedding materials), use of standardized construction details, use of standardized materials and construction practices, a standard design review process which includes review by utility personnel for possible maintenance concerns, standardized review forms, and record keeping procedures.

e. New Construction and Rehabilitation Inspection Program

This program ensures new construction or rehabilitative work is properly inspected, and built using the utility's standard construction specifications (including use of best management practices to prevent stream pollution). The program includes use of standardized construction procedures, standardized construction testing procedures, standardized inspection and testing forms/reports, and assurance that the inspection is conducted under the authority and supervision of a registered Professional Engineer. The program also provides subsequent closed circuit television (CCTV) inspection of line construction prior to expiration of the warranty, and retention of the tapes for reference.

f. Acquisition Considerations Program

This program ensures prospective infrastructure is inspected and evaluated for compliance with the utility's standard design and construction criteria before it is acquired by the utility from another entity. The program includes written standard procedures to conduct the evaluation and estimate the time/cost requirements to bring the infrastructure into compliance with utility standards.

g. Continuous Sewer System Assessment Program

i.) Prioritization

This program prioritizes sewer service areas (i.e., sewersheds) for sewer system assessment activities. Prioritization is based upon information such as complaints, flow monitoring (including flow isolation studies), historical location of sewer overflows, pump station run times, field crew work orders, and other relevant information available to the utility.

ii.) Dyed Water Flooding

This program conducts dyed water testing, when appropriate, to locate sources of inflow and other illicit connections to the sewer system. The program includes written standard procedures, standard forms, performance measures, and a mechanism for including dyed water testing information in the IMS.

iii.) Corrosion Defect Identification

This program identifies locations within the sewer infrastructure subject to corrosion and provides for inspection of those locations for corrosion on a routine basis. The program includes written procedures for corrosion identification, corrosion identification forms, performance goals, corrosion defect analysis, and a mechanism for including corrosion defect information in the IMS.

iv.) Manhole Inspection

This program ensures routine inspection of manholes within the sewer system. The program includes standard manhole inspection procedures, manhole inspection forms, performance goals, manhole defect analysis, and a mechanism for including manhole inspection information in the IMS.

v.) Flow Monitoring

This program supplies flow monitoring data to support engineering analyses related to sewer system capacity and peak flow evaluations, and to assist scheduling of sewer line maintenance. The program may include installation of an appropriate number of calibrated permanent and/or temporary flow meters, or rudimentary use of visual flow observations taken during base flow periods in wet and dry seasons. The latter option is more cost-effective for some very small utilities. Either program should include a procedure for adequate rainfall measurement, servicing meters, and a mechanism for including flow monitoring information in the IMS.

vi.) Closed Circuit Television (CCTV)

This program provides internal inspection of the integrity of gravity sewer lines. The appropriate number of qualified CCTV personnel and dedicated equipment, or the scope of a CCTV contract, is determined to ensure sewer inspection work is completed properly. The program includes standard operating procedures (including pre-inspection cleaning), performance measures, and mechanisms for including CCTV information in the IMS and retaining CCTV tapes.

vii.) Gravity System Defect Analysis

This program analyzes gravity sewer system defects. The program includes standard defect codes, written defect identification procedures and guidelines, a standardized process for cataloging gravity system defects, a mechanism for including gravity system defect information in the IMS, and training specified for personnel.

viii) Smoke Testing

This program identifies sources of inflow into the gravity sewer system by use of smoke

testing equipment. The program includes written standard smoke testing procedures, smoke testing forms, performance goals, smoke testing defect analysis, and a mechanism for including smoke testing information in the IMS.

ix.) Service Lateral Investigations

This program investigates infiltration and inflow contributions and other problems originating in service laterals. The program includes written standard investigation techniques, standard investigation forms, performance goals, standard analysis procedures, and a mechanism for including service lateral investigation information in the IMS.

x.) Pump Station Performance and Adequacy

This program permits evaluation of pump station performance and pump station adequacy. The program includes trend analysis of pump run-time meter, pump start-counter, or amperage data; historical review of the fundamental causes of pump failures; use of appropriate remote monitoring and alarm notification equipment; and a mechanism for including pump station performance information in the IMS.

h. Infrastructure Rehabilitation Program

This program rehabilitates gravity sewer lines, force mains, manholes, pump stations, and related appurtenances. The program includes a process for prioritizing rehabilitation, inventory of all completed rehabilitation (including a breakdown of the rehabilitation techniques used), inspection and performance measurement for all completed rehabilitation, written schedules for rehabilitation work, and a mechanism for including rehabilitation information in the IMS.

i. System Capacity Assurance Program

i.) Capacity Assurance for New Connections

This program ensures there is adequate capacity to collect, transmit, and treat additional sewage expected as a result of prospective new sewer connections. The program is integrated into, or thoroughly coordinated with, the building permit process. It is also integrated into the Acquisition Considerations Program described above in 5(f). The program has a mechanism for including capacity assurance information in the IMS.

ii.) Protocols for Capacity Assurance

The program includes, but is not limited to: use of standardized design flow rate rules of thumb (i.e., regarding pipe roughness, manhole head losses, accuracy of distance and slope on as-built drawings, and water use); use of techniques to predict the impacts of additional flow (i.e., use of a hydraulic model of gravity system, pressure system, and other appropriate techniques); and use of flow metering to confirm mathematical estimations of existing peak flow. The program requires certification of adequate capacity by a registered Professional Engineer, and includes an IMS mechanism for integrating analysis from this program with information on infiltration/inflow reduction activities.

6. Overflow Tracking

a. State Agency Reporting Program

This program includes written standard operating procedures which clearly define the minimum State Agency reporting requirements for events where sewage leaves the infrastructure before treatment, and the steps utility personnel must follow to meet or exceed those reporting requirements.

b. Local Agency Reporting Program

This program provides secondary notice to the public and to other appropriate organizations (e.g., downstream utilities with water intakes and local public health authorities) when an overflow presents an imminent and substantial threat to public health or the environment. The program includes written criteria for making this notice, procedures for notifying news media and posting notices at stream locations, and may also prepare an annual summary report available to the public.

c. Records Management Program

This program tracks all events where sewage leaves the utility's collection or transmission system before treatment (i.e., overflows to land, directly to waters, or indirectly to waters by storm drains or other paths). The program uses standardized forms which record, at minimum, the following information for response and inclusion in the IMS:

- Location of the discharge
- Name of the receiving water and description of the pathway (e.g., storm drain)
- Estimation of the discharge volume and the method of estimation
- Description of the system component that is source of the discharge
- Date and time the discharge started and stopped
- Root cause, or suspected root cause, of the discharge
- Steps taken to eliminate the discharge and steps taken to prevent reoccurrence.

7. Financial Analyses

a. Cost Analysis Program

This program regularly analyzes and projects future utility management, operations, and maintenance costs needed to properly implement these utility programs. The cost analyses include, at a minimum: overhead, labor and equipment, financial impacts of outsourcing certain activities, overtime, and the financial impacts imposed by organizational departments or agencies outside the utility. Cost analyses are performed for all management, operations, and maintenance equipment and the capital infrastructure investment. Cost analyses incorporate life cycle depreciation and establish cost-effective points for replacement. The program has a mechanism for including such replacement points in the IMS.

b. Capital Improvement Financing Program

This program analyzes, projects, plans and finances capital improvement needs established through proper engineering study. Capital improvement financing is planned using a five (5) year planning horizon with annual updates.

c. Budget and Customer Rate Program

This program establishes the annual utility budget and recommends customer rates. The program assures that the budget and funding provided by customer rates will meet the cost and capital financing needs set by programs 7(a) and 7(b) above.

8. Equipment and Supplies

a. Spare Parts Inventory Program

This program ensures proper management of the utility spare parts inventory including spare pipe. The program includes adequate parts storage facilities, identification and retention of an adequate number of critical spare parts (i.e., those which are difficult to obtain quickly but critical to proper operations), control of access to spare parts, an organized system for inventory management (either manual or computerized), arrangement with local vendors for common parts, and specification of spare parts to be carried on vehicles.

b. Equipment and Tools Inventory Program

This program ensures proper management of the utility equipment and tools inventory. The program includes adequate equipment and tools storage facilities, control of access to equipment and tools, an organized system for inventory management (either manual or computerized), and specification of equipment and tools to be carried on vehicles.

c. Vehicle Repair Program

This program ensures proper management of utility vehicles. The program includes provisions for vehicle maintenance and vehicle repair. Performance measures for the program will consider turn-around time, cost factors, contract maintenance, and the life cycle cost analysis performed for vehicles.

9. Customer Service

a. Complaint Management Program

This program ensures proper complaint management. The program includes written standard management procedures for dispatchers (i.e., dispatch priorities, work order generation, and standardized complaint and problem codes). The program uses an organized record keeping procedure (including the use of standardized forms) which facilitates tracking work orders and follow-up with customers, and uses a mechanism to evaluate response performance and supply this information to the IMS.

b. Public Information Program

This program communicates utility activities which may closely impact the public (e.g., smoke testing, major construction or maintenance, or emergency maintenance), and ensures communication of activities which may coincide with those of other departments and agencies (e.g., street paving).

c. Public Education Program

This program educates the public and solicits support regarding issues such as service lateral maintenance, grease management, food disposals, inflow sources,

maintenance/rehabilitation needs requiring increased rates, and problems caused by basement sump pumps.

10. Legal Support

a. Inter-Jurisdictional Agreement Program

This program develops, negotiates, and enforces agreements with neighboring utilities which send the utility flow or with major volume sewer customers. The program ensures that the agreements require the second party to have proper management, operation, and maintenance programs so the utility's infrastructure is not stressed by problems originating across jurisdictional boundaries. The program also ensures the agreements address flow-based capacity issues, specify the life of the agreement, have credible provisions for enforcement, and have provisions for modification.

b. Sewer Ordinance Program

This program develops, revises, and amends sewer ordinances as needed to support the proper management, operation, and maintenance of the utility. The program provides adequate legal authority for the utility regarding sewer use, grease management, pretreatment, private service laterals, sump pumps and roof drains, private haulers, recovering costs of damage to utility infrastructure, and other legal authorities as required. Legal support is provided for case work and guidance for utility staff.

11. Water Quality Monitoring

a. Routine Monitoring Program

This program determines the existence of unpermitted discharges originating at locations where sewers cross waterways or at other isolated or remote sewer locations. The program includes scheduled sampling during dry weather periods from a network of monitoring stations. The program also includes a map of the sampling network, and formally establishes sampling frequency, sampling parameters (i.e., fecal coliform and others), standard sampling procedures, quality assurance/quality control procedures, and a mechanism for including program information in the IMS.

b. Investigative Monitoring Program

This program determines the source of industrial, commercial, or sanitary wastewater resulting from cross connections with the stormwater drainage system, and typically activates through complaints or discovery by operations personnel. The program has formally established sampling parameters (i.e., fecal coliform and others), standard sampling procedures, quality assurance/quality control procedures, and a mechanism for including program information in the IMS.

c. Impact Monitoring Program

This program determines the impact of pollution resulting from discharges occurring within the utility infrastructure before treatment. Combined with the reporting programs described in Overflow Tracking (6) above, this program assists the utility, regulatory authorities, and public health authorities determine the appropriate response to protect health and/or the environment. The program has formally established sampling parameters (i.e., fecal coliform

and others), standard sampling procedures, quality assurance/quality control procedures, and a mechanism for including program information in the IMS.

12. Contingency Plan for Utility Infrastructure

a. Contingency Planning Program

This program develops and modifies contingency plans for the sewer system and the treatment facilities that will be implemented during emergency situations. The planning process includes a preparedness committee of senior and experienced management and field personnel. A system overview is conducted to determine vulnerability to a variety of events which may be due to utility failures, natural causes, or failures caused by another party. Based upon these hypothetical events and past experience taken from root cause failure information in the IMS, prediction system component failure is made. Strategies to timely repair or overcome such component failures are developed, and the six (6) major contingency plan components are available in writing: public notification, agency notification, emergency flow control, emergency operation and maintenance, preparedness training, and water quality monitoring (described in 11(c) above).

i.) Public Notification

The public notification component includes a set of criteria, developed with input from local public health authorities, which are used as a basis for initiating public notification; a step-by-step procedural flow diagram; a list of manager names and phone numbers; a plan for regular business hours, off-hours, weekends, and holidays; a list of *Public Contacts* with phone numbers; identification of managers authorized to give statements; and pre-scripted news releases.

ii.) Agency Notification

The agency notification component includes a set of criteria, developed with input from appropriate local, State, and Federal authorities, which are used as a basis for initiating agency notification; a step-by-step procedural flow diagram; a list of manager names and phone numbers; a plan for regular business hours, off hours, weekends, and holidays; a list of *Agency Contacts* with phone numbers; identification of personnel authorized to contact agencies; and copies of standard reporting forms used by the agencies.

iii.) Emergency Flow Control

The emergency flow control component is used to reduce overflow volumes and pollution where possible. The component includes a set of criteria which are used as a basis for initiating emergency flow control procedures; a step-by-step procedural flow diagram; a list of manager names and phone numbers; a plan for regular business hours, off-hours, weekends, and holidays; a list of *Emergency Flow Control Contacts* with phone numbers; identification of personnel authorized to initiate the emergency flow control program; and standard emergency flow control reporting forms.

Flow control activities may include flow re-routing, flow diversion, household flow reduction and advisories, commercial flow reduction and advisories, water pressure reduction and advisories, or use of pretreatment program protocols set forth in permits for

significant industrial users. The initiating criteria, reporting forms and report formats should be developed in cooperation with significant industrial users and appropriate local, State, and Federal authorities.

iv.) Emergency Operation and Maintenance

The emergency operation and maintenance component includes a set of criteria which are used as a basis for initiating emergency operation and maintenance procedures; a step-by-step procedural flow diagram; a list of manager names and phone numbers; a plan for regular business hours, off-hours, weekends, and holidays; a list of *Emergency Operation and Maintenance Contacts* with phone numbers; identification of personnel authorized to initiate emergency operation and maintenance procedures; and standard reporting forms.

The initiating criteria, reporting forms, and report formats should be developed in cooperation with utility's insurance representatives, State and Federal emergency management agencies, and the State regulatory authority. Further, development of the emergency operations and maintenance component should include analyses of the need and use of stand-by equipment (prearranged rentals), stand-by contractors, and access to critical spare parts.

v.) Preparedness Training

The preparedness training component ensures that all personnel are fully aware of procedures and able to efficiently implement the Contingency Plan. The preparedness training component includes specialized training courses, field trials, and special emergency situation safety training.

b. Response Flow Diagram

This diagram includes the roles of senior management and field personnel and shows the relationship of the six (6) major contingency plan components: public notification, agency notification, emergency flow control, emergency operation and maintenance, preparedness training, and water quality monitoring.

OPERATION PROGRAMS

1. Pump Station Operation

a. Preventive Operation Program

This program ensures reliable operation of the transmission system through use written standard operating procedures available for both manned and unmanned stations. Procedures may include reading and recording information from pump run-time meters, or start counters, or taking amperage readings; recording wet well conditions and grease accumulation; checking and resetting (as necessary) wet-well set points; checking and recording system pressure; checking remote monitoring and alarm equipment components; checking operation of alarms and stand-by power; and reporting maintenance needs. The program has established schedules, routes, priorities, standard forms, performance measures, and a mechanism for including program information in the IMS.

b. Reactive Operation Program

This program ensures timely response to atypical situations in the transmission system through use of written standard operating procedures available for both manned and unmanned stations. Procedures may include initiating auxiliary power with portable generators, installing portable pumps during high flow, or initiating the Contingency Plan. The program has established standard forms and reporting procedures, performance measures, and a mechanism for including program information in the IMS.

2. Pretreatment Program

This program ensures that operation of the utility's treatment facility is protected from pollutant pass-through or interference. If a utility has industrial or commercial users it may have this program which includes industrial user identification, permitting, monitoring and inspections, enforcement, and other components. Personnel involved with the utility pretreatment program will have frequent communication with operation and maintenance personnel to detect possible pretreatment permit violations. The program has standard operating procedures, performance measures, inspection schedules, and a mechanism for including program information in the IMS.

3. Corrosion Control Program

This program provides for inspection of the utility infrastructure for corrosion caused by hydrogen sulfide or other corrosives, the development and implementation of site-specific corrosion control measures, a monitoring program to evaluate corrosion control measures, program performance measures, and a mechanism for including program information in the IMS.

4. Fats, Oils, and Grease Control Program

This program prevents fats, oils, and grease from entering the utility infrastructure, therefore preserving sewer capacity, prolonging the infrastructure life, reducing overflow events, and saving the utility maintenance costs. The program includes a grease control ordinance, grease trap and interceptor design standards, permitting and inspecting commercial grease traps and interceptors, a credible enforcement component, a public education component for residential sources, performance measures, and a mechanism for including program information in the IMS.

5. Service Connection/Disconnection Program

This program includes written standard procedures for new sewer tap installation or for sewer disconnection; inspection of all new service connections to, or disconnections from, the utility sewer; a credible enforcement program; performance measures; and a mechanism for notifying personnel in the Mapping Program or including program information in the IMS.

6. Private Haulers Program

This program issues permits to private commercial or septic tank waste haulers discharging to the utility, and includes written standard operating procedures for inspection/sampling of the haulers, a credible enforcement program, program performance measures, and a mechanism for including program information in the IMS.

7. Line Location Program

This program responds to requests for utility sewer line locates, and includes written standard line location procedures, defined prioritization to assist scheduling, appropriate staffing and equipment for the average number of requests, standard line location procedures, standard forms, performance measures, and a mechanism for including program information in the IMS.

MAINTENANCE PROGRAMS

1. Pump Station Preventive Maintenance

a. Pump Station Repair Program

This program is a reactive maintenance component intended to repair pump stations that are currently in a state of disrepair but still cost-effective to service. The program includes established priorities for pump station repairs, maintaining an ongoing inventory of completed repairs, a work schedule for pump station repairs, and a mechanism for including pump station repair information in the IMS. Upon completion of pump station repairs, service activities are transferred to the pump station Preventive maintenance program.

b. Electrical Maintenance Program

This program is a component of the pump station Preventive maintenance program. The program includes an established number of crews and personnel required to perform effective electrical maintenance, written standard electrical maintenance procedures, scheduling Preventive maintenance, standard forms, performance measures, and a mechanism for including electrical maintenance information in the IMS.

c. Mechanical Maintenance Program

This program is a component of the pump station Preventive maintenance program. The program includes an established number of crews and personnel required to perform effective mechanical maintenance, written standard mechanical maintenance procedures, scheduling Preventive maintenance, standard forms, performance measures, and a mechanism for including mechanical maintenance information in the IMS.

d. Physical Maintenance Program

This program is a component of the pump station Preventive maintenance program. The program includes an established number of crews and personnel required to perform effective physical maintenance, written standard physical maintenance procedures, scheduling, standard forms, performance measures, and a mechanism for including physical maintenance information in the IMS.

2. Gravity Line Preventive Maintenance

a. Routine Hydraulic Cleaning Program

This program includes accurately determined cleaning needs, established priorities and scheduled cleaning activities, support of an appropriate number of crews and personnel, acquired necessary equipment (e.g., Jet Unit, Combination Unit, etc.), written standard hydraulic cleaning procedures, standard forms, performance measures, and a mechanism for including hydraulic cleaning information in the IMS.

b. Routine Mechanical Cleaning Program

This program includes accurately determined cleaning needs, established priorities and scheduled cleaning activities, support of an appropriate number of crews and personnel, acquired necessary equipment (e.g., Rodders, Bucket Machine, etc.), written standard mechanical cleaning procedures, standard forms, performance measures, and a mechanism

for including mechanical cleaning information in the IMS.

c. Root Control Program

This program includes accurately determined root control needs, established priorities and scheduled activities, support of an appropriate number of crews and personnel, acquired necessary equipment (e.g., mechanical, chemical, etc.), written standard root control procedures, standard forms, performance measures, and a mechanism for including root control information in the IMS.

d. Manhole Preventive Maintenance Program

This program includes accurately determined manhole maintenance needs, established priorities and scheduled activities, support of an appropriate number of crews and personnel, acquired necessary equipment (rings and lids, structural repair, etc.), written standard manhole maintenance procedures, standard forms, performance measures, and a mechanism for including manhole maintenance information in the IMS.

3. Air Valve Preventive Maintenance Program

This program provides for inspection and maintenance of air valves located on force mains (including regular valve exercise). The program includes an established number of crews and personnel required to perform effective Preventive maintenance, written standard air valve maintenance procedures, scheduling, standard forms, performance measures, and a mechanism for including air release valve maintenance information in the IMS.

4. Maintenance of Way

a. Maintenance of Rights-of-Way and Easements Program

This program includes accurately determined maintenance needs, established priorities and scheduled activities, support of an appropriate number of crews and personnel (based on the number of waterway crossings and/or miles of sewer off-street), written standard maintenance procedures, standard forms, performance measures, and a mechanism for including maintenance information in the IMS.

b. Street Paving Monitoring Program

This program includes accurately determined monitoring needs, established priorities and scheduled activities, coordination with storm drain projects and street and highway officials, support of an appropriate number of crews and personnel, acquired necessary equipment (e.g., manhole and valve raising, etc.), written standard monitoring procedures, standard forms, performance measures, and a mechanism for including monitoring information in the IMS.

5. Reactive Maintenance Program

This program provides response to customer complaints or other unscheduled system problems forwarded by dispatchers. The program includes support of an appropriate number of crews and personnel, written standard response procedures including a protocol for initiating the Contingency Plan, standard forms, collection of information in support of failure analysis, sewer map availability, performance measures, and a mechanism for including reactive maintenance information in the IMS.

SYSTEM PROFILE AND PERFORMANCE SUMMARY

A proactive utility will maintain a profile of its system as a basis for explaining its situation to regulatory agencies, the public, and when networking with other utilities. A profile typically contains basic population and inventory information as well as a recent system performance summary. An example of a system performance summary is provided on the following page.

Population Served: _____

Number of Customers: _____

Number of Treatment Plants: _____

Total Wastewater Design Treatment Capacity: _____

Total Volume of Wastewater Treated: _____

Miles of Gravity Sewers: _____

Number of Manholes: _____

Number of Inverted Siphons: _____

Number of Pump Stations: _____

Miles of Force Main: _____

Number of Employees: _____

Annual Capital Improvement Budget: _____

Annual Operation and Maintenance Budget: _____

Total Annual Operating Budget: _____

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www.epa.gov/watersense

Artie Buff, 404-562-9336

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www.epa.gov/epaoswer/hazwaste/minimize/partnership.htm

Dave Langston, 404-562-8478

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~ Success story: Rohm and Haas Electronic Materials replaced burner control sections with high-efficiency motor controllers. Saving $49,000/yr, and reducing energy use by 3.7 billion BTU/yr.

www.epa.gov/performancetrack

Reggie Barrino, 404-562-9635

Energy Star

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~ Success story: Marriott instituted various energy saving techniques saving $6 million; 3M increases energy efficiency 9%, saves $10 million.

www.energystar.gov

Danny Orlando, 404-562-9087

Waste Reduction Resource Center (WRRC)

Pollution Prevention (P2) Info clearinghouse—Online technical P2 library/case studies, training courses, Topic Hubs, P2 News, State P2 Contact Information.

http://wrrc.p2pays.org

1-800-476-8686

Waste Wise

Information geared towards municipal solid waste and select industrial wastes (e.g. packaging, paper, wood pallets, batteries) Free technical assistance, case studies, and public recognition/awards.

~ Success story: Pepsi switched from corrugated to reusable shipping, saving $44 million.

www.epa.gov/wastewise

Rhonda Rollins, 404-562-8664

Wooden pallets being prepared for reuse.

Resource Conservation Challenge (RCC)

Save money and energy - Manage materials more efficiently through recycling and reuse.

www.epa.gov/rcc
www.epa.gov/region4/recycle

~ Success story: Rooms To Go's comprehensive recycling program grossed over $1 million in 2007.

Dee Rodgers-Smith (Solid Waste), 404-562-8688
Mary Beth Van Pelt (Organics), 404-562-8615
Kim Clifton (E-Waste), 404-562-8477
Steve Smith (C&D), 404-562-8501

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Sector-specific Regulatory Compliance Assistance

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www.epa.gov/compliance/assistance

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Industry Sector Notebooks

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www.epa.gov/compliance/sectornotebooks.html

State Pollution Prevention (P2) Resources

Find all the P2 State contacts at:
~ http://wrrc.p2pays.org

EPA partnership programs and general P2
~ www.epa.gov/partners and www.epa.gov/p2

Buy environmentally responsible computers
~ www.epeat.net

Recycling opportunities for practically everything.
~ www.earth911.org

Best management practices/Lower plant energy bills
~ www1.eere.energy.gov/industry

Additional Success Stories

~ EPA's Colorado Lab—Reduces water usage 50%, saving 650,000 gallons, and $1,900/yr.

~ Retail complex in Oregon uses native landscaping—maintenance costs reduced 80%, and water bill $2,400.

~ Fiberglass Mfr. reduces waste acetone by 80%, goes from Small Quantity Generator (SQG) to Conditionally Exempt Small Quantity Generator (CESQG).

~ Dow reconditions steel drums, Saves $2.3 million, conserves 7.8 million lbs of steel.

~ Seydel's (textiles) reduction & re-manufacturing efforts generates $518,000 in revenue.

~ Institute for Local Self-reliance (ISLR) deconstructs/recycles home, nets $7,400 in materials.

EPA United States Environmental Protection Agency

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EPA Region 4
Introduction to Conducting Evaluations
of
Municipal Wastewater Collection System
Management, Operation, and Maintenance Programs

Version 1.0

PURPOSE & DISCLAIMER

This document is the work product of the EPA Region 4, Water Management Division, Water Programs Enforcement Branch (WPEB) and supercedes a 10-30-1996 draft previously released. This document serves as an introduction for new Region 4 inspectors in the WPEB Municipal Infrastructure Enforcement Program and as introductory information for utilities invited to participate in the Region 4 Management, Operation, and Maintenance (MOM) Programs Project. Questions in this document are provided to initiate the thought process necessary for conducting an evaluation of a collection system. Formal instruction for conducting an evaluation under the MOM Programs Project is provided in separate literature.

The MOM Programs Project is conducted in compliance with EPA Policy, EPA Guidance, and Rules and Regulations promulgated under the Clean Water Act. If some statement or part of the document is not in compliance with the Act, EPA Policy, EPA Guidance or the Rules and Regulations, then it should not be construed as conveying rights not conveyed by the Clean Water Act, EPA Policy, or the Rules and Regulations.

September 2003

Introduction

Many collection systems have received minimal maintenance for many years. This has resulted in deteriorated sewers with a high potential for overflows, cave-ins, hydraulic overloads at treatment plants, and other problems. There are two central reasons for conducting an evaluation of a municipal collection system:

Public and Environmental Health

Sanitary sewer overflows (SSOs) are a frequent cause of water quality violations. Beach closings, flooded basements, closed shellfish beds, and overloaded water treatment plants are a few of the symptoms of an inadequate collection system. Streams influenced by frequent SSOs support only the hardiest of species.

Legal Considerations

A discharge permit issued through the National Pollutant Discharge Elimination System (NPDES) requires that the "permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit." SSOs may be considered a violation of this permit provision.

SSOs may also be considered an unpermitted discharge of pollutants from a point source, as defined in the Clean Water Act.

A goal of the collection system evaluation should be to discover if a utility is plagued by overflows and/or bypasses within its system of conveyance to a treatment facility. If so, what are the impacts? Is the utility aware of the problem? Are they taking appropriate steps to address the problem in a timely manner and prevent future reoccurrence?

Management

The first stop on any evaluation should be the "home office." This location is a point of administration, and may include functions such as utility management, finance, engineering, planning, procurement, warehousing, personnel, or legal review. In a large city, this work may be split between different departments. A small town may have only one or two people doing some of these activities. Much of the information needed from this source can be obtained before the evaluation by a written request. Areas of review should include:

✔ *Financial Administration*

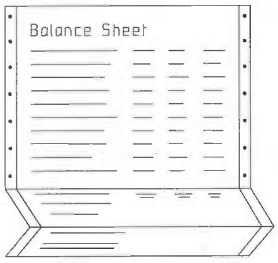
EPA and others have published guidance on the financial aspects of operating a wastewater utility. This is the single most important aspect of utility operation. Inadequate funding diminishes the chances for success.

User Rate/User Charge

- What are the utility's current rates?
- How are user rates calculated?
- How often are user charges adjusted based on that evaluation?
- Does the utility receive full funding from its revenue?
- Are utility funds used for other government activities?

Budget

The utility should be operating on an annual budget that details funding for all functions.



- Does the utility budget for annual operating costs?
- Does the budget provide sufficient itemization?
- Does the utility maintain a fund for future equipment and infrastructure replacement? How is work financed?

- Does the budget provide for sufficient funding?

Public Education/Outreach

The utility should be talking with the public on issues such as user rates and charges. It is up to the utility to educate the public on wastewater treatment, its impact on water resources, and the importance of keeping the user rates current. By maximizing resources and operating facilities efficiently, the utility may be able to delay increases in user rates for a short time. Adjustments for more efficient operation should be made before approaching the public on these issues.

- What type of public education/outreach programs does the utility have about the use of income from utility rates?

- Do these programs include communication with several groups such as local governments, community groups, the media, young people (schools, youth organizations)?

✔ *Personnel Administration*

Organization

- Is an organizational chart available which shows the various positions budgeted and filled?

- Are position descriptions available?

Operator Safety Program

A utility can have several levels of a safety program. It should consist of top administration, a safety department, a safety committee, and field personnel. For a small utility, top administration could be the mayor while a large utility could employ a personnel manager. All utilities should have a safety program that includes a safety policy, safety training and promotion, and accident investigation and reporting.

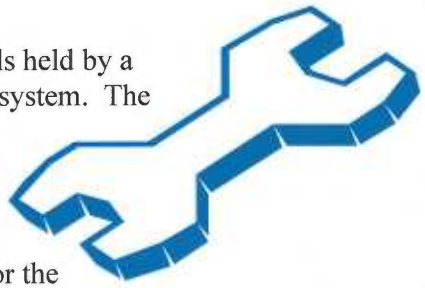
- Is there a documented safety program supported by a top administration official?

- Is there a safety department that provides training,

equipment, and an evaluation of procedures?

- Are all operators required to follow safe work procedures, such as the use of protective clothing and headgear, confined spaces, lock-out/tag-out policies, etc.?
- Is there a confined space entry procedure for manholes, wet wells, etc.?
- How often are safety procedures reviewed and revised?
- Does the safety department communicate with field personnel on safety by a procedures memo, direct communication, a video, etc.?

✔ *Equipment and Tools Administration*



The amount and types of equipment and tools held by a utility depend on the size, age, and condition of the system. The decision as to the type and amount of equipment to have on hand is a difficult one. A small utility may find it hard to justify the purchase of expensive, specialized equipment. The utility must identify the problems in the collection system and arrange for the appropriate tools and equipment accordingly. An alternative to purchasing is leasing, contracting, or sharing costs with other communities.

- Is there a list of equipment and tools used for operation and maintenance?
- Do field personnel feel they have access to the necessary equipment and tools to do all aspects of the operation and maintenance of its collection system?
- Is there access to suitable equipment if the utility's equipment is down for repair?
- Does the utility own or have ready access to a sufficient number of emergency power generators?
- Where does the utility store its equipment?
- Is a detailed equipment maintenance log kept?
- Are written equipment maintenance procedures available?

- What is the procedure for equipment replacement?

- If an in-house motor pool is used, what is the turnaround time for service?

Equipment that has reached its useful life should be replaced. To reduce the financial burden of equipment replacement, a fund should be established for equipment replacement. A utility should keep detailed records on the cost of operating the equipment to make good decisions about equipment replacement.

✔ *Legal Administration*

The utility should have legal documents to protect its collection system. Typically, sewer ordinances exist to satisfy Clean Water Act pretreatment regulations and to assure the utility's compliance with its NPDES permit. A legally sound sewer ordinance will give the utility retribution when corrosive and/or toxic materials are introduced into the collection system. Another important element is a grease control ordinance. Grease traps should be inspected by the utility for compliance. Some utilities choose to permit each trap owner.

- Is there a sewer use and a grease control ordinance?

- Is there active enforcement of the sewer and grease control ordinances?

- Are all grease traps inspected regularly?

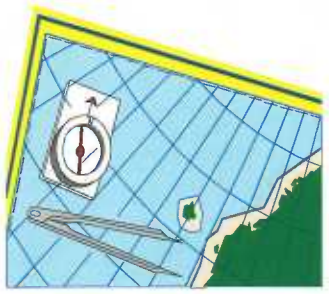
- How does the utility learn of new or existing grease traps?

- Who is responsible for enforcing the sewer ordinance and grease ordinance? Does this party communicate with the utility department on a regular basis?

- Are there any significant industrial dischargers to the system?

- Is there a pretreatment program in place?

✔ *Engineering Administration*



System Mapping and As-Built Plans

The utility should have an overall map of the collection system with sufficient detail to allow easy interpretation. There should be a collection system inventory organized by plant service areas that include the following information:

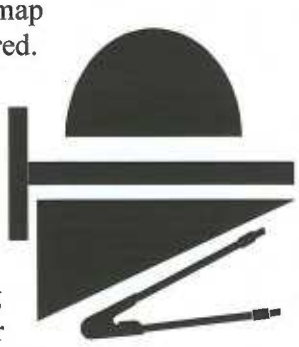
Gravity Lines:	Lineal feet by diameter
Manholes:	Number
Pump Stations:	Number by type
Force Mains:	Lineal feet by diameter
Air Release Valves:	Number and location
Inverted Syphons:	Number and location
Other Major Appurtenances:	Number and location
Service Population	By facility service area

A sewer atlas detailing the location of the above items should be available. The type of sewer atlas used by the utility will depend on their needs and resources. A large metropolitan utility may find that a sophisticated, computerized mapping system is required. A small community may be satisfied with a hand-drafted version.

- What type of mapping/inventory system is used?

- Is there a procedure for recording changes and updating the mapping system?

Mapping and inventory revisions should occur when there are changes in the collection system such as additions or repairs. Comprehensive maps of the system should be printed annually for large utilities, and a staff of "mappers" will likely be required to keep the maps up to date. Utilities may alternatively choose to contract map services. This is especially true if much catch-up work is required.



Design and Capacity Analysis

Through the interview and document review process, the evaluator should discover design procedures and the criteria needed for new work. In particular, the evaluator should discover how the utility determines the adequacy of the existing system for transmitting and treating future flows. The evaluator should discover what control the utility has over new connections to the system.

- Is there a document which details the design criteria and standard construction details. for gravity sewers, force mains, and pump stations?

- Is there a document that describes the procedures that the utility follows in conducting a design review? Are there any standard forms that guide the utility?

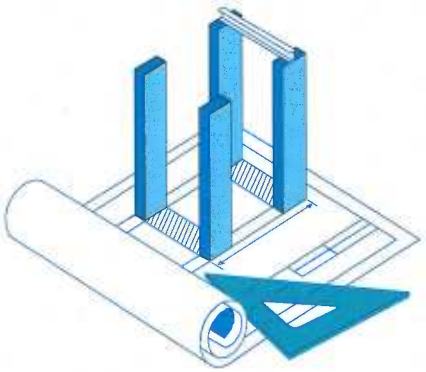
- What procedures are used in determining whether the existing sewer system capacity is adequate for new connections?

- Is any flow metering accomplished prior to allowing new connections?

- Is there a mathematical model of flow in the system used to predict the effects of new connections?

- Is any certification required which attests capacity is available for a new connection before it is made?

Construction



Through the interview and document review process, the evaluator should determine what procedures the utility uses to inspect and test new construction. These activities are important to ensure that new facilities do not contribute to future operation and maintenance problems. Excessive infiltration and inflow problems can exist with new construction if not properly built.

- Is there a document that describes the procedures that the utility follows in conducting their construction inspection and testing program? Are there any standard forms that guide the utility in conducting their construction inspection and testing program?

- Is new construction inspected by the utility or others?

- What are the qualifications of the inspector(s)?

- Is inspection supervision provided by a registered Professional Engineer?

- How is new construction tested? (air, water, weirs, etc.)

- Is new construction televised using closed-circuit camera techniques?

- Is new construction built to standard specs set by the local utility and/or the State?

- Is there a warranty for new construction? If so, is there a warranty inspection done at the end of this period?

Sewer System Evaluation Survey (SSES) and Rehabilitation

The SSES and sewer rehabilitation program is a structured methodology for finding the holes in a system and fixing them. Cost analysis is the major factor in determining the scope of rehabilitation. Due to the requirements of EPA's Construction Grants Program, many systems did evaluation surveys as a condition of their grant. Some systems also received grant funds for rehabilitation.

The SSES is a two-phase operation. The first phase is to gather preliminary information and technical data. Flow monitoring, records and map evaluations, and system inspection are some of the tasks to be completed. Prioritizing areas for further evaluation is the end result of phase one.

The second phase is to conduct further testing of the prioritized sewer areas identified in the preliminary phase and analyze these results. Rehabilitation recommendations based on a cost-effective analysis is the end result of phase two and concludes the SSES.

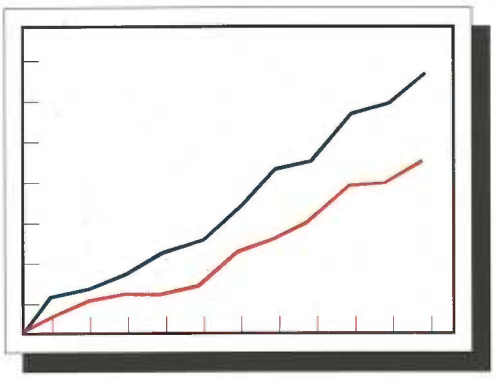
Rehabilitation may consist of a variety of techniques designed to reduce inflow and infiltration into the sewer system. Many methods are available with highly variable costs and service lives. Rehabilitation costs are usually significantly less than replacement costs.

SSES and rehabilitation activities are best described as a highly intensive program of operation and maintenance. Because over time many utilities have neglected proactive operation and maintenance of their sewer systems, these activities are often used to "catch-up" to a condition which can be maintained on a regular basis. Many of the techniques used in SSES and rehabilitation activities are described in the Operation and Maintenance section of this document, and should also be elements found in a proactive operation and maintenance program.

- Have SSES activities been performed in the past? If so, is documentation available?
- Has any sewer rehabilitation work been done in the past 15 years?
- How many sanitary sewer overflows have occurred in the last year?
- Is there a record?

✔ *Water Quality Monitoring*

Monitoring streams in the service areas can help identify problems in the collection system such as leaking pipes, washed-out stream crossings, and other pollution sources which could be attributed to the sewer system. Fecal Coliform is a common parameter monitored to detect potential contamination from sewers.



- Is there a water quality monitoring program in the service areas?
- If so, what parameters are monitored and at what frequency?
- How many locations are monitored?

✔ *Management Information Systems*

A management information system uses data from work reports prepared by field personnel to optimize the operation and maintenance of the collection system. A powerful tool, the information system is used as an aide to schedule preventive and reactive work on the system. It can also be used to measure efficiency, and track and develop costs.

- What types of work reports are prepared by the field personnel?

  Examples include:
  - Main Sewer Construction
  - Main Sewer Maintenance
  - Main Sewer Repair
  - Structure Maintenance
  - Structure Repair or Abandonment
  - Building Sewer Maintenance
  - Building Sewer Repair

- Do the work reports include complete and useful information?
- How are records kept?
- Does the facility use computer software to manage information? If so, what type of systems are used?

- What kind of management reports are generated from the work report data?

  Examples include:
  - Payroll
  - Production
  - Work Costs
  - System Inventory
  - Main line maintenance history
  - Service line maintenance history
  - Main and service line repair history

Performance Indicators

Performance indicators are used to determine the condition of the system. These indicators are not absolute because there may be other reasons to suggest a less than adequate system condition. However, if several of the factors indicate possible problems, further investigation is warranted.

- What is the per capita wastewater flow for the maximum month, week, and day?

  EPA considers Infiltration/Inflow (I/I) to be excessive if the total daily flow during periods of high groundwater exceeds 120 gallons per capita per day (gpcd), and during a storm event exceeds 275 gpcd.

- What is average annual BOD of the treatment facility influent?

  An average of much less than 200 mg/L may indicate excessive I/I.

- What is the ratio of maximum wet weather flow to average dry weather flow?

  A review of 10 case studies by EPA found that peak wet weather flow ranged from 3.5 to 20 times the average dry weather flow. Typically, as the ratio approaches 4 to 5, the likelihood of surcharge and overflow increases.

- What is the annual number of overflows, and what are the causes (i.e., grease blockages, debris blockages, pump malfunctions, overloaded sewers, lift station power loss, etc.)?

- What is the annual number of sewer cave-ins? What were the causes (i.e., pipe corrosion, root intrusion, leaks, etc.)

✔ *Complaints*

- How are public complaints handled?
- What are the common complaints received?
- How often are these complaints reported?
- Is there a record?
- Does the utility have a procedure in place to evaluate and respond to complaints?

✔ *Public Relations*

- Is there a public relations program in place?
- Are the employees of the utility trained in public relations?
- What type of public notification is given for treatment plant upsets or collection system overflows?
- Is the public notified prior to major construction or maintenance work?
- How often does the utility communicate with other municipal departments?

✔ *Emergency Maintenance and/or Contingency Plans*

- Does the utility have a written emergency maintenance plan?
- What type of equipment does the utility have available for emergency maintenance? How quickly can the utility access that equipment in case of an emergency?

✔ *Spare Parts Inventory Management*

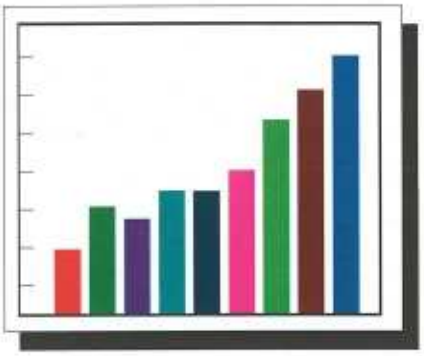
- Does the utility have a central location for the storage of spare parts?
- Have spare parts which are difficult to obtain, but critical to operation been identified?
- Does the utility maintain a stock of common spare parts on its maintenance vehicles?

- What methods are employed to keep track of the location, usage, and reordering of spare parts? Are parts logged out when taken by maintenance personnel for use?
- Does the utility salvage specific equipment parts when equipment is placed out of service and not replaced?
- How often does the utility conduct a check of the inventory of parts to ensure their tracking system is working?
- Who has the responsibility to track the inventory?

Operation and Maintenance

The operation and maintenance (O&M) of a wastewater collection system is a difficult undertaking. Besides keeping the system in good working order, a proper O&M program should convey all wastewater to the treatment plant. A well-operated system will employ many, if not all, of the techniques described in this section.

✔ *Maintenance Scheduling*



- Does the utility schedule its maintenance activities?
- How are priorities determined?
- How is the effectiveness of the maintenance schedule measured?

✔ *Sewer Cleaning*

Sewer utilities have been cleaning lines for a long time. Most sewer cleaning programs have been directed towards emergency situations which occur due to stoppages. A better O&M program will have regular cleaning schedules for the system.

- Is there a routine schedule established for cleaning sewer lines on a system-wide basis (e.g., "once every seven to twelve years," or "between 8% and 14% per year" ?

- Is there a process present to identify sewer line segments that have chronic problems and that should be cleaned on a more frequent schedule?

Cleaning Equipment

Mechanical cleaning equipment, such as a rodding device or bucket machine, has been the mainstay of utility cleaning operations for a long time. Though this type of equipment is still in use, hydraulic cleaning equipment which uses water pressure directed through a nozzle has generally replaced the need for mechanical equipment.

- What type of cleaning equipment does the sewer utility use?
- How many cleaning units of each type does the utility have?
- How many cleaning crews and shifts does the utility employ?
- How many cleaning crews are dedicated to routine cleaning?
- How many cleaning crews are dedicated to emergency cleaning?
- What has the utility's experience been regarding pipe damage caused by mechanical cleaning equipment?
- Where is the cleaning equipment stationed?

Chemical Cleaning and Root Removal

Roots are a major cause of stoppages in many systems, so root removal and control is an important utility operation.

- Does the utility have a root control program?
- Are chemical cleaners used? What types?
- How often are they applied?
- How are the chemical cleaners applied?
- What results are achieved through the use of chemical cleaners?

✔ *Hydrogen Sulfide Monitoring and Control*

The presence of hydrogen sulfide gas in gravity and pressure sewer lines can, and often does, lead to serious and catastrophic corrosion of concrete pipes and the metallic components of sewer systems. Hydrogen sulfide corrosion is usually a problem in areas having little topographic relief where there may be long travel times. Hydrogen sulfide corrosion can also be a problem downstream from pump stations having long wet well holding times.

- Are odors a frequent source of complaints?
- Has the sewer utility verified the existence/non-existence of a hydrogen sulfide problem, and if one is present, does it have in place corrosion control programs?
- What are the major elements of the utility's program?

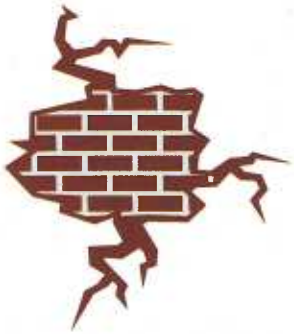
A control program could be use of chemicals or aeration to prevent the formation of hydrogen sulfide. Pipe materials which resists corrosion are also effective. Often, a combination of approaches will be included in a program.

✔ *Lift Stations*

Lift stations are an important part of most wastewater systems. In coastal or other areas with little topographical relief, lift stations are a major O&M item. The effects of deteriorated collection systems are often realized at lift stations in the form of severe overflows during rain events.

Operation

- How many personnel are detailed to pump station operations and maintenance?
- Are these personnel assigned full-time or part-time to pump station duties?
- Is there sufficient redundancy of equipment?



Emergencies

- Who responds to lift station overflows? How are they notified?

- How is loss of power at a station dealt with? (e.g., on-site electrical generators, alternate power source, portable electric generators)

Alarms and Monitoring

- How are lift stations monitored?

The answer to this question will depend on the station size, and the size and complexity of the system. In many systems, audible alarms or flashing lights are used to indicate a problem at the station. Reliance is placed on either the local populace or law enforcement to notice and report an alarm. In more modernized systems, alarm conditions are remotely monitored at a central location. This is particularly true for the larger stations. These SCADA (Supervisory Control and Data Acquisition) systems allow for real-time control, monitoring, and record keeping from remote locations.

Inspection

- How often are lift stations visited?
- What is inspected during these visits?
- Is there a checklist?

Preventative and Routine Maintenance

- Is there a preventive maintenance program for lift station equipment, and if so, what is involved in this program?
- Is an adequate parts inventory maintained for all equipment?
- Is there a sufficient number of trained personnel to properly maintain all stations?

Record keeping

- Are O&M logs maintained for all pump stations?
- Are manufacturer's specifications and equipment manuals available for all equipment?
- Are run-times or ampere readings recorded for all pumps? How is this information used to assess performance?

Force Mains and Air Release/Vacuum Valves

Force mains and air release/vacuum valves are an integral part of the transmission system. Force mains receive the lift station effluent and convey it to the gravity system or the treatment plant. Air release/vacuum valves are installed at the high points of the force main.

The route of force mains should be inspected regularly in order to determine if any leaks are present. This is particularly true where the route is through remote areas. Air release/vacuum valves should be identified and receive regular documented maintenance. Malfunctions of these valves can lead to overflows and/or a reduced hydraulic capacity of the force main.

- Does the utility schedule and conduct inspections of force main routes?
- Does the utility have a scheduled maintenance/inspection program for air release/vacuum valves?

✔ *Sewer System Evaluation*

As discussed in the Management section, many of the techniques in use for SSES work should be a part of a utility's operation and maintenance program. Larger utilities can justify the purchase of much of the equipment used in this effort.

Flow Monitoring

Flow monitoring data collection and evaluation should be an important part of a good O&M program. A well-designed flow monitoring program will give a snapshot of the current condition of the system. By isolating the portions of the system that are making the greatest contribution to the problem, resources can be directed where they will be of greatest benefit.

Techniques used to monitor flow include continuous metering, nighttime field measurements, quantification of pump run-times, and flow measurements taken at the treatment plant. Continuous flow measurement at key locations throughout the collection system will give the most accurate indication of system integrity. The other techniques have been used to some advantage with smaller systems.

Use of meters which measure depth of flow and velocity will allow accurate results, even under surcharged conditions. Meters are available which allow continuous data recording

which can either be downloaded locally or transmitted to a remote location. Coupled with appropriate software, this is a powerful tool for sewer system evaluation.

- Does the utility have a flow monitoring program? If so, what methods are used?

Manhole Inspection

Inspecting manholes is an important part of any maintenance program. Often utilities are unaware of the location of many of their manholes. This is unfortunate since manholes are an important source of I/I and are good indicators of problems in the system. Missing manhole lids and offset manhole cones are often the result of sewer overflows. Debris on manhole steps or high waterlines indicate the presence of surcharged conditions.

Some utilities use manhole inserts to reduce inflow to the system. A manhole insert is a small, tub-shaped plastic device installed at the top of the manhole and held in position by the manhole lid. Its purpose is to catch water that enters the manhole via holes in the lid or via the access pick holes.

- Does the utility have a routine manhole inspection program?

- Is there a data management system for documenting and tracking manhole inspection activities?

- What triggers whether a manhole needs rehabilitation?

Sewer Cleaning Related to I/I Reduction

- Are sewers cleaned prior to flow monitoring?

- Are sewers cleaned prior to televised inspection?

Televised Inspection

Inspecting sewers using closed-circuit television (CCTV) cameras is a powerful tool for I/I reduction. Leaking joints or punctures can be easily detected and often repaired at the time of inspection. CCTV is also a good method to inspect the integrity of new construction before the warranty expires.

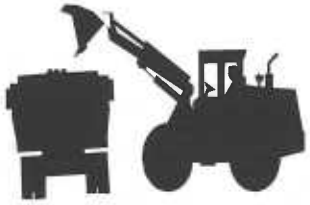
- Does the utility use televised inspection? If so, in what context?

Smoke Testing and Dyed Water Flooding

These techniques are useful to locate defects in the system and illegal connections.

- Does the utility use smoke testing to identify sources of inflow into the system?
- Does the utility use dyed water flooding to identify suspected sources (indirect connections) of inflow into the system when smoke testing yields inconclusive results?
- Is there a data management system for tracking these activities?
- Is there a document that describes the procedures that the utility follows? Are there any standard forms?

✔ *Rehabilitation*



Several techniques are available for sewer rehabilitation. A determination of the best techniques to apply to a particular situation should be made following the SSES and an economic analysis comparing the different options.

Main Line Repairs

Point and Replacement Repairs

Point repairs consist of repairing cracked, corroded, or broken gravity sewers and force mains. This work typically includes excavation to the location of the break, removal of the broken pipe section(s) and replacement with new pipe.

Joint Testing and Grouting

Joint testing and grouting are done on sewer line sections with leaking joints but no structural defects. This work can be done in conjunction with the routine televising of lines. Grouting has a limited life and must be repeated every 5-10 years.

Sewer Lining

Sewer lining is a technique which returns pipe to new condition. Many of the current systems can be used where pipe is structurally deficient. Due to the limited excavation required for these techniques, they are good choices where surface construction would cause much disruption.

- What type of main line repairs has the utility used in the past?
- Does the utility currently use any of above techniques for main line repairs?

Manhole Repairs

Manhole repairs consist of repairing structural defects or leakage in individual manholes and castings. The structural repair work may include:

- Complete manhole replacement
- Replacing castings (lid and frame)
- Replacing defective adjusting rings or top segments
- Spray relining the existing manhole
- Grouting fissures to eliminate leakage

- What rehabilitation techniques are used for manhole repairs?

- What type of documentation is kept?

✔ *Service Laterals*

Service laterals can often be the largest source of I/I to a system. Taps, joints, and locations of structural damage are common points where I/I may be introduced into the collection system. Most utilities have legally established what part(s) of the service lateral they maintain. Jurisdiction may cover the tap only, cover all construction to the property line, or cover construction all the way to the building. The utility itself may not have direct control over installation of new service laterals. Typically the municipality's building inspectors have this responsibility. What is important is that there is communication and a consistency of standards between the utility and building departments.

- To what degree does the utility have responsibility for service laterals?

- Does the utility have a written procedure for the approval and inspection of new construction service laterals?

- Does the utility require service laterals to meet certain standards of construction? How are these standards made available to builders?

- Does the utility have a procedure to actively find and remove illegal tap-ins?

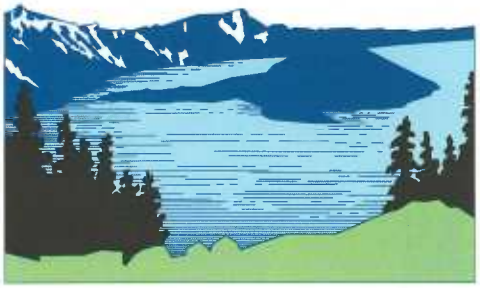
- What is the utility's jurisdiction related to repair/replacement of service laterals?

- Does the utility include I/I originating from service laterals as part of their system evaluations?

✔ *Alternative Collection Systems*

Alternative collection systems differ significantly from the conventional gravity sewer commonly employed to convey wastewater. Alternative systems include: grinder pump pressure systems, septic tank effluent pump (STEP) systems, small diameter gravity systems, and vacuum collection systems. Each system has its own unique operation and maintenance requirements and could be found as a subset of a system which is predominately gravity sewer or by itself as a stand-alone utility.

Although each alternative system operates differently and has different maintenance requirements, all require a similar management system. In each system appurtenances are located at each residence, so the utility needs to have ready access, maintain adequate spare parts, and install alarm systems to notify the utility of any problems between inspections.



Grinder Pump Systems

Grinder systems employ a holding tank (typically up to 100 gallons and located near an individual residence) which houses a small pump with a grinder attached. Wastewater is discharged intermittently using float controls. The collection system is comprised mostly of 1½" and 2" PVC plastic lines. Manholes are generally not installed, but cleanouts should be installed at the ends of all lines and at critical points. Air release valves are installed at the downstream side of high points. Pressures are low.

A system serving 500 homes would include 500 individual pump stations so a utility needs to have an appropriate staffing level for maintenance. A minimum of two personnel should be available. Generally speaking, a staff including two full-time employees per 1,000 stations has been found sufficient for well-designed systems.

Major sources of emergency maintenance include electrical problems and grease buildup in the holding tanks, resulting in failure of the floats to activate the pumps. Corrosion within the holding tank can also be a problem. Grinding solids reduces the likelihood of solids deposition, but hydrogen sulfide may be a problem where the pressure line discharges to the treatment plant or into a gravity collection system.

Pump preventive maintenance is critical and adequate spare pumps should be in inventory. Pumps and grinders may require frequent replacement and overhaul. Pump life is limited and a plan to replace all pumps should be in place. Infiltration is generally not a problem, but exfiltration may occur through deteriorated joints.

Septic Tank Effluent Pump Systems

STEP systems are similar to the grinder pump system except a septic tank replaces the holding tank and grinders are not present on the pumps. A greater range in pump types (centrifugal, progressive cavity, etc.) are common with these systems. Although the septic tank provides preliminary treatment and solids settlement, it is part of the collection system.

Significant infiltration may occur with poorly sealed and constructed septic tanks. Lines are generally sized assuming low infiltration rates. High infiltration rates will increase pump operation and may reduce pump life.

The wastewater is highly septic and can cause odor and corrosion problems where the pressure line discharges into a conventional manhole or treatment works. Proper operation and maintenance of the septic tank is essential for proper function of the collection system, so tanks should be pumped out on a set schedule.

Small Diameter Gravity Sewers

Like STEP systems, small diameter gravity systems use septic tanks for preliminary treatment and solids removal. However, no pumps are used. The septic tank overflows into a small diameter (4" and up) pipe placed at a moderate grade. The lower solids concentration in the wastewater results in less deposition of solids in the pipe.

Cleanouts are generally used in place of manholes, and pipes are sized assuming low infiltration rates. Similar to the STEP system, the integrity and maintenance of the septic tank is a critical factor for proper operation.

Vacuum Sewer Systems

Vacuum systems have a central vacuum station which includes vacuum pumps, holding tanks, and pressure pumps. The vacuum pumps provide a continuous suction in the collection line. A holding tank and vacuum valve are installed near each residence.

When the wastewater reaches a set level in the holding tank, the valve is opened to release a slug of liquid into the collection line. A loss of vacuum in the system will generally trigger a fault condition. Major breaks may cause the system to shut down, and leaks are difficult to locate. Once the wastewater arrives at a central vacuum station, it enters a holding tank and is pumped to the treatment facility through a force main.

- Does the utility have control of the near-residence portions of the collection system?
- Who owns the near-residence systems?
- Does the utility do periodic inspections of the near-residence facilities?
- What is the frequency of these inspections?
- Are pressure check valves installed on pumps?
- Are clean-outs installed at the end of each branch line?
- Is a pipe locating system installed?
- Are air release valves installed on the downstream side of high points?
- Does the system have a warning alarm system at each residence?
- How does the utility respond to the alarm system?
- Are odor control systems are installed?

System-Wide MOM Programs Recent Performance Summary													
Performance Measures for Previous 12 Months (Year / Month)													
	A. Number of Customer Complaints												
	B. Number of NPDES Permit Violations												
	C. Number of Capacity-Related Overflows												
	D. Number of Maintenance-Related Overflows												
	E. Number of Operations-Related Overflows												
	F. Number of Blockages												
	G. Number of Cave-Ins												
	H. Number of Pump Station Failures												
	I. Peak Flow Factor at Treatment Plant (1 hour high/dry month avg.)												
	J. Monthly Average Treatment Plant Flow Rate (gal/capita/day)												
	K. Monthly High One Day Treatment Flow Rate (gal/capita/day)												
	L. Number of By-Passes at Treatment Plant												
	M. Volume of Treatment Plant By-Passes (gal)												
	N. WWTP Weekly Average Influent BOD (mg/L)												

Useful References for Management, Operations, and Maintenance Programs

The following references may be obtained from their cited sources. Documents referenced to California State University, Sacramento may be obtained by contacting:

California State University, Sacramento
Office of Water Programs
6000 J Street
Sacramento, California 95819-6025
(Tel) 1-916-278-6142 (Fax) 1-916-278-5959
(E-mail) wateroffice@csus.edu

Documents referenced to the Water Environment Federation may be obtained by contacting:

Water Environment Federation
601 Wythe Street
Alexandria, VA 22314-1994 USA
(Member Services Center) 1-800-666-0206
(Fax) 1-703-684-2492 (E-mail) pubs@wef.org
(Internet) http://www.wef.org/TechResCatalog/marketplace/

Documents referenced to the Environmental Protection Agency may be obtained by contacting either the NCEP (if in stock) or the NTIS:

U.S. Environmental Protection Agency
National Service Center for Environmental Publications
P.O. Box 42419
Cincinnati, OH 45242
(Tel) 1-800-490-9198 (Fax) 1-513-489-8695
(Internet) http://www.epa.gov/ncepihom/orderpub.html

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(Tel) 1-800-553-NTIS (Fax Orders) 1-703-605-6900
(E-mail) orders@ntis.fedworld.gov
(Internet) http://www.ntis.gov/ordering.htm

The EPA Region 4 Guide may be obtained by contacting Region 4 directly:

U.S. Environmental Protection Agency, Region 4
Water Management Division
Water Programs Enforcement Branch
61 Forsyth Street, SW
Atlanta, GA 30303-8909

Useful References for Management, Operations, and Maintenance Programs

➢ Sewer System Infrastructure Analysis and Rehabilitation, October 1991, United States Environmental Protection Agency, EPA/625/6-91/030

- Collection Systems: Methods for Evaluating and Improving Performance, 1998, California State University, Sacramento Foundation, Rick Arbour and Ken Kerri, USEPA Grant No. CX924908-01-0

- Wastewater Collection Systems Management, Manual of Practice 7, 1998, Water Environment Federation, 601 Wythe Street, Alexandria, Virginia, 22314

- Operation and Maintenance of Wastewater Collection Systems, A Field Study Program, Fifth Edition, Volume 1, 1996, California State University, Sacramento

- Operation and Maintenance of Wastewater Collection Systems, A Field Study Program, Fifth Edition, Volume 2, 1996, California State University, Sacramento

- NPDES Compliance Inspection Manual, Chapters 4 and 9, September 1994, EPA 300-B-94-014

➢ Handbook for Retrofitting POTWs, July 1989, EPA 625-689-020

- Pretreatment Compliance Monitoring and Enforcement Guidance, September 1986, United States Environmental Protection Agency

➢ Guidance for Conducting a Pretreatment Compliance Inspection, September 1991, EPA 300R-92-009

- EPA Region 4 Guide for Conducting Evaluations of Municipal Wastewater Collection System Management, Operation, and Maintenance Programs, October 30, 1996

➢ = Available for viewing on-line at the National Environmental Publications Internet Site (NEPIS). Go to www.epa.gov/necepihom/nepishom and search using the document code (e.g., 625689020).

APPENDIX E

Appendix E

Sewer Overflow Response Plan

The City of JACKSON MISSISSIPPI

Prepared By:
City of Jackson
Water/Sewer Utilities Division
200 S. President Street, Rm 405
P.O. Box 17
Jackson, MS 39205-0017
Voice: (601) 960-2090
Fax: (601) 968-3502
Submitted On: September 28, 2011
Approved On: October 10, 2011
Amended On: _____, 20___

Sewer Overflow Response Plan

Sewer System Owner:
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PO Box 17
Jackson, MS 39205-0017

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(601) 960-1084

Chris Mims, Director of Communications
Office of the Mayor
(601) 960-1084
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dgaillet@city.jackson.ms.us

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Regulatory Agencies to Receive Sewer Overflow Report:

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I. AUTHORITY

This Sewer Overflow Response Plan (SORP) is prepared to facilitate proper incident reporting procedures outlined in MDEQ Agreed Order No **5823 10** and Section 750-2.7 Incident Reporting of the NPDES permits.

II. GENERAL

The Sewer Overflow Response Plan (SORP) is designed to facilitate the proper response to sewer overflows to by the appropriate City of Jackson (COJ) personnel and the proper reporting of such overflows to State and Local Authorities. For the purpose of this plan the City of Jackson or City of Jackson personnel includes all contractors who provide labor, materials, services or any other resource to comply with all applicable regulations and goals. Quick response will minimize the effects of the overflow with respect to impacts on public health, the environment, beneficial uses and water quality of surface waters and on customer service. The SORP further includes provisions for safety pursuant to the directions provided by the Mississippi Department of Environmental Quality (MDEQ) and that notification and reporting is made to the MDEQ and the Hinds County Department of Health (HCDH) when applicable.

A. Purpose

The purpose of the SORP is to:

1. Develop a proactive procedure to identify potential and actual sewer overflows;
2. Develop an immediate response plan to minimize health and environmental impacts from overflows;
3. Establish procedures to quickly eliminate the overflow;
4. Develop protocols to report SSOs to MDEQ and other agencies as appropriate; and
5. Develop public notification procedures to be used as appropriate.

"Sanitary Sewer Overflow" or "SSO" shall mean any discharge of wastewater to waters of the United States or the State from the City's Sewer System through a point source not specified in any NPDES permit, as well as any overflow, spill, or release of wastewater to public or private property from the Sewer System that may not have reached waters of the United States or the State, including all Building Backups.

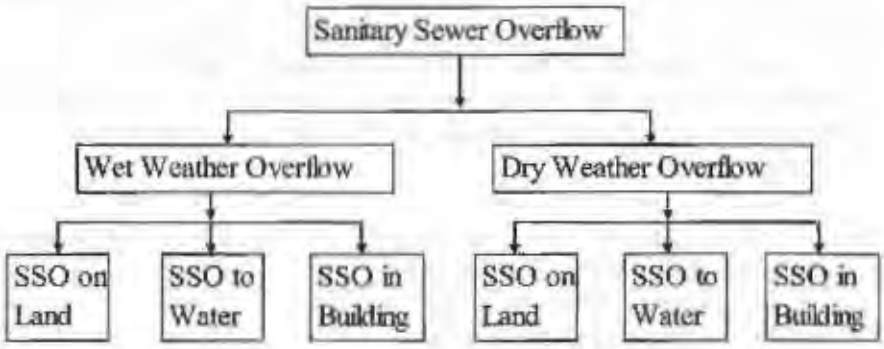
The "POTENTIAL" SSO location is defined as the manhole or point at which an SSO is likely to occur in the event of a pump station failure. These were located by observing the lowest manhole (usually the closest to the pump station if not the pump station itself) by United Water and the City. These were visual observations only and not surveyed at this time.

This SORP is developed to address the fundamental types of SSOs:

- **Wet Weather Overflows**
  Wet weather overflows result from excessive flows during significant rain events and/or elevated ground and surface water conditions. They can be attributed to a number of factors, including, but not limited to, the following:
  - Downspouts
  - Footing drains
  - Sump pumps
  - Leaking service laterals
  - System Infiltration
  - Flooding from the stormwater system

- **Dry Weather Overflows**
  Overflows during dry weather are most often caused by flow restrictions or system disruptions. Dry weather SSOs can be attributed to a number of factors including, but not limited to, the following:
  - Bottlenecks and/or blockages
  - Grease
  - Roots
  - Debris
  - Mechanical failures
  - Sewer main breaks

Additionally, each of these types of SSO can lead to a discharge to either land, water of the U.S. or State, or within a building. The protocols outlined in the following sections describe the appropriate response to a SSO based on its location as shown on the following chart.



The SORP Long Term Corrective Actions Procedures (Section VII) discusses the type, location, destination, cause, impact, and containment and remediation requirements of SSO, as well as prevention measures.

The effective date of this plan is October 10, 2011. All schedules/proposed deadlines within this plan begin on the effective date. A detailed implementation plan can be found in Appendix A.

B. Organization of Plan

The key elements of the SORP are addressed individually as follows:

Section III	Overflow Identification and Response Procedure
Section IV	Building Backups Procedure
Section V	Public Advisory Procedure
Section VI	Regulatory Agency Notification Procedure
Section VII	Long Term Corrective Action Procedures
Section VIII	Personnel Training
Section IX	Maintenance of SORP
Section X	Appendices

III. OVERFLOW IDENTIFICATION AND RESPONSE PROCEDURE

The Overflow Identification & Response Procedure presents a strategy for the COJ to identify and then mobilize labor, materials, tools and equipment to correct or repair conditions, which may cause or contribute to a sewer overflow. The plan considers a wide range of potential system failures that could create an overflow to surface waters, land or buildings.

A. Receipt of Information Regarding an SSO

An overflow may be detected by COJ personnel or by others. COJ is diligent in attempting to identify SSOs before they become a public issue. After each significant rainfall event, COJ personnel shall remotely monitor or inspect potential and known SSO locations for problems. Significant rain events include those rain events that are known to be, or suspected of being, associated with, or contributing to SSO occurrences, regardless of the intensity, duration or measured rain gauge size of the event. In addition, other public offices such as police and fire departments are to report any SSOs encountered. COJ personnel are responsible to act based on received notification of sewage overflow from the wastewater collection system, and to provide immediate response to investigate and/or correct reported sewer overflow. Generally, telephone calls from the public reporting sewer overflows are received at the public offices identified in Appendix B. If received by another public office, that office will alert Public Works.

The call taker (person who received notice of an SSO) obtains all relevant information available regarding the overflow including:

a. Time and date call was received;
b. Caller's name and phone number;
c. Specific location of problem;
d. Description of problem;
e. Time overflow was noticed by the caller;
f. Observations of the caller such as odor and duration; and
g. All relevant information that helps COJ personnel to quickly locate, assess and stop the overflow.

The call taker records initial information including their name in a Sewer System Work Order (Appendix C) and notifies Sewer Maintenance Division personnel. In addition to the Work Order form, which is used for sewer maintenance activities, reports of an overflow require additional information. Overflows are entered into a Wastewater SSO Assessment Form (Appendix C). In addition all information regarding a SSO is entered into the SSO database system.

B. Dispatch of Personnel to Site of Reported Sewer Overflow

The COJ will dispatch maintenance personnel to confirm reported overflows as soon as reasonably possible of receiving notification of the overflow(s). During the normal business hours, the goal of the City is for this confirmation to take place in less than one hour of the notification. During non-business hours, this confirmation should normally take place within two hours of the notification. In addition, the COJ proposes to divide the City, using existing police precincts, into sewer response zones. Each zone will have personnel and equipment assigned and located within that zone for SSO response. These zone response teams should be in place within 24 months. In the interim, COJ will continue to respond from existing maintenance facilities within the proposed time frame. These zones are shown on an Exhibit in Appendix D. The City is using the police precinct zones since these zones were previously defined and provided for a reasonable response area for each team. Until verified, the report of a possible spill will not be referred to as a "sewer overflow" only as a "maintenance activity". COJ personnel will complete the Wastewater SSO Assessment Form (Appendix C) within 24 hours of the reported activity and upon confirmation, provide the information orally to the MDEQ. The COJ Supervisor, Superintendent, Wastewater Collections engineer, or authorized designee is responsible for reviewing, updating and signing the final Sewage Overflow Report. Sewage overflow response internal notification and tracking protocol is summarized in Appendix D.

If the overflow will affect swimming areas during the swimming season, public drinking water intakes, or if it results in a fish kill, the COJ shall notify the MDEQ contact person and the HCHD contact person orally, immediately upon confirmation of the SSO. After business hours, any significant overflows should be reported to the MEMA 24 hour response number. An Exhibit showing the swimming areas can be found in Appendix D.

Failure of any element within the sanitary sewer collection system that threatens to cause or causes a SSO shall trigger an immediate response to isolate and correct the problem. Personnel and equipment shall be available to respond to any SSO locations. Additional maintenance personnel shall be "on call" in the event extra manpower is needed.

1. Dispatching Maintenance Personnel

   - When COJ personnel receive notification of a potential sewer overflow, the COJ will dispatch maintenance personnel with appropriate resources as required.
   - Maintenance personnel may be dispatched by telephone or radio or other means. The appropriate personnel, materials, supplies and equipment will be provided as needed.

2. Maintenance Personnel Instructions

   - The call taker must verify that the entire message has been received and acknowledged by the maintenance personnel who were dispatched. All personnel being dispatched to the site of an SSO will proceed immediately to the site of the overflow. Any delays or conflicts in assignments will be reported immediately for resolution.
   - In all cases responding maintenance personnel shall report their findings, including possible damage to private and/or public property, to their supervisor immediately upon completing their investigation. If the supervisor has not received findings from the field crew within one (1) hour of dispatch the supervisor will contact the responding maintenance personnel to determine the status of the investigation. The call time, dispatch time, and arrival time will be shown on the Wastewater Overflow Form.

3. Additional Resources

   Should the superintendent or the wastewater collections engineer receive requests for additional personnel, material, supplies, and equipment from maintenance personnel working at the site of a sewer overflow, the request will be immediately forwarded to the appropriate supervisory personnel.

4. Preliminary Assessment of Damage to Private and Public Property

   COJ personnel will take photographs of the sewer overflow impacted area in order to thoroughly document the nature and extent of impacts. Photographs will be retained for filing with the Overflow Report. COJ personnel shall only enter private property with permission from the property owner or tenant-in-possession.

5. Field Supervision and Inspection

   - The COJ Superintendent, Wastewater Collections engineer, or authorized designee shall be responsible for verbally notifying MDEQ and HCDH within the specified 24 hour time period and submitting the Overflow Report to MDEQ. The contact information and required reporting timeframe can be found in Appendix E.
   - The COJ Superintendent or Wastewater Collections engineer shall visit the site of the sewer overflow during and/or after work to ensure that provisions of this Overflow Response Plan and other directives are met.

6. Coordination with Hazardous Materials Response

- Upon arrival at the scene of a sewer overflow, should a suspicious substance (e.g., oil sheen, foamy residue) be found on the ground surface, or should a suspicious odor (e.g., gasoline) not common to the sewer system be detected, the COJ sewer maintenance crew shall immediately contact the responsible supervisor for guidance before taking further action.
- Should the supervisor determine the need to alert the hazardous material response team, the maintenance personnel shall await the hazardous waste team response.
- Contact the MDEQ 24-hour Emergency Response after hours at 1-800-222-6362.
- Upon arrival of the Hazardous Material Response Team, the COJ sewer maintenance personnel will take direction from the person with the lead authority of that team. Only after that authority determines it is safe and appropriate, will the COJ sewer maintenance personnel proceed under the SORP with the containment, clean-up activities and correction.

C. Overflow Correction, Containment, and Clean-Up

This section describes specific actions to be performed by COJ sewer maintenance personnel once a SSO has been identified and confirmed according to the procedures outlined in previous sections.

The objectives of these actions are:

- To protect public health, environment and property from sewage overflows and restore surrounding area back to normal as soon as possible;
- To establish perimeters and control zones with appropriate traffic cones and barricades, vehicles or use of natural topography (e.g. hills, berms);
- To promptly notify the regulatory agency with preliminary overflow information and potential impacts; and
- To contain the sewer overflow to the maximum extent possible including preventing the discharge of sewage into waters of the US and/or State.

1. Responsibilities of Maintenance Personnel Upon Arrival

It is the responsibility of the first personnel who arrive at the site of a sewer overflow to protect the health and safety of the public by mitigating the impact of the overflow to the maximum extent possible. If the overflow is not the responsibility of The City of Jackson, but there is imminent danger to public health, public or private property, or to the quality of waters of the state, then the COJ Supervisor, Superintendent, Wastewater Collections engineer, or authorized designee shall take prudent emergency action.

Upon arrival at a SSO, the COJ sewer maintenance personnel perform the following:

- Determines the cause of the overflow, e.g. sewer line blockage, pump station mechanical or electrical failure, sewer line break, etc.;
- Takes immediate steps to stop the overflow, e.g. relieves pipeline blockage, manually operates pump station controls, utilize portable by-pass pump system, repairs pipe, etc. Extraordinary steps may be considered where overflows from private property threaten public health and safety (e.g., an overflow running off of private property into the public right-of-way). Record what the blockage material is. For example: grease, rags, etc.;
- Requests additional personnel, materials, supplies, or equipment that will expedite and minimize the impact of the overflow; and
- If needed, identifies and requests assistance or additional resources to correct the overflow or to assist in determination of its cause.

2. Initial Measures for Containment

When possible, initiate measures to contain the overflowing sewage and recover sewage that has already been discharged. Take all steps necessary to minimize the impact to public health and the environment

- Determine the immediate destination of the overflow, e.g. storm drain, street curb gutter, body of water, stream bed, inside building, etc.;
- Identify and request the necessary materials and equipment to contain or isolate the overflow, if not readily available;
- Establish control zones to help prevent public access using appropriate signs and barricades; and
- Take immediate steps to contain the overflow, e.g., block or bag storm drains, recover through vacuum truck, divert into downstream manhole, etc.

3. Additional Measures Under Potentially Prolonged Overflow Conditions

In the event of a prolonged sewer line blockage or a sewer line collapse, set up a portable by-pass pumping operation around the obstruction.

- Take appropriate measures to determine the proper size and number of pumps required to effectively handle the sewage flow.
- Implement continuous or periodic monitoring of the by-pass pumping operation as required.
- Address regulatory agency issues in conjunction with emergency repairs.

Pump Station Emergency Procedures

Numerous pump stations throughout COJ's system have a pump station bypass into the force main. If the SSO is caused by pump failure at one of these stations, maintenance personnel should call for a portable by-pass pump system to be brought to the pump station so the station can utilize the bypass into the force main and continue to function while the station is being repaired. If the SSO occurs at a pump station without a pump station bypass into the force main a detailed plan for avoiding an additional SSO during the repair period will be included in the detailed resource plan for the SSO which is submitted to MDEQ. For example, COJ could utilize a temporary HDPE force main to transfer flow to the gravity system.

In addition, the COJ will conduct an evaluation and analysis to determine the storage volume and pump around procedures for each pump station. The COJ is currently reviewing existing documents to determine the extent of field work required to adequately estimate the storage volume for each pump station. The pump station emergency operations plan and volume inventory shall be completed within 180 days of MDEQ's approval of this SORP. This inventory will also include which stations have an emergency bypass into the force main. For those stations without a bypass a schedule will be submitted for the construction of the needed bypass within 12 months of the completed inventory. Appendix C contains a table of the potential overflow location for each pump station. These sites are shown on the included map as well.

4. Cleanup

Sewer overflow sites shall be cleaned thoroughly after an overflow, so that no sewage related residue (e.g., sewage solids, papers, rags, plastics, and rubber products) remains.

- Whenever possible digital photos should be taken of the area before and after cleanup.
- Where practical, thoroughly flush the area clear of any sewage or wash-down water. Solids and debris are to be flushed, swept, raked, picked-up, and transported for proper disposal. Next the area shall be thoroughly flushed clear of any sewage or wash-down water.
- Secure the overflow area to prevent contact by members of the public until the site has been thoroughly cleaned.
- Where appropriate, disinfect and deodorize the overflow site.
- Where sewage has resulted in ponding, pump the pond dry and dispose of the residue in accordance with applicable regulations and policies.
- If a ponded area contains sewage, which cannot be pumped dry, it may be treated with lime and aerated. If sewage has discharged into a body of water that may contain fish or other aquatic life, do not use bleach. Contact the MDEQ for specific instructions. See Appendix E for contact information.
- When backup is in a building, follow the procedures outlined in Section IV.

5. Minimize Transmitted Flows

Minimize the volume of untreated wastewater transmitted (via gravity or force main) into the portion of the sewer system impacted by the events precipitating the SSO.

- When an area is experiencing an SSO, determine the upstream (or tributary) areas that are contributing to the overflow and utilize the collection system for temporary storage. This may include temporary plugs in the gravity main or by manually controlling lift station pumps so as to pump on a delayed basis.
- When possible, utilize temporary pumps and force main to pump around the affected area.
- In extreme situations, it may be necessary to shut down commercial or industrial facilities that contribute high volumes of wastewater or to request the general public to limit water use. This action should only be performed by the Director of Public Works.

D. Sewage Overflow Report

The Wastewater SSO Assessment Form in Appendix C contains information which is required to be reported to MDEQ and possibly to HCDH depending upon the nature of the spill. The SSO Assessment Form will be provided to MDEQ within 5 days of the SSO. The COJ maintenance crew leader completes a Wastewater SSO Assessment Form then promptly notifies the COJ Water/Sewer Utilities Division and MDEQ when the overflow is eliminated. Along with the Assessment Form, when the corrective action is not a permanent one, the Superintendent, Wastewater Collections engineer, or authorized designee will prepare a detailed resource plan and milestone schedule for long term corrective action for the cause of the SSO. This plan and schedule will be submitted with the SSO Assessment form. Monitoring of compliance with the plan and schedule milestones will be conducted quarterly after the original occurrence.

If the overflow will affect swimming areas during the swimming season, public drinking water intakes, or results in a fish kill the COJ shall notify the MDEQ contact person and the HCDH contact person immediately upon confirming the discharge. See Appendix E for contact information.

In addition to the Assessment Form all information regarding a SSO will be entered into a Work Order and SSO database system which will be purchased and maintained by the City. This database system will allow the City to maintain long term records including, but not limited to, location, cause, date, volume, and corrective actions taken for SSOs throughout the City. The Work Order and SSO database will retain a minimum of five years of data. The City is purchasing and implementing a new data management system. This system shall be in place within 9-12 months of MDEQ's approval of this SORP In the interim, the City will have all data entered into a MS Office database system by a contractor. At this time, the proposed contractor for data entry is WEI-AJA, LLC. Both the City and contractor will have access to the data. This data will be transferred to the new system once it is implemented. Information regarding the sewer overflow includes the following:

- Determination if the sewage overflow had reached waters of the State and/or waters of the US, i.e., all overflows where sewage was observed running to such waters, or there was obvious indication (e.g. sewage residue) that sewage flowed to these waters;

- Determination that the sewage overflow had not reached surface waters by describing conditions at the sewage overflow, which support this determination.

- Determination of the start date and time of the sewer overflow by one of the following methods:
    1. Date and time information received and/or reported to have begun and later substantiated by COJ sewer maintenance personnel; or
    2. Visual observation;

- Determination of the stop date and time of the sewer overflow by one of the following methods:
    1. When the blockage is cleared and/or flow is controlled or contained; or
    2. The arrival time of the COJ sewer maintenance personnel, if the overflow stopped between the time it was reported and the time of arrival.

- Determination of the volume of the sewer overflow using the "San Diego Method". This method uses image of overflowing manholes to provide a visual comparison. COJ shall complete its own image inventory for various flows within 180 days of MDEQ's approval of this SORP. Until the COJ image inventory is complete, the EPA provided images will be used.

- Photograph the event, when possible.

- Assessment of any damage to the exterior areas of public/private property. COJ sewer maintenance personnel shall not enter private property for purposes of estimating damage to structures, floor and wall coverings, and other personal property without authorization from their supervisor. Procedures for SSOs within an existing building are outlined in Section IV.

E. Customer Satisfaction

COJ personnel will follow up in person or by telephone with the entity who was reporting the overflow within five working days after work is complete. The cause of the overflow and its resolution will be disclosed.

IV. BUILDING BACKUPS PROCEDURE

A. Communication Plan

SSOs that backup into a building may be reported by any member of the public or customer served by the COJ's Wastewater Collection and Treatment System including homeowners, tenants in rental properties or personnel who work in commercial, industrial or institutional properties. Points of contact and phone numbers to call in the event of a building backup during normal working hours, Monday through Friday from 8:00 AM to 5:00 PM, are listed in the telephone directory. Customers can call the Utilities Division at 601-960-1189 or the Sewer Maintenance Division at 601-960-1875 to report building backups. After hours and on weekends, citizens should call the emergency number at 601-960-1875. In order to make customers aware of these numbers, the following will be added to all water/sewer bills: "To Report a Sewer Problem – Call 601-960-1189 or 601-960-1875 after business hours"

B. Response Process

Upon notification of a building backup, representatives of the COJ's Sewer Department will follow the timeframes and processes outlined in Section III of this plan entitled "Overflow Response Procedure". The personnel flow chart for this response can be found in Appendix D. Accordingly, COJ personnel will conduct a site investigation within the timelines outlined previously for business and non-business hours to determine if the cause is a problem in the COJ system or if it has occurred as a result of a failure on the customer's (private) side of the system.

If the building backup is found to be caused by a collection system failure on the public main, the COJ will immediately begin the response process to correct the problem and, in addition, will provide the property owner, property owner's representative or tenant with the names and contact information for authorized independent cleaning contractors who they may contact to clean and sanitize all indoor areas affected by the building backup. The independent cleaning contractor will use measures consistent with the standards in that industry to remove all waste and disinfect the affected areas. The work of the independent cleaning contractor is limited to cleaning the waste from the affected areas indoors and disinfecting those areas. The independent cleaning contractor will not be authorized to perform any services to repair or restore private property or the structure affected by the building backup. By providing the names of authorized independent cleaning contractors, the City does not assume responsibility for damages to the private property or structure affected by the building backup and will only pay the authorized independent cleaning contractor for costs associated with cleaning the waste from the affected building and for disinfecting the affected areas within the building. Neither this provision nor any other provision of the Sewer Overflow Response Plan shall be construed to create any private claim or cause of action against the City or other governmental entity, or to require the City or other governmental entity to compensate any private party for any loss or damage alleged to arise from or relate to a sanitary sewer overflow or building backup.

As part of the advanced planning and preparation, the Public Works Department will ensure that a list of authorized private contractors are maintained and that any such authorized

contractors are fully equipped to respond to building back-up events and perform various clean-up measures caused by sewage contamination. Those meetings will be conducted within 90 days of the adoption of the SORP. A list of authorized contractors will be created within 90 days after the completion of the interview process. Only contractors equipped to fully and quickly respond to a building backup will be included on the list of responding contractors. The City will expect all authorized contractors to respond as quickly as possible, but in no case longer than 6 hours, unless circumstances warrant and are documented. A list of authorized contractors can be found in Appendix B.

If a building backup is found to be caused by a private service lateral failure, the customer will be advised that the public collection system is functional and that they should seek the services of a plumber/professional cleaning service to remedy the problem at their expense.

C. System Repair Process

The materials and construction procedures to be used to correct or repair conditions in the COJ Sewer System will be in accordance with all applicable federal, state and local laws and regulations. No safety regulations, materials requirements or quality of construction craftsmanship will be compromised in the interest of getting the problem repaired quickly. The repair process will follow the procedures outlined in Section III.

D. Response Follow-Up

Measures taken to correct or repair conditions in the COJ sewer system that caused the building backup will be in accordance with those described in Section VII of this plan entitled "Long Term Corrective Actions Procedures". In addition, COJ personnel will follow up in person or by telephone with the entity who reported the overflow within five working days after cleaning work is complete. The cause of the overflow and its resolution will be discussed along with the adequacy of the clean-up. The City will annually review the effectiveness and timeliness of each contractor's performance in responding to building backups to determine whether the contractor should remain on the authorized list. Should the City receive any complaints about a contractor's performance, or should the contractor not respond within 6 hours of notification the City will immediately investigate and review the contractor's performance to determine whether the contractor should remain on the authorized list.

V. PUBLIC ADVISORY PROCEDURE

This section describes the actions the City of Jackson will take, in cooperation with the MDEQ and/or HCDH, to limit public access to areas potentially impacted by sewer overflows from the wastewater collection system.

When evaluating the potential impact of an SSO on public health and the environment, sensitivity factors will be evaluated. These factors will determine the level of public notification and clean up activity required. These sensitivity factors include proximity or impact to:

- Streams, rivers, creeks, and other natural waterways
- Heavy pedestrian or inhabited areas
- Special facilities such as schools, public parks, walking trails, etc.
- Swimming Areas
- Drinking Water Intakes

A. Control Zones

The first COJ personnel on site will attempt to prevent public access by establishing a control zone around the perimeter of the affected surface area using appropriate signs and barricading practices. The temporary signs and barricades will warn passersby to avoid contact with this area. Barricading practices will include, but be not limited to, cones, warning tape, barrels, barricades, etc. The limits, duration, and most appropriate control zone plan will vary on a case-by-case situation.

1. Location of Control Zones

Although the location of temporary signs and barricades will vary for each site, the goal will always be to warn the public to avoid contact until the cleanup is complete. When possible, the control zone will be posted:

- Just beyond the limits of the impacted surface area
- Near high pedestrian and/or vehicular traffic areas
- Other appropriate locations.

2. Duration of Control Zones

Signs and barricades will be posted as soon as the overflow is confirmed and they will remain in place until clean up activities are complete. The timeframe may vary depending on the extent of the response activities, which may include significant mitigation and cleanup requirements. Example signs can be found in Appendix B.

3. Public Information

The Public Works Director or their designee will answer questions from customers about COJ response to SSOs and, when necessary, will respond to the customer reporting the SSO to explain COJ's response. The control zone signs also include the contact number {(601)-960-1875} for the public to call for additional information. Contact information for public offices to be notified can be found in Appendix B. When deemed appropriate, the Public Works Director or his designee will issue a news release to warn customers about the SSO.

News Release [See Appendix B]
COJ maintains a standard news release on SSOs that can be quickly adapted to the particular situation and issued if COJ determines there is a significant threat to

public health. Contact information for media outlets can also be found in Appendix A.

Customer Letters [See Appendix B]

In situations where a service line issue has been identified, COJ sends letters to residential and commercial customers in the affected area. The letters advises the customer of their service line condition and their responsibility in alleviating future SSO by removing roots, extraneous water, disposing of grease and other materials properly and including a brochure on proper disposal.

Public Notification Decision Matrix

Event	Action
Overflow into streams	COJ will place temporary signs along the stream at public access points unless posted otherwise. Additional notification will be considered in conjunction with MDEQ and HCHD.
Overflow in a residential or high traffic area, such as a school or public park.	COJ will place temporary signs in the area of the overflow. Additional notification will be considered in conjunction with MDEQ and HCHD.
Overflow creating a significant health hazard or significant volume has reached waters of the US and/or State	COJ will issue a news release and place temporary signs in the area of the overflow. Additional notification will be considered in conjunction with MDEQ and HCHD.

VI. REGULATORY AGENCY NOTIFICATION PLAN

The Regulatory Agency Notification Plan establishes procedures that the City of Jackson follows to provide formal notice to the MDEQ in the event of a SSO. Agency notifications will be performed in parallel with other internal notifications. Internal notification and mobilization of COJ sewer maintenance personnel are established in Section III - Overflow Response Procedure.

Using data supplied during the verification process and updates from the maintenance personnel, the Sewer Maintenance Superintendent prepares initial and final Overflow/Bypass Reports. Initial report will be provided orally to the MDEQ and if necessary the HCDH within 24 hours from the time the COJ became aware of the SSO. If the overflow will affect swimming areas during the swimming season, public drinking water intakes, or results in a fish kill the COJ shall notify the MDEQ contact person and the HCDH contact person orally, or MEMA, if after business hours, immediately upon confirming the discharge. Contact information can be found in Appendix E.

COJ shall prepare and provide the written final report (digital or hard copy) to the regulatory agency within five (5) days after the COJ becomes aware of the overflow. The wastewater collections engineer is responsible for meeting the notification requirement. The superintendent prepares written notification to the appropriate regulatory agency of any confirmed overflows. The wastewater collections engineer signs these notifications. In addition, the detailed resource plan and milestone schedule for long term corrective action regarding SSOs will be submitted with the written report. Regardless of other notifications, a Report of Noncompliance form is required to be submitted with the monthly Discharge Monitoring Report.

A. Immediate Notification

If the overflow will affect swimming areas during the swimming season, public drinking water intakes, or results in a fish kill, the COJ shall notify the MDEQ contact person and the HCDH contact person orally, or MEMA if after business hours, immediately upon confirming the discharge.

COJ shall fax the initial and any updated Wastewater SSO Assessment Form to:

MDEQ
Attn: **Environmental Compliance and Enforcement Division**
Municipal and Private Facilities
Telephone: **(601) 961-5171**
Fax: **(601) 961-5674**

B. Secondary Notification

Wastewater collections engineer, Superintendent, or authorized designee may contact other agencies, as necessary, as well as other interested and possibly impacted parties.

Hinds County Health Department	Sherri Payne, Regional Environmentalist
Environmental Health	Marvin Bolden, County Environmentalist
539 E Beasley Road	Lakeshia Paige, County Environmentalist
PO Box 20	Phone: (601)-957-1026
Jackson, MS 39205-0020	Fax: (601)-957-1053
Contact Person:	sherrie.payne@msdh.state.ms.us
	marvin.bolden@msdh.state.ms.us
	lakeshia.paige@msdh.state.ms.us

VII. LONG TERM CORRECTIVE ACTION PROCEDURES

The type of mitigation and remediation will vary depending on the cause of the SSO. Wet weather SSO are usually caused by inflow and infiltration (I/I), not by blockages or other problems in the system. Mitigation of wet weather overflows may not be possible until the overflow subsides, but when it does, the City will implement all necessary steps to clean up and disinfect the overflow site.

In addition, the City will remotely monitor or establish routine inspection routes to be completed after each significant rain event. Significant rain events include those rain events that are known to be, or suspected of being, associated with, or contributing to SSO occurrences, regardless of the intensity, duration or measured rain gauge size of the event. This inspection will look for visual signs of a SSO at locations having more than one SSO in the past two years and all pump stations not on a central monitoring system. A map of these locations and sample inspection form can be found in Appendix C. As the City begins these inspections, the most efficient inspection routes will be determined. The inspection program will be maintained by the City with the assistance of a contractor if needed. The City will supply the results of the inspection to the contractor to add to the appropriate database. The City will use the established rain gauges throughout the City to determine the intensity and duration of the rain event. The location of the rain gauges provides adequate coverage for each Police Precinct and is shown on the SSO Inspection Map in Appendix C. Initially, all sites will be inspected following each significant rain event. As rainfall information and inspection results are collected, these results will allow the COJ to evaluate the inspection list and determine when each site should be inspected based on rainfall intensity and duration. In addition any new sites where multiple SSOs have occurred will be added and those sites where permanent corrective action has been completed and SSOs are no longer occurring will be removed after demonstrating that the previously identified SSO is shown not to overflow during an average 2 year, 24 hour intensity rain storm. The Utility Manager will be responsible for the management of the inspection program. The SSO list will be reviewed monthly by the contractor to determine the appropriate status of each SSO.

Dry weather events will be addressed using several methods. COJ field professionals will identify the most effective method or combination of methods to return service to the system. Field crews will use television inspection to determine the most effective way to resolve any service disruption. CCTV inspection will identify the cause and location of the blockage and the necessary techniques needed to eliminate it. The following summarizes common abatement resolution activities. These resolution techniques can be used independently or combined based on field conditions and CCTV inspection.

- **Roots/Grease**
  Combination cleaner/flusher equipment is used to remove any grease, roots, or other obstructions from the line. A root cutter attachment may be necessary to remove the obstruction. Heavy roots and related pipeline integrity problems (through CCTV inspections) are reviewed for replacement and/or rehabilitation. Heavy cleaning may also be achieved through third party services as appropriate.

- **Collapsed Pipe/Sewer Breaks**
  An emergency pipe repair will be required to replace the defective or collapsed pipe. A work order will be initiated immediately and necessary containment and diversion procedures will be in place until the appropriate repairs are completed.

- **Mechanical Failures/Treatment Facility Malfunctions**
  Portable by-pass pumping systems may be used until the repairs are completed at collapsed pipe, the pump station or treatment facility. The responding crews will notify their maintenance supervisor to acquire additional support from construction crews as soon as the emergency repairs are identified.

- **Remove I/I**
  The City will evaluate systemic wet weather SSO and implement corrective measures as part of the Overflow Abatement Program. Currently the City is engaged in a program of I/I identification and repair as an ongoing SSES program.

The City's Work Order and SSO database tracking system will also be used to identify recurring problems within the system so each problem can be addressed properly.

VIII. PERSONNEL TRAINING

COJ personnel will conduct training for the appropriate response crews and support staff to ensure their compliance with the SORP. These training sessions will be organized based on the latest SORP, as well as other reference materials. Training sessions will be supplemented with a practical hands-on field component to prepare response personnel for anticipated situations.

The Utility Manager will be responsible for management of the training program. This will include signing off on completed training as well as reviewing required and future training needs. The training will be conducted by the City's chosen training contractor. The first training sessions were conducted by WEI-AJA, LLC in December 2010.

Also, COJ will conduct refresher sessions annually or when changes are made to the SORP to ensure the same results. COJ will oversee the SORP to ensure that the established procedures are being followed during implementation and field operation.

A detailed training plan is included in Appendix F. Appropriate training materials are being prepared separately.

IX. MAINTENANCE OF SORP

COJ will review the SORP during the first quarter of each year and amend it as appropriate. Any changes or amendments to this SORP shall be sent to MDEQ by April 30 after each annual review. The review shall be conducted by the Public Works Director or his designee. Review shall include, at a minimum, the following activities:

- Conduct workshop with managers and key personnel to review response activities and gather suggestions for new or revised procedures
- Review all contact lists and update as necessary
- Update the SORP as needed in regard to updated regulatory requirements

X. APPENDICES

Appendix A – Detailed Implementation Plan

Appendix B - Public Offices, Media Contact, and Authorized Cleanup Contractors Contact Information

Appendix C – Wastewater SSO Assessment Forms & Maps

Appendix D - Sewer Overflow Response Internal Notification & Tracking Protocol

Appendix E – Regulatory Agency Contact Information and Notification Period

Appendix F – Personnel Training Documents

SORP Implementation Plan

1. Personnel – Advertise all vacant positions within the Sewer Division – 31 Positions (See Attached Personnel Schedule). Positions will be advertised within 60 days of SORP adoption. (See Attached Crew Description for the general description of crew responsibilities regarding SORP).

2. Training – COJ and its subcontractors will begin preparing training materials to begin SORP Training Classes for all relevant personnel within 60 days.

3. PS Evaluation - COJ will begin an inspection of each pump station to determine the capacity and needed improvements. The storage capacity of each station will be determined within 180 days.

4. Post Rainfall Inspection – COJ will begin inspecting known and potential overflow locations after each rainfall immediately upon adoption of the SORP. Until all staffing needs are met, COJ will use subcontractors to complete these inspections.

5. Recordkeeping and Reporting - COJ will immediately begin sending all SSO reports to subcontractor for entry into a MS Office database. This system will be utilized until the new data management system is online.

6. Response Zones – Within 24 months, the COJ will establish response teams within each police precinct to respond to any SSO's. In the interim, existing staff and subcontractors will respond to all SSO's.

7. Equipment Needs – Existing aging equipment will have to be replaced in order for sewer crews to adequately perform. COJ will evaluate existing equipment and prioritize needed equipment purchases within 60 days.

Sewer Division Crew Description

Construction Crews

The sewer division will include one superintendent and four-field supervisors. The field supervisors will manage eight construction crews. Each supervisor will manage one precinct with two construction crews. Each construction crew will include a crew leader, one heavy equipment operator II, two heavy equipment operators I, one equipment operator II, three maintenance workers II and two maintenance workers I. These crews will install paid taps, repair main lines, repair cave-ins, raise manholes top, etc.

SORP Crews

The supervisor will also manage two Sewer Overflow Response Crews. Each crew will include a crew leader, one heavy equipment operator II, two maintenance workers II, and a maintenance worker I. These crews will responds to any SSO reports, clean main lines, and televise main lines, locate manholes, smoke test, dye test, and inspect manholes.

Equipment Assignments:

Each Construction crew will need one crew/ tool truck, two 14 yd. dump trucks, one backhoe, one air compressor, small pumps 2-inch to 3-inch, pipe saws, backhoe trailer, and other construction equipment.
Each SORP Response Crew will need one tv truck, one combination jet truck, laptop, pumps, plugs, etc.

Two track excavators, two rubber tire backhoes (for back filling), and one bulldozer, will support all eight construction crews.

CURRENT PERSONNEL SCHEDULE

COST CENTER	OCCUPATION CODE	POSITION TITLES		FSLA	RANGE	2003 BUDGET	2004 BUDGET	2005 BUDGET	2006 BUDGET	2007 BUDGET	2008 BUDGET	2009 BUDGET	2010 BUDGET	2011 BUDGET	VACANT POSITIONS as of 10-15-2010
52210		SEWER / ADMINISTRATION													
	0283-0-01	SENIOR CIVIL ENGINEER	S	E	031	0	0	1	1	1	1	1	1	1	1
	0061-0-01	CIVIL ENGINEER II	S	E	029	0			0	0	1	1	1	1	0
	0060-0-01	CIVIL ENGINEER I	S	E	027	1	1	1	1	1	0	0	0	0	0
	6602-0-01	PROJECT/CONSTRUCTION MANAGER	S	E	027	0	0	0	0	0	1	0	0	0	0
	6578-0-01	ENGINEERING GRADUATE	S	NE	026	1	1	0	0	0	0	0	0	0	0
	0310-0-01	SEWER SYSTEMS SUPERINTENDENT	S	E	025	0	0	0	0	0	0	1	1	1	0
	6577-0-01	ENGINEERING TECHNICIAN	S	NE	024	0	0	1	1	1	1	1	1	1	0
	0435-0-01	METERING STATION TECHNICIAN	S	NE	020	1	1	1	1	1	1	1	1	1	0
	0112-0-01	ENGINEERING INSPECTOR	S	NE	019	1	1	0	0	0	0	0	0	0	0
	0107-0-01	DRAFTING TECHNICIAN	S	NE	014	3	3	3	3	3	3	3	3	3	1
	0008-0-01	ADMINISTRATIVE SECRETARY	S	NE	014	1	1	1	1	1	1	1	1	1	1
	0270-0-01	SECRETARY	S	NE	012	1	1	1	1	1	1	1	1	1	0
	0309-0-01	SEWER METER MAINTENANCE WORKER	S	NE	009	1	1	1	1	1	1	1	1	1	0
		Total Full-Time				10	10	10	10	10	11	11	11		
		Total Allotted Positions												11	3
52215		MAINTENANCE SUPPLY													
	0245-0-01	PURCHASING MANAGER	S	E	026	0	0	1	1	1	1	1	1	1	0
	0250-0-01	PURCHASING SUPERVISOR	S	E	023	0	0	1	1	1	1	1	1	1	0
	0160-0-01	INVENTORY CONTROLLER	S	NE	016	0	0	1	1	1	1	1	1	1	0
	0432-0-01	OFFICE COORDINATOR	S	NE	019	0	0	1	1	1	1	1	1	1	0
	0149-0-01	HEAVY EQUIPMENT OPERATOR I	S	NE	012	0	0	1	1	1	1	1	1	1	0
	0326-0-01	STOREKEEPER	S	NE	010	0	0	3	3	3	3	3	3	4	0
	0179-0-01	MAINTENANCE WORKER II	W	NE	009	0	0	1	1	1	1	1	1	0	0
		Total Full-Time				0	0	9	9	9	9	9	9		
		Total Allotted Positions												9	0
52220		SEWER / OPERATIONS & MAINTENANCE													
	0310-0-01	SEWER SYSTEMS SUPERINTENDENT	S	E	025	1	1	1	1	1	0	0	0	0	0
	0432-0-01	OFFICE COORDINATOR	S	NE	019	1	1	1	1	1	1	1	1	1	0
	0311-0-01	SEWER SYSTEMS SUPERVISOR	S	E	019	3	3	3	3	3	3	3	3	3	1
	0074-0-01	CREW LEADER	S	NE	016	9	9	9	9	9	9	9	9	9	1
	0008-0-01	ADMINISTRATIVE SECRETARY	S	NE	014	1	1	1	1	1	1	1	1	1	0
	0150-0-01	HEAVY EQUIPMENT OPERATOR II	S	NE	014	1	1	1	1	1	1	1	1	1	1
	0117-0-01	EQUIPMENT OPERATOR II	S	NE	012	1	1	1	1	1	1	1	1	1	0
	0149-0-01	HEAVY EQUIPMENT OPERATOR I	S	NE	012	6	6	6	6	6	6	6	6	6	4
	0270-0-01	SECRETARY	S	NE	012	1	1	1	1	1	1	1	1	1	0
	0247-0-01	PUBLIC SERVICE DISPATCHER	S	NE	011	5	5	5	5	5	5	5	5	5	1
	0116-0-01	EQUIPMENT OPERATOR I	S	NE	010	3	3	3	3	3	3	3	3	3	2
	0292-0-01	SENIOR MAINTENANCE WORKER	W	NE	011	3	3	3	3	3	3	3	3	3	2
	0179-0-01	MAINTENANCE WORKER II	W	NE	009	23	23	23	23	22	22	22	17	17	2
	0178-0-01	MAINTENANCE WORKER I	W	NE	007	2	2	1	1	1	2	2	7	7	7
	0294-0-01	SENIOR CUSTODIAN	W	NE	007	0	0	1	1	1	1	1	1	1	0
		Total Full-Time				60	60	60	60	60	59	59	58		
		Total Allotted Positions												58	21
52225		SEWER EVALUATION SERVICE													
	0311-0-01	SEWER SYSTEMS SUPERVISOR	S	E	019	1	1	1	1	1	1	1	1	1	0
	0074-0-01	CREW LEADER	S	NE	016	4	4	4	4	4	4	4	4	4	0
	0270-0-01	SECRETARY	S	NE	012	1	1	1	1	1	1	1	1	1	0
	0149-0-01	HEAVY EQUIPMENT OPERATOR I	S	NE	012	4	4	4	4	4	4	4	4	4	1
	0292-0-01	SENIOR MAINTENANCE WORKER	W	NE	011				0	0	0	1	1	1	0
	0179-0-01	MAINTENANCE WORKER II	W	NE	009	12	12	12	12	12	12	11	11	11	6
		Total Full-Time				22	22	22	22	22	22	22	22		
		Total Allotted Positions												22	7
		SEWER DEPARTMENT TOTAL FULL-TIME				92	92	101	101	101	101	101	101	101	31

1 of 1

APPENDIX B- PUBLIC OFFICES, MEDIA CONTRACT, AUTHORIZED CLEANUP CONTRACTORS CONTACT INFORMATION

Contact Name	Telephone
City of Jackson Water/Sewer Utilities Division:	(601) 960-2090
City of Jackson Sewer Maintenance Division:	(601) 960-1875
JWP Project Manager:	(601) 421 0610
Savanna Street Wastewater Treatment Plant (SSWWTP):	(601) 372-3439
Fire Department:	911 emergency or (601) 960-1234
COJ Police:	911 emergency or (601) 960-1234
Hinds County Health Department	(601)-957-1026

MDEQ

During Normal Operating Hours – 8:00 a.m. – 5:00 p.m.

MDEQ Operator – 601-961-5171
MDEQ ECED Municipal & Private Facilities Branch Manager – 601-961-5588
MDEQ ECED Engineer for Jackson – 601-961-5319

After Normal Operating Hours (non-emergency)

(Voice Mail)
MDEQ ECED Municipal & Private Facilities Branch Manager – 601-961-5588
MDEQ ECED Engineer for Jackson – 601-961-5319

After Normal Operating Hours (emergency)

MEMA 24-hour State Warning Point – 1-800-222-6362

LIST OF MEDIA CONTACTS TO REPORT OVERFLOW

Contact Name	Telephone
Clarion Ledger:	(601) 961-7250
WLBT:	(601) 948-3333
WJTV:	(601) 372-6311
WAPT:	(601) 922-1607

STANDARD PRESS RELEASE

COJ maintains a standard press release on SSO that can be quickly adapted to the particular situation and issued if COJ determines there is a significant threat to public health.

NEWS RELEASE
DATE XXXXXXXXX
For Immediate Release

For More Information
Contact: Public Works Director
601-960-2091

COJ Alerts Customers to Sanitary Sewer Overflow

COJ issued an alert today to people in the [insert area(s)] concerning a sanitary sewer overflow. "The overflow occurred as a result of [significant rain event/ a blockage/ or other]," said Public Works Director or Authorized Designee. "COJ responds to overflows in a manner consistent with state and federal standards. We warn passersby to avoid contact by posting signs and using barricades, and we disinfect the area after the overflow stops."

- Location of overflow (by street address or other appropriate method)
- Cause of the SSO
- Destination of the SSO flow (e.g. waterbody, name of receiving water, MS4 system, etc.)
- Estimated Volume

Note: Use this paragraph if the overflow is in a recreational area or significantly affects a stream etc. The signs do not necessarily prohibit use of recreational areas, unless posted otherwise. The Mississippi Department of Environment (MDEQ) determines whether to post nearby waterways that may have been affected if water quality testing indicates a need.

Overflows pose hazards similar to those in public restrooms or even your own bathroom. If you, your family, or your pets do have contact with the overflow, wash thoroughly with soap and water. Remember: Washing your hands carefully and often is the best defense against illness carried by animal or human waste.

If you have questions or need to report an overflow, please call COJ at (601)-960-1875.

CUSTOMER NOTIFICATION LETTER

Maintenance of Sewer Service Connection
These letters will be modified by the author per specific location and condition
FIRST NOTIFICATION

Date: XXXXX
Name: XXXXXXX
Address: XXXXXX

RE: Notice of collection system non-compliance

The Municipal Code of the City of Jackson requires that owners maintain their sewer service line "in such a condition as to safeguard the property, life and health of others". Specifically this means that excess ground water overloading the public system through joint leaks, sump pumps, roof drain or surface water inlets or sewer line blockages due to root intrusion, grease and/or debris from the service line is prohibited.

The City has determined that your sewer service line is impacting the operating condition of the public system. In accordance with City Code, you must take action to ensure that your service line is in proper operating condition.

The City fully recognizes that you may not have been aware of problems in your service line and that you may not have experienced any service problem. Taking the necessary corrective action to restore your service line to its intended operating condition will protect your interests as well as the public.

In order to provide adequate time for you to address these service line problems, the City will reinvestigate the public main serving your property on or about _____ (sixty (60) days) from the date of this letter. If there is evidence that the condition affecting the public system is not corrected, the City will take appropriate action that may include interruption of water service to this address until such time as the sewer service line problem(s) is corrected. There may also be additional charges for water service disconnection and reinstatement.

COJ is willing to work with you to the extent possible on the correction of your service lateral problems. You may call to make an appointment to discuss by calling (601)-960-1875 and speak to the dispatcher on duty.

SAMPLE SEWER OVERFLOW SIGN

CAUTION!

SEWER OVERFLOW

Avoid Bodily Contact With Water

For More Information Contact

City of Jackson- (601)-960-1875

APPENDIX C – WASTEWATER ASSESSMENT FORMS & MAPS

CITY OF JACKSON, MISSISSIPPI
SEWER SYSTEM WORK ORDER FORM

City Of Jackson, MS
Dept. Of Public Works
P.O. Box 17
Jackson, MS 39205
601-960-2091

Date: _____ Complaint #: _____ Utility Locate # _____

Reported By: _____ Owners Name: _____

House #: _____ Street: _____ Phone #: _____

Serviced By: _____ Plumber On Site: _____ Time In: _____ Time Out: _____

Complaint Type

- ☐ Sewer Stopped Up
- ☐ Check Sewer Odor
- ☐ Sewer Leak
- ☐ Sewer in House
- ☐ Toilet Overflow
- ☐ Sewer in Tub
- ☐ Sewer in Yard
- ☐ Cleanout Overflow
- ☐ Manhole Overflow
- ☐ Sewer in Ditch
- ☐ Sewer in Creek
- ☐ Sewer in Street
- ☐ Sewer in Storm Drain
- ☐ Roots in Line
- ☐ Hole in Street/Ground
- ☐ Cave In in Yard
- ☐ Cave In at Stub
- ☐ Cave In at Manhole
- ☐ Cave In in Street
- ☐ Cave In in Easements/Woods
- ☐ Repair/Replace Cleanout
- ☐ Install New Sewer Cleanout
- ☐ Clean Sewer Line
- ☐ Repair Service Line
- ☐ Repair Main Line
- ☐ Install New Sewer Line
- ☐ Repair Sewer Tap
- ☐ Install New Sewer Tap
- ☐ Locate Manhole
- ☐ Uncover Manhole
- ☐ Raise/Lower Manhole
- ☐ Repair MH
- ☐ MH Ring Broken
- ☐ MH Lid Broken
- ☐ MH Lid Missing
- ☐ Seal Down MH Lid
- ☐ Locate Sewer Lines
- ☐ Check For Available Sewer Line
- ☐ Disconnect Service Line
- ☐ Plug/Disconnect Abandon Sewer
- ☐ TV Sewer Line
- ☐ Smoke Test Sewer Line
- ☐ Check Air Release Valve
- ☐ Check Stream Crossing
- ☐ Maintain Row/Easement
- ☐ Clean/Dress-Up Yard
- ☐ Disinfect/Flush Yard
- ☐ Flush Out Ditch
- ☐ Savanna Street WWTF
- ☐ Assist Other Department
- ☐ Other _____

Account Type

- ☐ Residential
- ☐ Business
- ☐ Gov. Federal
- ☐ Gov. State
- ☐ Gov. County
- ☐ Gov. City
- ☐ Other _____

Location

- ☐ In House
- ☐ Under Bldg.
- ☐ Front Yard
- ☐ Back Yard
- ☐ Cleanout
- ☐ Manhole
- ☐ Storm Drain
- ☐ Ditch/Creek
- ☐ Other _____
- ☐ Driveway
- ☐ In Street
- ☐ Edge of Street
- ☐ Turn Out
- ☐ Easement
- ☐ ROW
- ☐ Woods

Problem Type

- ☐ Sewer Main
- ☐ Sewer Tap
- ☐ Manhole
- ☐ Service Line
- ☐ Pump Station
- ☐ Force Main
- ☐ Other _____

No City Problem

- ☐ Main Line OK
- ☐ Service Line OK
- ☐ Advised Customer Needs Plumber

Service Line Problem

- ☐ City ROW
- ☐ Customer

Weather _____

Tap Goes To Manhole ☐ No ☐ Yes

Existing City Cleanout: ☐ No ☐ Yes

Description of Repairs

- ☐ Checked Sewer Odor
- ☐ Unstopped Sewer Main
- ☐ Unstopped Service Line
- ☐ Unstopped Main and Service
- ☐ Rodded Service Line
- ☐ Cleaned Main Line
- ☐ Point Repaired Sewer Line
- ☐ Replaced Section of Line
- ☐ Replaced Entire Line
- ☐ Installed New Sewer Line
- ☐ Repaired/Replaced Cleanout
- ☐ Install New Cleanout
- ☐ Repaired/Replaced Sewer Tap
- ☐ Installed New Sewer Tap
- ☐ Located Manhole
- ☐ Uncovered Manhole
- ☐ Raised/Lowered Manhole
- ☐ Replaced MH Ring
- ☐ Replaced MH Lid
- ☐ Sealed MH Lid
- ☐ Repaired MH Cone/Wall
- ☐ Repaired MH Invert
- ☐ Put Barricade At Hole
- ☐ Put Dirt/Asphalt In Hole
- ☐ Televised Sewer Lines
- ☐ Smoke Tested Sewer Lines
- ☐ Checked Air Release Valve
- ☐ Checked Steam Crossing
- ☐ Located Sewer Line
- ☐ Checked If Sewer Available
- ☐ Plugged/Removed Abandoned Sewer
- ☐ Maintained ROW/Easement
- ☐ Cleaned/Dressed Up Yard
- ☐ Disinfected/Flushed Yard/Ditch
- ☐ Put Tag On Door
- ☐ Assisted Other Dept.
- ☐ No Action
- ☐ Other (explain below)

Pipe Material: ☐ Concrete ☐ PVC ☐ CIP ☐ DIP ☐ TRUSS ☐ HDPE ☐ Other: _____

Pipe Size: _____ ins **Pipe Depth:** _____ ft **MH Size:** _____ ins **MH Depth:** _____ ft

Other Needs/Explanation of Repairs: _____

Crew Leader _____ Supervisor _____ Complainant's Signature _____ Date _____

City of Jackson, Mississippi
Wastewater Overflow Assessment Form

City of Jackson, Mississippi
Department Of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-2091

Notification Date _____ Time _____ AM PM Sewer Complaint # _____

Name of Person Reporting Overflow _____

House Number _____ Street _____ Phone _____

House Number of Overflow _____ Street _____

SSO Location _____ Dispatch Date _____ Time _____ AM PM

Arrival Date _____ Time _____ AM PM Verification Date _____ Time _____ AM PM

Latitude _____ Longitude _____ Precinct _____

NPDES System Area (circle) Savanna St. (MS0024295) Trahon (MS0044059) Presidential Hills (MS0030295)

Receiving Waterway: (circle) Belhaven, Big Creek, Bogue Chitto, Caney, Eastover, Eubanks, Hanging Moss, Hardy, Lynch, Purple, Three Mile, Town, Trahon, White Oak

Did overflow reach waterway? ☐ Yes ☐ No Line Ownership: ☐ Municipal ☐ Private

Overflow Source ☐ Manhole ☐ Constructed Bypass ☐ Pump Station ☐ Ground Surface (defective pipe underground) ☐ Cleanout ☐ Other _____

Date/Time Overflow Began _____ (circle) AM PM Date /Time Overflow End _____ AM PM

Estimated Volume of Discharge _____ Gallons Estimation Method _____

Cause of Overflow: ☐ Grease ☐ Roots ☐ Solids ☐ Collapsed Pipe ☐ Pump Station Failure ☐ Excessive Flow ☐ Undersized Line ☐ Other (Describe) _____

Temporary Corrective Action: (see Attached Photos) _____

This section to be completed in the field.

MDEQ Notification Date _____ Time _____ AM PM

Number of Overflows at this Location within Past 12 Months (Including Dates of Overflows): _____

Actions taken to minimize environmental impact (See Attached Photos) _____

If Overflow Cause Due to Rainfall, Number of Inches of Rain _____

Planned Permanent Corrective Action – If Applicable – (Itemization and Schedule) – See attached Detailed Resource Report and Schedule Work Order No.: _____

Public Notification: ☐ Yes ☐ No If yes - ☐ Signs ☐ News Release ☐ Other

Customer Satisfaction Response/Additional Comments – If applicable, see Attached.

This section to be completed by supervisor.

_____ Signature of City Respondent

_____ Signature of Authorized Supervisor

City Of Jackson, Mississippi
Sewer System Overflow Inspection Form

City of Jackson, Mississippi
Department Of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-2891

#										
1	15 South					PS	Hardy Creek	1		
2	Amanda Lane					PS	Big Creek	1		
3	Brookhollow Drive L 160					PS	Trahon Creek	1		
4	6675 Hwy 18					PS	Trahon Creek	1		
5	2102 Thousand Oak					PS	Trahon Creek	1		
6	Broadway Cove					PS	Trahon Creek	1		
7	461 Greenmount Drive					PS	Trahon Creek	1		
8	201 Cedarwood Drive					PS	Trahon Creek	1		
9	140 Chesswood Avenue					PS	Trahon Creek	1		
10	1453 Country Club Drive					PS	Bogue Chitto Creek	3		
11	125 Delray Avenue					PS	Casey Creek	1		
12	185 Dunbrooke Drive					PS	Trahon Creek	1		
13	553 Eden Downs					PS	Trahon Creek	1		
14	I-55 Frontage Road					PS	Casey Creek	1		
15	207 Elton Road					PS	Casey Creek	1		
16	I-55 Water Plant					PS	Belhaven Creek	1		
17	747 Flag Chapel Road					PS	Bogue Chitto Creek	2		
18	992 Flag Chapel Road					PS	Bogue Chitto Creek	3		
19	1431 Forest Avenue					PS	Pyburkes Creek	3		
20	155 Forest Hill Drive					PS	Trahon Creek	1		
21	3557 Forest Hill Road					PS	Trahon Creek	1		
22	2283 Forest Park Drive					PS	Trahon Creek	1		
23	Greenwing Court					PS	Purple Creek	1		
24	2130 Hickory Drive					PS	Casey Creek	1		
25	561 Hollandale Drive					PS	Trahon Creek	1		
26	174 Lakeshir Road					PS	Trahon Creek	1		
27	4068 Vesus Avenue					PS	Trahon Creek	1		
28	4391 Terry Road					PS	Casey Creek	1		
29	201 Red Hill Drive					PS	Trahon Creek	1		
30	160 Marshall Avenue					PS	Trahon Creek	1		
31	Holly Hills Drive					PS	Trahon Creek	1		
32	Robinwood Drive					PS	Trahon Creek	1		
33	500 McCluer Road					PS	Casey Creek	1		
34	3890 McCluer Road					PS	Casey Creek	1		
35	687 McCluer Road					PS	Trahon Creek	1		
36	1073 McCluer Road					PS	Trahon Creek	1		
37	1665 McCluer Road					PS	Trahon Creek	1		
38	2684 Moore Drive					PS	Casey Creek	1		
39	155 Hillview					PS	Casey Creek	1		
40	4810 McRaven Road					PS	Lynch Creek	2		
41	4660 McRaven road					PS	Lynch Creek	2		
42	6186 McRaven road					PS	Lynch Creek	2		
43	4600 McRaven road					PS	Lynch Creek	2		
44	6112 Floral Drive					PS	Hanging Moss Creek	3		
45	3700 W. Northside Drive					PS	Bogue Chitto Creek	3		
46	4837 Old Byram Road					PS	Trahon Creek	1		
47	4681 Old Byram Road					PS	Trahon Creek	1		
48	Palaun Street					PS	Bogue Chitto Creek	3		
49	Plantation Court					PS	White Oak Creek	4		
50	155 Portwood Drive					PS	Trahon Creek	1		
51	2103 Raymond Road					PS	Casey Creek	1		
52	5440 River Thames Road					PS	White Oak Creek	4		
53	5407 River Thames Road					PS	White Oak Creek	4		
54	5293 Robinson Road					PS	Casey Creek	1		
55	10 Rob Lane					PS	Trahon Creek	1		
56	2238 Sheffield Drive					PS	Hanging Moss Creek	4		
57	6340 Country Club					PS	Bogue Chitto Creek	3		
58	255 S. Shellrock					PS	Bogue Chitto Creek	3		
59	3458 Dixion Sykes Road					PS	Bogue Chitto Creek	3		
60	1465 Short Avenue					PS	Trahon Creek	1		
61	4095 Siwell Road					PS	Big Creek	1		
62	4071 Siwell Road					PS	Trahon Creek	1		
63	139 Stratford Drive					PS	Trahon Creek	1		
64	6985 Clinton Boulevard					PS	Lynch Creek	1		
65	151 Sylvan Trail					PS	Lynch Creek	3		
66	351 Sylvan Trail					PS	Lynch Creek	3		
67	498 Sylvan Trail					PS	Trahon Creek	3		
68	4640 Terry Road					PS	Trahon Creek	3		
69	6135 Hwy. 18					PS	Trahon Creek	1		
70	132 Timberlawn Road					PS	Trahon Creek	1		
71	6159 US Hwy. 49 North					PS	Bogue Chitto Creek	3		
72	Western Hills Drive					PS	Trahon Creek	1		
73	1900 Wallace Street					PS	Lynch Creek	1		
74	1750 Wallace Street					PS	Lynch Creek	2		
75	1651 Wallace Street					PS	Lynch Creek	2		
76	1914 US Hwy. 80 West					PS	Lynch Creek	2		
77	4210 Church Circle					PS	Lynch Creek	2		
78	600 S. Browning Drive					PS	Lynch Creek	2		
79	1230 Zephyr Street					PS	Lynch Creek	2		
80	6315 Yarbrough Street					PS	Lynch Creek	2		
81	4130 Whitehall Road					PS	Lynch Creek	2		
82	Whitestone Road					PS	Hanging Moss Creek	3		
83	Shermondale Drive					PS	Trahon Creek	1		
84	3855 Yarbro					PS	Lynch Creek	2		
85	E. River Place					PS	Belhaven Creek	2		

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86	Old River Place					PS	Belhaven Creek	2		
87	Apache Road #1					PS	Big Creek	1		
88	Apache Road #2					PS	Big Creek	1		
89	Presidential Hills					PS	Bogue Chito Creek	2		
90	2010 Chadwick Drive					PS	Caney Creek	1		
91	1235 Echelon Parkway					PS	Hanging Moss Creek	3		
92	677 Woody Dr. Jackson, MS 39212					EPA List	Caney Creek	1		
93	495 Woody Dr, Jackson, MS 39212					EPA List	Caney Creek	1		
94	136 Shiloh Dr, Jackson, MS 39212					EPA List	Hardy Creek	1		
95	130 Shiloh Dr. Jackson, MS 39212					EPA List	Hardy Creek	1		
96	5402 Interstate 55 Frontage Rd, Jackson, MS 39212					EPA List	Caney Creek	1		
97	5406 Interstate 55 Frontage Rd, Jackson, MS 39212					EPA List	Caney Creek	1		
98	482b Old Byram Rd, Jackson, MS 39212					EPA List	Trahon Creek	1		
99	855 Raven St 8/26/2010					posted	Hardy Creek	1	2010.1	
100	Monroe & Carlisle 8/3/2010					posted	Belhaven Creek	4	2010.2	
101	139 Holly Hill Dr, Jackson, MS 39212					EPA List	Trahon Creek	1		
102	Hanging Moss Creek crossing near JA 9/29/2010					posted	Hanging Moss Creek	4	2010.3	
103	Hwy 80 near Wiggins Rd & Shaw Rd					posted	Lynch Creek	2	2010.4	
104	155 Holly Hill Dr, Jackson, MS 39212					EPA List	Trahon Creek	1		
105	Millsaps Ave behind the Grace Homes 10/1/2010					posted	Town Creek	4	2010.5	
106	201 Country Club Dr.					posted	Lynch Creek	2	2010.6	
107	2407 Wheatley St, Jackson, MS 39212					EPA List	Caney Creek	1		
108	3725 Jayne Ave.					posted	Lynch Creek	2	2010.7	
109	4509 Ritchey Dr. 10/13/2010					posted	Lynch Creek	2	2010.8	
110	2884 Marydale Dr, Jackson, MS 39212					EPA List	Caney Creek	1		
111	Ritchey & Bolden St. 10/20/2010					posted	Lynch Creek	2	2010.9	
112	Galvez & South Dr. 10/20/2010					posted	Lynch Creek	2	2010.10	
113	2937 Marydale Dr, Jackson, MS 39212					EPA List	Caney Creek	1		
114	Jayne & Sanford St. 10/20/2010					posted	Lynch Creek	2	2010.11	
115	2926 Greenwood Ave. 10/20/2010					posted	Hardy Creek	1	2010.5420	
116	3982 Nassau St. 10/20/2010					posted	Eubanks Creek	4	2010.5422	
117	2410 Belvedere Dr. 10/20/2010					posted	Three Mile Creek	1	2010.5430	
118	825 Carver St. 10/25/2010					posted	Town Creek	3	2010.5506	
119	1425 Topp Ave. 10/25/2010					posted	Lynch Creek	2	2010.5510	
120	2426 Belvedere Dr, Jackson, MS 39204					EPA List	Three Mile Creek	1		
121	1295 Pahuyet St. 10/28/2010					posted	Town Creek	3	2010.5542	
122	763 Dellwood Dr. 10/28/2010					posted	Caney Creek	1	2010.5543	
123	2334 Belvedere Dr, Jackson, MS 39204					EPA List	Three Mile Creek	1		
124	540 Flourton Ave. 10/08/2010					posted	Lynch Creek	2	2010.5595	
125	2111 East Dr, Jackson, MS 39204					EPA List	Three Mile Creek	1		
126	150 Leavell Woods Dr. 10/29/2010					posted	Caney Creek	1	2010.5539	
127	2101 East Dr, Jackson, MS 39204					EPA List	Three Mile Creek	1		
128	Alta Woods Blvd. 10/29/2010					posted	Three Mile Creek	1	2010.5562	
129	3984 Skyline Dr. 10/30/2010					posted	Town Creek	3	2010.5585	
130	2012 Willow Way, Jackson, MS 39204					EPA List	Three Mile Creek	1		
131	4340 Woodfield Ave. 10/30/2010					posted	Eubanks Creek	3	2010.5587	
132	2024 Willow Way, Jackson, MS 39204					EPA List	Three Mile Creek	1		
133	6138 Rand St. 10/30/2010					posted	Hanging Moss Creek	3	2010.5591	
134	511 Ford Ave 10/30/2010					posted	Town Creek	3	2010.5592	
135	4153 South Dr. 10/30/2010					posted	Lynch Creek	2	2010.5600	
136	395 A Blume Dr. 11/1/2010					posted	Hanging Moss Creek	4	2010.5612	
137	2139 East Dr, Jackson, MS 39204					EPA List	Three Mile Creek	1		
138	1942 O'Bannon Dr. 11/1/2010					posted	Town Creek	3	2010.5611	
139	1837 Avenue H 11/1/2010					posted	Town Creek	3	2010.5622	
140	324 Rollingwood Dr. 11/1/2010					posted	Hanging Moss Creek	4	2010.5629	
141	2352 Coronet Pl, Jackson, MS 39204					EPA List	Three Mile Creek	1		
142	324 Rollingwood Dr. 11/2/2010					posted	Hanging Moss Creek	4	2010.5634	
143	2346 Coronet Pl, Jackson, MS 39204					EPA List	Three Mile Creek	1		
144	4481 Maryland Dr. 11/2/2010					posted	Lynch Creek	3	2010.5636	
145	2261 Belvedere Dr, Jackson, MS 39204					EPA List	Three Mile Creek	1		
146	1253 Woodvillage Dr. 11/2/2010					posted	Lynch Creek	2	2010.5638	
147	610 Forest Ave.					posted	Eubanks Creek	3	2010.5640	
148	3527 Nashville St.					posted	Town Creek	3	2010.5642	
149	3853 Gammill St. 11/4/2010					posted	Town Creek	3	2010.5675	
150	3147 Sage St. 11/4/2010					posted	Town Creek	3	2010.5680	
151	124 Sewanee Dr. 11/5/2010					posted	Lynch Creek	2	2010.5704	
152	2251 Forest Glen Ln 11/5/2010					posted	Eubanks Creek	3	2010.5721	
153	Briarwood Dr. & State St. 11/6/2010					posted	Hanging Moss Creek	4	2010.5723	
154	1515 Maria Dr, Jackson, MS 3920					EPA List	Hardy Creek	1		
155	6245 Meadow Dr.11/6/2010					posted	Purple Creek	4	2010.5725	
156	Maria Dr. Jackson, MS 39204					EPA List	Caney Creek	1		
157	3984 Skyline Dr.11/6/2010					posted	Town Creek	3	2010.5726	
158	306 Sheila Dr. 11/6/2010					posted	Lynch Creek	2	2010.5731	
159	324 Rollingwood Dr. 11/6/2010					posted	Hanging Moss Creek	4	2010.5733	
160	940 Briscilla Cir. 11/7/2010					posted	Caney Creek	1	2010.5739	
161	103 Grover Cleveland Cir. 11/7/2010					posted	Bogue Chito Creek	3	2010.5745	
162	5599 Queen Christina Ln 11/7/2010					posted	Lynch Creek	3	2010.5750	
163	3930 Skyview Dr.					posted	Town Creek	3	2010.5758	
164	4580 Old Canton Rd					posted	Bailover Creek	4	2010.5759	
165	311 Gum St, Jackson, MS 39201-6300 11/8/2010					posted	Lynch Creek	2	2010.5769	
166	845 Monterey St. 6/2009					posted	Three Mile Creek	1	2010.5775	
167	Hardy Ave & Porter St. 11/8/2010					posted	Lynch Creek	2	2010.5777	
168	145 Lorene Blvd. 11/9/2010					posted	Town Creek	4	2010.5783	
169	1724 Gibraltar Dr. 11/9/2010					posted	Lynch Creek	1	2010.5793	
170	1616 Main St. 11/9/2010					posted	Town Creek	3	2010.5794	

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171	1413 W Northside Dr. 11/9/2010					posted	Eubanks Creek	3	2010 5999	
172	1654 McClure Rd. Jackson, MS 39212					EPA List	Trahon Creek	1		
173	1890 Camilla Dr. 11/13/2010					posted	Casey Creek	1	2010 5839	
174	449 Manon Blvd. 11/11/2010					posted	Casey Creek	1	2010 5984	
175	2295 Forest Park Dr. Pumping Station 11/13/2010					posted	Trahon Creek	1	2010 5980	
176	158 Cloverleaf Cir. 11/13/2010					posted	Town Creek	3	2010 5897	
177	1119 Primrose St. 11/15/2010					posted	Casey Creek	1	2010 5904	
178	1244 Gallatin St. 11/15/10					posted	Lynch Creek	2	2010 5910	
179	2763 Newport St. 11/15/2010					posted	Town Creek	3	2010 5913	
180	137 Oakridge Dr. Jackson, MS 39212					EPA List	Trahon Creek	1		
181	348 Northpointe Pkwy 11/16/2010					posted	Purple Creek	4	2010 5944	
182	Johnson St. & Capitol St 11/16/2010					posted	Town Creek	3	2010 5946	
183	2939 Oakmont Dr. 11/19/2010					posted	Lynch Creek	2	2010 5987	
184	1141 Woodfield Dr. 11/19/2010					posted	White Oak Creek	4	2010 5983	
185	509 Woody Dr. 11/20/2010					posted	Casey Creek	1	2010 6012	
186	1134 Woodville Cir. Jackson, MS 39212					EPA List	Casey Creek	1		
187	1700 McClure Rd. 11/28/2010					posted	Trahon Creek	1	2010 6025	
188	404 Daniel Cir. 11/22/2010					posted	Casey Creek	1	2010 6042	
189	Cinnebill Dr. 11/22/2010					posted	Eubanks Creek	4	2010 6040	
190	1117 Oneh St. 11/22/2010					posted	Lynch Creek	2	2010 6050	
191	900 Frederick Dr. 11/23/2010					posted	Lynch Creek	2	2010 6056	
192	1377 Robinson Rd. Jackson, MS 39204					EPA List	Casey Creek	2		
193	595 Cedar Springs Dr. 11/23/2010					posted	Trahon Creek	1	2010 6060	
194	1908 Wingfield Cir. Jackson, MS 39209					EPA List	Lynch Creek	2		
195	Weisburg Dr. & N. State St. 11/23/2010					posted	Hanging Moss Creek	4	2010 6063	
196	1902 Wingfield Cir. Jackson, MS 39209					EPA List	Lynch Creek	2		
197	320 Wesley Dr. 11/29/2010					posted	Eubanks Creek	3	2010 6067	
198	124 E South St. Jackson, MS 39201					EPA List	Town Creek	2		
199	1939 Valley St. 11/26/2010					posted	Lynch Creek	2	2010 6119	
200	3150 Robinson Rd. Jackson, MS 39204					EPA List	Casey Creek	2		
201	Wood St. & Bell St. 11/27/2010					posted	Town Creek	1	2010 6136	
202	463 Roland St. Jackson, MS 39209					EPA List	Lynch Creek	2		
203	Woody Dr. (near 463 Woody) 11/27/2010					posted	Casey Creek	1	2010 6137	
204	455 Roland St. Jackson, MS 39209					EPA List	Lynch Creek	2		
205	3937 Willaredt Dr. 11/30/2010					posted	Three Mile Creek	1	2010 6200	
206	933 W Porter St. Jackson, MS 39204					EPA List	Lynch Creek	2		
207	928 S. Valley Path Rd. 11/30/2010					posted	Casey Creek	1	2010 6205	
208	1311 W Pearl St. Jackson, MS 39203					EPA List	Town Creek	2		
209	Hanging Moss & Heather Ln. 11/30/2010					posted	Hanging Moss Creek	3	2010 6217	
210	134 Ownby St. Jackson, MS 39209					EPA List	Lynch Creek	2		
211	3405 Jonwood Dr. 11/30/2010					posted	Eastover Creek	4	2010 6219	
212	4205 Oakmont Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
213	Michael Clay Dr. & Clyde Ln. 12/1/2010					posted	Town Creek	3	2010 6229	
214	4202 Oakmont Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
215	Clinton Ave. & Flynt Ave. 12/1/2010					posted	Lynch Creek	2	2010 6234	
216	North St (Bard St. Jackson, MS					EPA List	Town Creek	2		
217	435 Houston Ave. 12/2/2010					posted	Lynch Creek	2	2010 6238	
218	4251 Meadowmont Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
219	114 Wynell Rd. 12/2/2010					posted	Eubanks Creek	3	2010 6250	
220	North St & Fortification St. Jackson, MS					EPA List	Belhaven Creek	2		
221	Raymond Rd. & Elms Court Cir. 12/3/2010					posted	Hardy Creek	1	2010 6259	
222	904 Mt Vernon Ave. Jackson, MS 39209					EPA List	Lynch Creek	2		
223	1418 Forest Hill Rd. 12/5/2010					posted	Timmy Creek	1	2010 6270	
224	4332 Meadowmont Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
225	5535 Quail Mary Ln. 12/5/2010					posted	Lynch Creek	2	2010 6311	
226	4201 Meadowmont Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
227	585 Cedar Springs Dr. 12/5/2010					posted	Trahon Creek	1	2010 6312	
228	1695 High St. Jackson, MS 39202					EPA List	Belhaven Creek	2		
229	810 N. Jefferson St. 12/5/2010					posted	Town Creek	2	2010 6316	
230	744 Georgia Ave. Jackson, MS 39209					EPA List	Town Creek	2		
231	Allen St & Brady St. 12/6/2010					posted	Town Creek	2	2010 6330	
232	343 Fairview St. Jackson, MS 39209					EPA List	Lynch Creek	2		
233	Bailey Ave. near 1030 12/6/2010					posted	Town Creek	2	2010 6333	
234	9557 Parkland Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
235	3528 Hutson Ave. 12/7/2010					posted	Hanging Moss Creek	4	2010 6340	
236	1231 Corinth St. Jackson, MS 39209					EPA List	Lynch Creek	2		
237	162 St. Andrews Dr. 12/7/2010					posted	Purple Creek	4	2010 6347	
238	1230 Corinth St. Jackson, MS 39209					EPA List	Lynch Creek	2		
239	Hardy St. & Allen St. 12/8/2010					posted	Town Creek	2	2010 6356	
240	337 Cedarcrest St. Jackson, MS 39209					EPA List	Town Creek	2		
241	457 Meadow Heights Dr. 12/8/2010					posted	Eubanks Creek	4	2010 6366	
242	9102 Cahill Dr. Jackson, MS 39209					EPA List	Lynch Creek	2		
243	1400 Hinds Raymond Rd. (near 1482) 12/9/2010					posted	Casey Creek	1	2010 6384	
244	436 Frederick St. 12/9/2010					posted	Lynch Creek	2	2010 6387	
245	9102 Cahill Dr. 12/10/2010					posted	Lynch Creek	2	2010 6401	
246	332 Livingston St. 12/10/2010					posted	Town Creek	4	2010 6402	
247	1520 Berkley Dr. 12/10/2010					posted	Eubanks Creek	4	2010 6415	
248	Hartridge Dr. & Ashdown St. 12/11/2010					posted	Town Creek	3	2010 6425	
249	463 Croker Ave. 12/11/2010					posted	Canal Creek	1	2010 6430	
250	Berkley Dr. & Crane Blvd. 12/14/2010					posted	Eubanks Creek	4	2010 6449	
251	129 Grosvenor Cir. 12/14/2010					posted	Casey Creek	1	2010 6501	
252	Briarwood Dr. & North State St. 12/15/2010					posted	Hanging Moss Creek	4	2010 6514	
253	I-55 North & Northside Drive 12/15/2010					posted	Eastover Creek	4	2010 6521	
254	1645 Wiggins Rd. 12/16/2010					posted	Lynch Creek	2	2010 6532	
255	200 E Capitol St. 12/17/2010					posted	Town Creek	2	2010 6575	

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256	3430 Albemarle Rd. 12/17/2010					posted	Town Creek	3	2010 6577	
257	354 St. Andrews Dr. 12/18/2010					posted	Purple Creek	4	2010 6587	
258	485 Woody Dr. 12/20/2010					posted	Hardy Creek	1	2010 6613	
259	3244 M. L. King Dr. 12/20/2010					posted	Town Creek	3	2010 6614	
260	Avalon Dr. & Wilsell Rd. 12/20/2010					posted	Eubanks Creek	3	2010 6630	
261	1253 Woodvillage Dr. 12/21/2010					posted	Lynch Creek	2	2010 6649	
262	550 Houston Ave. 12/21/2010					posted	Lynch Creek	2	2010 6655	
263	McDowell Road Est. (NO ADDRESS GIVEN) 12/23/2010					posted	Caney Creek	1	2010 6658	
264	2900 St. Charles St & Culbertson Ave. 12/24/2010					posted	Lynch Creek	2	2010 6737	
265	595 Cedar Springs Rd. 12/28/2010					posted	Trahon Creek	1	2010 6817	
266	Dead end Pear Orchard Pl 12/29/2010					posted	Purple Creek	4	2010 6818	
267	Holly Hill Dr 12/29/2010					posted	Trahon Creek	1	2010 6823	
268	1068 Combs St. 12/28/2010					posted	Hardy Creek	1	2010 6782	
269	668 Chelsea Dr 1/1/2011					posted	Caney Creek	1	2010 6901	
270	1754 Brecon Dr. 1/3/2011					posted	Eastover Creek	4	2010 6962	
271	508 Will O Wisp Way 1/4/2011					posted	Three Mile Creek	1	2010 6975	
272	616 Lowder Dr 1/4/2011					posted	Lynch Creek	2	2010 6979	
273	540 Briarcliff Cir. 1/5/2011					posted	Caney Creek	1	2010 7000	
274	1754 Brecon Dr. 12/27/2010					posted	Eastover Creek	4	2010 6769	
275	1800 Walter Dutch Welch Dr. 1/4/2011					posted	Town Creek	3	2010 6974	
276	5107 Waynhurst Dr. 1/4/2011					posted	Hanging Moss Creek	4	2010 6976	
277	415 Armour Dr. 1/5/2011					posted	Hanging Moss Creek	4	2011 6	
278	120 Colonial Dr. 1/5/2011					posted	Three Mile Creek	1	2011 8	
279	3475 I 55 S Timber Ridge Alts. 1/5/2011					posted	Caney Creek	1	2010 14	
280	Belvedere Dr. & Fremont St. 1/6/2011					posted	Hardy Creek	1	2011 43	
281	2625 Belvedere Dr. 1/7/2011					posted	Hardy Creek	1	2011 72	
282	6893 State Highway 18 1/7/2011					posted	Caney Creek	1	2011 82	
283	5749 Queen Christina Ln. 1/10/2011					posted	Lynch Creek	2	2011 128	
284	540 Briarcliff Cir. 1/10/2011					posted	Caney Creek	1	2011 129	
285	McWillie Dr. & Garvin St. 1/11/2011					posted	Hanging Moss Creek	4	2011 156	
286	Beechwood Dr. 1/13/2011					posted	Hanging Moss Creek	3	2011 186	
287	300 Wiltman St. 1/13/2011					posted	Lynch Creek	2	2011 189	
288	2981 McDowell DR 1/14/2011					posted	Caney Creek	1	2011 201	
289	Bailey Ave. & Woodrow Wilson Ave. 1/15/2011					posted	Town Creek	3	2011 216	
290	5549 Queen Christina Ln 1/17/2011					posted	Lynch Creek	3	2011 241	
291	431 Allot St. 1/19/2011					posted	Town Creek	2	2011 281	
292	Bailey Ave. & Woodrow Wilson Ave. 1/20/2011					posted	Town Creek	3	2011 313	
293	4809 Sheridan Dr. 1/20/2011					posted	Eubanks Creek	4	2011 325	
294	104 Elgrot St. 1/27/2011					posted	Lynch Creek	3	2011 472	
295	858 Combs St. 1/28/2011					posted	Three Mile Creek	1	2011 503	
296	540 Briarcliff Cir. 1/31/2011					posted	Caney Creek	1	2011 559	
297	2624 Bailey Ave. 2/1/2011					posted	Town Creek	3	2011 597	
298	724 Raymond Rd. 2/2/2011					posted	Three Mile Creek	1	2011 616	
299	462 Floyd Ave. 2/2/2011					posted	Hardy Creek	1	2011 617	
300	4025 Markham St, Jackson, MS 39209					EPA List	Town Creek	3		
301	2971 McDowell Rd. 2/3/2011					posted	Caney Creek	1	2011 635	
302	450 Browning St. 2/7/2011					posted	Lynch Creek	3	2011 686	
303	51 Northtown Rd 2/8/2011					posted	Purple Creek	4	2011 702	
304	533 Queen Isabella Ln, Jackson, MS 39208					EPA List	Lynch Creek	3		
305	301 Elton Rd. 2/9/2011					posted	Caney Creek	1	2011 722	
306	1072 Cooper Rd. 2/11/2011					posted	Caney Creek	1	2011 776	
307	405 Marigold St (In the park) 2/16/2011					posted	Three Mile Creek	1	2011 888	
308	5455 Queen Mary Ln, Jackson, MS 39209					EPA List	Lynch Creek	3		
309	1119 McLean St. 2/17/2011					posted	Lynch Creek	2	2011 909	
310	519 Queen Julienne Ln, Jackson, MS 39208					EPA List	Lynch Creek	3		
311	3915 Jayne Ave.					posted	Lynch Creek	2	2011 947	
312	691 Tiffon Drive 2/2/2011					posted	Caney Creek	1	2011 1024	
313	5408 Queen Mary Ln, Jackson, MS 39209					EPA List	Lynch Creek	3		
314	209 Houston Ave. 2/22/2011					posted	Lynch Creek	2	2011 1038	
315	7540 Sunset Drive 2/23/2011					posted	Town Creek	3	2011 1141	
316	2113 Lincoln Ave. 2/28/2011					posted	Lynch Creek	3	2011 1157	
317	540 Briarcliff Cir. 2/25/2011					posted	Caney Creek	1	2011 1161	
318	Garvin St. & McWillie Dr. 2/25/2011					posted	Hanging Moss Creek	4	2011 1098	
319	2937 Maydale Dr. 2/24/2011					posted	Caney Creek	1	2011 1066	
320	415 E. Capitol St 2/24/2011					posted	Town Creek	2	2011 1080	
321	117 Clinton Park Dr. 2/23/2011					posted	Lynch Creek	3	2011 1044	
322	5124 Queen Eleanor Ln. Jackson, MS 39209					EPA List	Lynch Creek	3		
323	West Bank Interceptor Dead End of N Cheryl Dr. 3/24/2011					posted	Hanging Moss Creek	4	2011 1159	
324	5148 Queen Eleanor Ln, Jackson, MS 39209					EPA List	Lynch Creek	3		
325	5349 Queen Christina Lane 3/1/2011					posted	Lynch Creek	3	2011 1155	
326	125 Taylor Street 3/2/2011					posted	Town Creek	3	2011 1193	
327	412 Windsor Dr, Jackson, MS 39209					EPA List	Lynch Creek	3		
328	109 Glen Erin St. 3/2/2011					posted	Caney Creek	1	2011 1183	
329	Behind ballfield on Lakeland Dr. 3/9/2011					posted	Eubanks Creek	4	2011 1374	
330	260 Cobbsnok Ave, Jackson, MS 39209					EPA List	Lynch Creek	3		
331	225 Meadowbrook Rd. 3/10/2011					posted	Eubanks Creek	4	2011 1394	
332	259 Cobbsnik Ave, Jackson, MS 39209					EPA List	Lynch Creek	3		
333	905 Pinnegar Rd. 3/16/2011					posted	Three Mile Creek	1	2011 1494	
334	Dead end of N Cheryl (West Bank Interceptor) 3/21/2011					posted	Hanging Moss Creek	4	2011 1590	
335	207 Country Club Dr, Jackson, MS 39209					EPA List	Lynch Creek	3		
336	154 Houston Ave. 3/23/2011					posted	Lynch Creek	2	2011 1635	
337	Country Club Dr, Jackson, MS					EPA List	Rogue Chitto Creek	3		
338	6210 Broad Oak Dr. 3/28/2011					posted	Purple Creek	4	2011 1700	
339	Country Club Dr/Welch, Jackson, MS					EPA List	Lynch Creek	3		
340	2726 Bailey Ave. 3/29/2011					posted	Town Creek	3	2011 1723	

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341	4923 Wicker Dr, Jackson, MS 39209					EPA List	Lynch Creek	3		
342	West Cheryl Dr. & Heritage Hill Dr. 4/18/2011					posted	Hanging Moss Creek	4	2011 9999	
343	Queen Mary Ln. 4/21/2011					posted	Lynch Creek	3	2011 2102	
344	3111 Santa Clair Cir. 4/21/2011					posted	Hardy Creek	1	2011 2111	
345	339 Maple Ridge Dr. 4/19/2011					posted	Hardy Creek	1	2011 2158	
346	1100 J.R. Lynch St. 4/20/2011					posted	Town Creek	2	2011 2161	
347	Wood St. & Bell St. 11/16/2010					posted	Town Creek	3		
348	Fern Dr & Willow Way 4/25/2011					posted	Three Mile Creek	1	2011 2162	
349	202 Ridgeway St. 4/23/2011					posted	Town Creek	4	2011 2182	
350	Bailey Ave/Medgar Evers Blvd, Jackson, MS					EPA List	Town Creek	3		
351	Poplar St. & Walnut St. 4/23/2011					posted	Lynch Creek	2	2011 2183	
352	Fern Dr. & Willow Way 4/25/2011					posted	Three Mile Creek	1	2011 2192	
353	901 E Fortification St. 4/25/2011					posted	Town Creek	2	2011 2194	
354	5334 Brookhollow Dr. 4/25/2011					posted	Trahon Creek	1	2011 2203	
355	311 John St, Jackson, MS 39213					EPA List	Town Creek	3		
356	2162 Mavis Lane Rd 4/25/2011					posted	Caney Creek	1	2011 2206	
357	Bailey Ave/James St., Jackson, MS					EPA List	Town Creek	3		
358	Ridgeway St. & Bay St. 4/26/2011					posted	Town Creek	3	2011 2214	
359	Dead end of N. Cheryl Dr. (West Bank Interceptor) 4/27/2011					posted	Hanging Moss Creek	4	2011 2186	
360	Dalton St. & J. R. Lynch St. 4/27/2011					posted	Town Creek	3	2011 2229	
361	1852 Booker Washington St. Jackson, MS 39213					EPA List	Town Creek	3		
362	Pearman St. & J. R. Lynch St. 4/27/2011					posted	Town Creek	2	2011 2232	
363	1852 Booker Washington St. Jackson, MS 39213					EPA List	Town Creek	3		
364	5534 Queen Mary Lane 4/27/2011					posted	Lynch Creek	3	2011 2238	
365	1852 Booker Washington St. Jackson, MS 39213					EPA List	Town Creek	3		
366	3128 Longwood Dr. 4/28/2011					posted	Caney Creek	1	2011 2240	
367	6604 US Highway 80 W 4/28/2011					posted	Lynch Creek	2	2011 2235	
368	512 Scottdale Dr 4/27/2011					posted	Trahon Creek	1	2011 9000	
369	4445 Medgar Evers Blvd. 4/28/2011					posted	Town Creek	3	2011 2273	
370	1338 S. Gallatin St 4/29/2011					posted	Lynch Creek	2	2011 2275	
371	West Bank Interceptor, dead end of N. Cheryl 5/9/2011					posted	Hanging Moss Creek	4	2011 9001	
372	2622 Marion Dunbar St. 4/28/2011					posted	Town Creek	3	2011 2236	
373	Lamar Blvd & Windsor Ave. 4/28/2011					posted	Town Creek	4	2011 2280	
374	1300 Bainbridge Dr. 5/2/2011					posted	Town Creek	3	2011 2292	
375	1324 Lexington Rd. 5/2/2011					posted	Town Creek	3	2011 2291	
376	LS #007 McClure #1 500 McClure Rd 5/3/2011					posted	Caney Creek	1	2011 9004	
377	LS #0069 Sewell #1] Sewell Rd. & McClure Rd. 5/3/2011					posted	Trahon Creek	1	2011 9005	
378	LS #005 [Sewell #2] Sewell Rd. & McClure Rd.					posted	Trahon Creek	1	2011 9006	
379	1600 walter dutch welch dr. Jackson, MS 39213					EPA List	Town Creek	3		
380	SW0193 South Savanna WWTP 5/3/2011 - 5/4/2011					posted	Hardy Creek	1	2011 9007	
381	4138 Parkway Ave, Jackson, MS 39213					EPA List	Town Creek	3		
382	103 Ashley Dr. 5/4/2011					posted	Hanging Moss Creek	4	2011 2324	
383	Moody St. & Queen St. 5/4/2011					posted	Bellhaven Creek	2	2011 2323	
384	2351 Castle Hill Dr. 5/5/2011					posted	Hardy Creek	1	2011 2352	
385	5006 Tolson Dr. 5/5/2011					posted	Lynch Creek	3	2011 2351	
386	3900 Eastover Dr. 5/5/2011					posted	Eastover Creek	4	2011 2354	
387	345 Lavista Blvd. 5/5/2011					posted	Town Creek	4	2011 2355	
388	1461 Brooklyn Dr 5/5/2011					posted	Eubanks Creek	3	2011 2367	
389	2375 Reddoch Dr & 55 Frontage Rd. 5/6/2011					posted	Hanging Moss Creek	4	2011 2371	
390	Acre St. near 200 E. Ridgeway St. 5/7/2011					posted	Town Creek	4	2011 2380	
391	5011 Cottonwood Ln 5/7/2011					posted	Trahon Creek	1	2011 2385	
392	202 Ridgeway St. 5/6/2011					posted	Town Creek	4	2011 2390	
393	1212 Melwood Pl. 5/8/2011					posted	Eubanks Creek	4	2011 2401	
394	1620 W Northside Dr, Jackson, MS 39213					EPA List	Bogue Chitto Creek	3		
395	1011 Cromwell St. 5/9/2011					posted	Town Creek	1	2011 2406	
396	155 Abram Ford Dr. Jackson, MS 39213					EPA List	Town Creek	3		
397	5534 Norwood Ave. 5/10/2011					posted	Caney Creek	1	2011 2426	
398	140 Abram Ford Dr, Jackson, MS 39213					EPA List	Town Creek	3		
399	187 East Woodchest Dr. 5/10/2011					posted	Caney Creek	1	2011 2427	
400	130 Abram Ford Dr, Jackson, MS 39213					EPA List	Town Creek	3		
401	1335 N. State St. 5/10/2011					posted	Bellhaven Creek	4	2011 2431	
402	4256 Overlook Dr, Jackson, MS 39213					EPA List	Town Creek	3		
403	2524 Clinton Blvd. 5/11/2011					posted	Lynch Creek	3	2011 2447	
404	5543 Cahill Dr. 5/11/2011					posted	Lynch Creek	2	2011 2459	
405	817 Glenwood St. 5/11/2011					posted	Bellhaven Creek	4	2011 2458	
406	4061 Oaklawn Dr, Jackson, MS 39206					EPA List	Eubanks Creek	3		
407	510 Canton Club Cir. 5/11/2011					posted	Purple Creek	4	2011 2448	
408	5007 Cottonwood Ln. 5/11/2011					posted	Trahon Creek	1	2011 2459	
409	Capitol St. & Prentiss St. 5/11/2011					posted	Town Creek	2	2011 2464	
410	4249 Meadowlane Dr, Jackson, MS 39206					EPA List	Eubanks Creek	3		
411	401 Lamar Blvd. 5/12/2011					posted	Town Creek	4	2011 2472	
412	5529 Bainbridge Dr. 5/12/2011					posted	Town Creek	3	2011 2476	
413	5721 Heathrow Dr. 5/12/2011					posted	Town Creek	4	2011 2497	
414	845 Briarwood Dr, Jackson, MS 39206					EPA List	Eubanks Creek	3		
415	202 E. Ridgeway St. 5/10/2011					posted	Town Creek	4	2011 2225	
416	3628 Robin Park Cir. 5/16/2011					posted	Caney Creek	1	2011 2533	
417	2975 W. McDowell Rd. 5/16/2011					posted	Caney Creek	1	2011 2531	
418	1701 Pinewood Dr. 5/16/2011					posted	Hanging Moss Creek	3	2011 2529	
419	Prentiss St. & Capitol St. 5/16/2011					posted	Town Creek	2	2011 2530	
420	960 Lake St. 5/16/2011					posted	Town Creek	2	2011 2601	
421	516 Woodson Dr, Jackson, MS 39206					EPA List	Hanging Moss Creek	3		
422	2811 Coleman Ave. 5/23/2011					posted	Town Creek	3	2011 2611	
423	516 Woodson Dr, Jackson, MS 39206					EPA List	Hanging Moss Creek	3		
424	5409 Queen Mary Lane 5/24/2011					posted	Lynch Creek	3	2011 2635	
425	533 Woodson Dr, Jackson, MS 39206					EPA List	Hanging Moss Creek	3		

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City of Jackson, Mississippi
Department Of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-1699

426	Walnut St. & Porter St. 5/23/2011					posted	Lynch Creek	2	2011 2657	
427	No. 1 Dutchmen's Row 6/1/2011					posted G Huff	Town Creek	3	2011 2758	
428	5727 Commwood Ln. 6/1/2011					posted G Huff	Trahon Creek	1	2011 3766	
429	1048 Greymont Ave. 6/1/2011					posted G Huff	Belhaven Creek	2	2011 2767	
430	2002 Boling St. 6/2/2011					posted G Huff	Bogue Chitto Creek	3	2011 2776	
431	369 Olympia Fields, Jackson, MS 39211					EPA List	Purple Creek	4		
432	Greymont St. & Moody St. 6/2/2011					posted G Huff	Belhaven Creek	2	2011 2784	
433	817 Oakwood St. 6/3/2011					posted G Huff	Belhaven Creek	4	2011 2808	
434	4612 Belmale Pl. 6/3/2011					posted G Huff	Eubanks Creek	3	2011 2810	
435	Glenrose Dr. & Bayberry Dr. 6/10/2011					posted G Huff	Lynch Creek	3	2011 2911	
436	946 Lorenz Blvd. 6/6/2011					posted G Huff	Town Creek	4	2011 2914	
437	930 Belhaven St. 6/6/2011					posted G Huff	Belhaven Creek	4	2011 2921	
438	3842 Orchard View Dr, Jackson, MS 39211					EPA List	Purple Creek	4		
439	1480 Raymond Rd. 6/7/2011					posted G Huff	Caney Creek	1	2011 2939	
440	730 Colonial Cir. Jackson, MS 39211					EPA List	Purple Creek	4		
441	Livingston Rd & Bowell St.					posted G Huff	Town Creek	3	2011 2941	
442	121 Old Canton Hill Dr, Jackson, MS 39211					EPA List	Purple Creek	4		
443	1034 Greymont Ave. 6/9/2011					posted G Huff	Belhaven Creek	2	2011 3008	
444	Bay St. & Ridgeway St. 6/10/2011					posted G Huff	Town Creek	3	2011 2972	
445	1918 Boling St. 6/12/2011					posted G Huff	Bogue Chitto Creek	3	2011 2992	
446	5115 Harrow Dr. Jackson, MS 39211					EPA List	Hanging Moss Creek	4		
447	149 Lea Cir. 6/12/2011					posted G Huff	Caney Creek	1	2011 2993	
448	5140 Harrow Dr. Jackson, MS 39211					EPA List	Hanging Moss Creek	4		
449	1066 Meadow Heights Dr. 6/13/2011					posted G Huff	Eubanks Creek	4	2011 2902	
450	375 Rollingwood Dr. Jackson, MS 39211					EPA List	Hanging Moss Creek	4		
451	Sewell Rd. & McCleur Rd. 6/23/2011					posted G Huff	Trahon Creek	1	2011 3017	
452	363 Rollingwood Dr, Jackson, MS 39211					EPA List	Hanging Moss Creek	4		
453	730 Pimlico Pl 6/14/2011					posted G Huff	Hanging Moss Creek	4	2011 2922	
454	787 E. Northside Dr. 6/14/2011					posted G Huff	Eubanks Creek	4	2011 2923	
455	200 S. Capitol St. 6/14/2011					posted G Huff	Town Creek	2	2011 2926	
456	200 Cummins St. 6/14/2011					posted G Huff	Three Mile Creek	1	2011 2927	
457	5365 Suffolk Dr. Jackson, MS 39211					EPA List	Hanging Moss Creek	4		
458	170 Treehaven Dr. 6/14/2011					posted G Huff	Hardy Creek	1	2011 2929	
459	5520 Dolphin Dr. 6/23/2011					posted G Huff	Lynch Creek	3	2011 2936	
460	Jayne Ave. & Linsey Dr. in creek 6/13/2011					posted G Huff	Lynch Creek	2	2011 2957	
461	230 Pimhoe Pl, Jackson, MS 39211					EPA List	Hanging Moss Creek	4		
462	4000 N. West St. 6/16/2011					posted G Huff	Eubanks Creek	3	2011 2962	
463	324 Queen Mary Lane 6/17/2011					posted G Huff	Lynch Creek	3	2011 2980	
464	250 Wacker Dr. 6/18/2011					posted G Huff	Eubanks Creek	3	2011 3002	
465	2681 McDowell Rd. 6/19/2011					posted G Huff	Caney Creek	1	2011 3002	
466	1770 Shady Lane 6/22/2011					posted G Huff	Lynch Creek	1	2011 3008	
467	373 Barnes St. 6/30/2011					posted G Huff	Hanging Moss Creek	4	2011 3015	
468	1325 Stanton Dr. 6/21/2011					posted G Huff	White Oak Creek	4	2011 3030	
469	342 Combs St. 6/23/2011					posted G Huff	Three Mile Creek	1	2011 3051	
470	1051 Palmyra St. 6/24/2011					posted G Huff	Town Creek	3	2011 3064	
471	4212 Oakmont Dr. 6/24/2011					posted G Huff	Lynch Creek	2	2011 3070	
472	Twin Oaks Cir. 6/24/2011					posted G Huff	Trahon Creek	1	2011 3084	
473	Quail Run Rd. Jackson, MS					EPA List	Hanging Moss Creek	4		
474	920 Wentworth St. 6/26/2011					posted G Huff	Belhaven Creek	2	2011 3094	
475	621 Monterey St. 6/26/2011					posted G Huff	Three Mile Creek	1	2011 3095	
476	2030 Eastover Dr. Jackson, MS 39211					EPA List	Eastover Creek	4		
477	1411 Lasley Ave. 6/26/2011					posted G Huff	Town Creek	3	2011 3096	
478	1413 E Northside Dr, Jackson, MS 39211					EPA List	Eastover Creek	4		
479	902 Gisele Dr. 6/27/2011					posted G Huff	Three Mile Creek	1	2011 3107	
480	922 Crestor Ave. 6/27/2011					posted G Huff	Caney Creek	1	2011 3108	
481	4570 Old Canton Rd, Jackson, MS 39211					EPA List	Eastover Creek	4		
482	2840 Robinson Rd. 6/27/2011					posted G Huff	Lynch Creek	2	2011 3109	
483	61601-5 Frontage Rd. 6/27/2011					posted G Huff	White Oak Creek	4	2011 3110	
484	4580 Old Canton Rd & Northside, Jackson, MS 39211					EPA List	Eastover Creek	4		
485	3920 Jane Dr. 6/27/2011					posted G Huff	Caney Creek	1	2011 3111	
486	4220 E Northside Dr, Jackson, MS 39211					EPA List	Eastover Creek	4		
487	520 Briarcliff Cir. 6/27/2011					posted G Huff	Trahon Creek	1	2011 3118	
488	3741 Waycona Dr. 6/30/2011					posted G Huff	Lynch Creek	1	2011 3162	
489	4207 Mississippi St. 6/30/2011					posted G Huff	Town Creek	2	2011 3168	
490	Jefferson St. & Tombigbee St. 6/29/2011					posted G Huff	Belhaven Creek	2	2011 3172	
491	1210 Mckwood Pl, Jackson, MS 39206					EPA List	Eubanks Creek	4		
492	Forest Ave. & Watkins Dr. 7/5/2011					posted G Huff	Eubanks Creek	3	2011 3204	
493	Greymont St. & High St. 7/5/2011					posted G Huff	Belhaven Creek	2	2011 3206	
494	969 Featherwood Dr. 7/5/2011					posted G Huff	Caney Creek	1	2011 3211	
495	638 Newland Ave. 7/5/2011					posted G Huff	Hanging Moss Creek	4	2011 3208	
496	1918 Willow Way 7/1/2011					posted G Huff	Three Mile Creek	1	2011 3179	
497	5115 harrow Dr. 7/5/2011					posted G Huff	Hanging Moss Creek	4	2011 3199	
498	111 Glenstone Cir. 7/5/2011					posted G Huff	Caney Creek	1	2011 3202	
499	4150 Crane Blvd, Jackson, MS 39216					EPA List	Eubanks Creek	9		
500	Greymont St. & High St. 7/6/2011					posted G Huff	Belhaven Creek	2	2011 3206	
501	828 Crawford St. 7/7/2011					posted G Huff	Town Creek	3	2011 3238	
502	La Salle St. & Fielding Ave. 7/6/2011					posted G Huff	Hardy Creek	1	2011 3224	
503	4631 Churchill Dr, Jackson, MS 39206					EPA List	Eubanks Creek	9		
504	3619 Northhaven Dr. 7/6/2011					posted G Huff	Eubanks Creek	3	2011 3224	
505	4685 Churchill Dr, Jackson, MS 39206					EPA List	Eubanks Creek	4		
506	363 Broadmoor Dr. 7/7/2011					posted G Huff	Eubanks Creek	4	2011 3237	
507	Forest Ave. & watkins Dr. 7/7/2011					posted G Huff	Eubanks Creek	3	2011 3233	
508	4800 Windermere Terrace, Jackson, MS 39206					EPA List	Eubanks Creek	9		
509	1333 Tupp Ave. 7/7/2011					posted G Huff	Lynch Creek	2	2011 3232	
510	4822 Windermere Terrace, Jackson, MS 39206					EPA List	Eubanks Creek	4		

City Of Jackson, Mississippi
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511	124 Northwood Dr. 7/8/2011					posted G Huff	Caney Creek	1	2011 3275	
512	621 Houston Ave. 7/8/2011					posted G Huff	Lynch Creek	2	2011 3274	
513	Palmyra St. & Elm St. 7/11/2011					posted G Huff	Town Creek	1	2011 3285	
514	903 Pearl St. 7/11/2011					posted G Huff	Town Creek	2	2011 3281	
515	4927 Ridgewood Rd 7/6/2011					posted G Huff	Eastover Creek	4	2011 3249	
516	215 E Northside Dr, Jackson, MS 39206					EPA List	Eubanks Creek	4		
517	0100 Block Palmyra St. 7/10/2011					posted G Huff	Town Creek	1	2011 3279	
518	4148 Robin Dr, Jackson, MS 39206					EPA List	Eubanks Creek	4		
519	Fortin Ave. & Watkins Dr. 7/6/2011					posted G Huff	Eubanks Creek	3	2011 3245	
520	4106 Robin Dr. Jackson, MS 39206					EPA List	Eubanks Creek	4		
521	1830 Harrison Ave. 7/12/2011					posted G Huff	Lynch Creek	2	2011 3292	
522	5715 McFadden Rd - Dead end of Beechcreek Rd. 7/6/2011					posted G Huff	Hardy Creek	1	2011 3262	
523	Mississippi St. & Jefferson St. 7/12/2011					posted G Huff	Bellhaven Creek	2	2011 3299	
524	5124 Harlow Dr. 7/12/2011					posted G Huff	Hanging Moss Creek	4	2011 3297	
525	Montgomery St. & Valentine St. 7/13/2011					posted G Huff	Three Mile Creek	1	2011 3306	
526	914 Northwood Dr. 7/12/2011					posted G Huff	Bellhaven Creek	4	2011 3311	
527	500 Hemenway Dr - Pump Station 7/13/2011					posted G Huff	Caney Creek	1	2011 3326	
528	5614 Hillside Dr. 7/13/2011					posted G Huff	Three Mile Creek	1	2011 3302	
529	5601 Greenwood Ave. 7/14/2011					posted G Huff	Hardy Creek	1	2011 3345	
530	2936 Lexington Rd. 7/13/2011					posted G Huff	Town Creek	1	2011 3343	
531	Queen Christina Lane 7/14/2011					posted G Huff	Lynch Creek	1	2011 3342	
532	Ridgewood St. & Fairview St. 7/14/2011					posted G Huff	Bellhaven Creek	4	2011 3328	
533	2500 N State St, Jackson, MS 39216					EPA List	Bellhaven Creek	4		
534	508 Cotterman Ave. 7/15/2011					posted G Huff	Lynch Creek	2	2011 3352	
535	4218 Riverside Dr, Jackson, MS 39209					EPA List	Bellhaven Creek	4		
536	591 Hackman Rd. 7/15/2011					posted G Huff	Trahon Creek	1	2011 3372	
537	1400 Dalsby St. / Highway 80 Frontage 7/13/2011					posted G Huff	Lynch Creek	2	2011 3356	
538	710 McTyeire Ave, Jackson, MS 39202					EPA List	Lagoon Creek	4		
539	0300 Block Richey Dr. 7/17/2011					posted G Huff	Caney Creek	1	2011 3377	
540	706 McTyeire Ave, Jackson, MS 39202					EPA List	Town Creek	4		
541	Churchill Dr & Belvedere Rd. 7/18/2011					posted G Huff	Eubanks Creek	4	2011 3392	
542	712 McTyeire Ave, Jackson, MS 39202					EPA List	Town Creek	4		
543	160 Circle Ave. 7/18/2011					posted G Huff	Town Creek	2	2011 3381	
544	Vacant lot near 1001 Greeley St. 7/18/2011					posted G Huff	Town Creek	2	2011 3380	
545	Maryland Dr. near 4452 7/18/2011					posted G Huff	Lynch Creek	3	2011 3395	
546	0300 Riverside Dr - Water Plant - Pearl River 7/18/2011					posted G Huff	Eubanks Creek	4	2011 3402	
547	1013 N State St & Mayflip St, Jackson, MS 39202					EPA List	Town Creek	4		
548	Tara Rd. & ejelton St. 7/18/2011					posted G Huff	Hardy Creek	1	2011 3398	
549	1024 N State St & Mayflip St, Jackson, MS 39202					EPA List	Town Creek	4		
550	372 E. Woodcrest Dr. 7/18/2011					posted G Huff	Caney Creek	1	2011 3387	
551	Poplar Blvd. & Kenwood Pl. 8/3/2011					posted G Huff	Bellhaven Creek	4	2011 3777	
552	3932 Lodi St. 8/5/2011					posted G Huff	Town Creek	2	2011 3830	
553	3215 Fontaine Dr. 8/5/2011					posted G Huff	Purple Creek	4	2011 3830	
554	9464 Old Canton Rd. 8/9/2011					posted G Huff	Purple Creek	4	2011 32250	
555	9015 I-55 North 8/6/2011					posted G Huff	White Oak Creek	4	2011 31183	
556	1963 Shady Ln. 8/5/2011					posted G Huff	Three Mile Creek	1	2011 32887	
557	1493 Cunningham Ave. 8/1/2011					posted G Huff	Town Creek	3	2011 31527	
558	3315 Flint Ave. 8/9/2011					posted G Huff	Lynch Creek	2	2011 32688	
559	2136 Gertrude Dr. 8/8/2011					posted G Huff	Caney Creek	1	2011 32128	
560	509 S Floral Dr. 8/8/2011					posted G Huff	Hanging Moss Creek	3	2011 3229	
561	5349 Queen Christina Ln, Queen Eleanor Ln. 8/5/2011					posted G Huff	Lynch Creek	2	2011 3267	
562	301 McTyeire Ave. 8/5/2011					posted G Huff	Town Creek	4	2011 3226	
563	3003 Woodvale Dr. 8/4/2011					posted G Huff	Caney Creek	1	2011 3201	
564	900 Poplar Blvd. & Kenwood Pl. 8/4/2011					posted G Huff	Bellhaven Creek	4	2011 3651	
565	2725 Gardiner Cir. 8/5/2011					posted G Huff	Eastover Creek	4	2011 3706	
566	2529 Livingston Rd. 8/5/2011					posted G Huff	Town Creek	3	2011 3613	
567	648 Chelsea Dr. 8/3/2011					posted G Huff	Caney Creek	1	2011 3610	
568	904 E. Fortification St. 8/3/2011					posted G Huff	Bellhaven Creek	4	2011 3657	
569	128 Pine Knoll Pl 8/2/2011					posted G Huff	Three Mile Creek	1	2011 10140	
570	233 Valencia St. 8/2/2011					posted G Huff	Three Mile Creek	1	2011 10139	
571	3610 Raings Rd. 8/2/2011					posted G Huff	Caney Creek	1	2011 10117	
572	1644 Camellia Dr. 8/2/2011					posted G Huff	Lynch Creek	1	2011 10125	
573	4735 Hertage Manor 8/2/2011					posted G Huff	Trahon Creek	1	2011 10150	
574	Ashley Dr. & Old Canton Rd. 8/1/2011					posted G Huff	Hanging Moss Creek	4	2011 20016	
575	1644 Camellia Dr. 8/1/2011					posted G Huff	Lynch Creek	1	2011 20017	
576	235 Ross St. 8/1/2011					posted G Huff	Town Creek	2	2011 10028	
577	2302 St. Charles St. 8/1/2011					posted G Huff	Lynch Creek	2	2011 10015	
578	903 East Fortification 8/1/2011					posted G Huff	Bellhaven Creek	2	2011 10053	
579						posted G Huff	Town Creek	3	2011 3733	
580						posted G Huff	Town Creek	3	Untitled Placemark	
581						posted G Huff	Lynch Creek	3	Untitled Placemark	
582	1672 Shady Lane 8/24/2011					posted G Huff	Three Mile Creek	1	2011 3402	
583	5405 Dogwood Ave. 8/24/2011					posted G Huff	Town Creek	2	2011 3403	
584	6331 Churchill Dr. 8/24/2011					posted G Huff	Eubanks Creek	4	2011 3404	
585	702 Wildwood Dr. 8/20/2011					posted G Huff	Three Mile Creek	1	2011 3461	
586	349 Lois Cir. 8/22/2011					posted G Huff	Caney Creek	1	2011 3455	
587	539 W. McDowell Rd. 8/22/2011					posted G Huff	Hardy Creek	1	2011 3449	
588	5428 Bailey Ave. 8/21/2011					posted G Huff	Town Creek	3	2011 3429	
589	539 W. McDowell Rd. 8/20/2011					posted G Huff	Hardy Creek	1	2011 3418	
590	329 Colonial Dr. 8/25/2011					posted G Huff	Three Mile Creek	1	2011 3506	
591	5960 Mostly Dr. 8/26/2011					posted G Huff	Caney Creek	1	2011 3519	
592	Cedarhurst Dr. & Woodbury Rd. 7/26/2011					posted G Huff	Eubanks Creek	4	2011 3525	
593	1904 Homer Ave. 7/26/2011					posted G Huff	Town Creek	3	2011 3535	
594	3020 Woodbury Dr. 7/27/2011					posted G Huff	Caney Creek	1	2011 3547	
595	4484 Highway 18 7/27/2011					posted G Huff	Caney Creek	1	2011 3538	
596	927 Cooper Rd. 7/27/2011					posted G Huff	Caney Creek	1	2011 3533	
597	2907 Angela Cir. 7/27/2011					posted G Huff	Lynch Creek	3	2011 3527	
598	4179 Wildwood Terrace 7/27/2011					posted G Huff	Caney Creek	1	2011 3539	

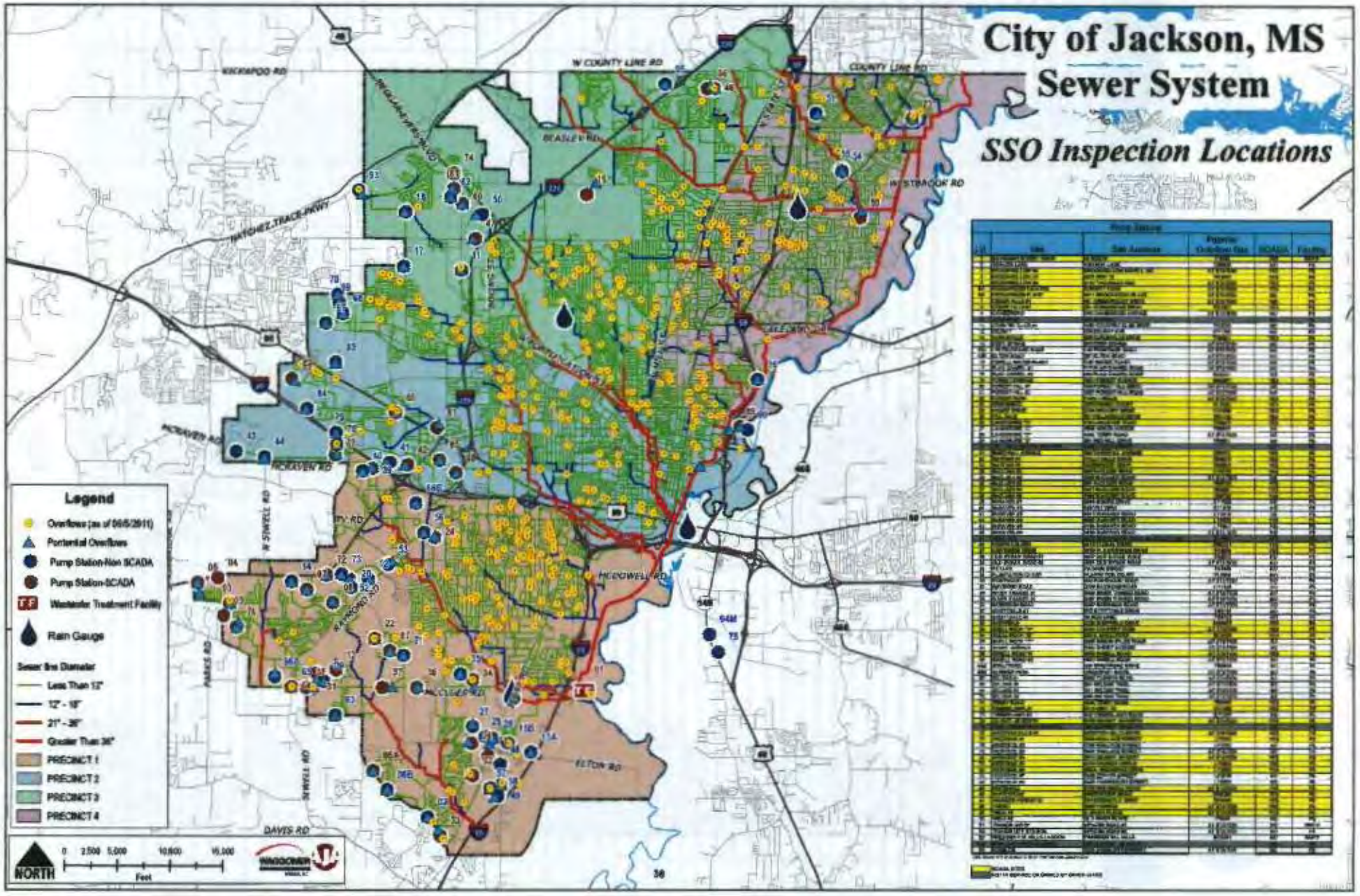
City Of Jackson, Mississippi
Sewer System Overflow Inspection Form

City of Jackson, Mississippi
Department of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-2651

599	4156 Crane Blvd. 7/21/2011					posted G Huff	Eubanks Creek	4	2011 9639
600	2007 Lamar St. 7/28/2011					posted G Huff	Town Creek	4	2011 3567
601	1654 Camellia Dr. 7/30/2011					posted G Huff	Lynch Creek	1	2011 9672
602	2811 Bay Ave. 7/29/2011					posted G Huff	Town Creek	3	2011 9749
603	178 E. Woodcrest Dr. 8/2/2011					posted G Huff	Caney Creek	1	2011 3650
604	178 E. Woodcrest Dr. 7/27/2011					posted G Huff	Caney Creek	1	2011 20015
605	213 Lee Cir. 7/31/2011					posted G Huff	Hardy Creek	1	2011 9998
606	Cedarhurst Dr. & Brookdale Rd. 7/31/2011					posted G Huff	Eubanks Creek	4	2011 10000
607	U.S.A 056 Franklin D Roosevelt Dr. 7/14/2011					posted G Huff			2011 20015
608	U.S.A 056 Franklin D Roosevelt Dr. 7/5/2011					posted G Huff			2011 20016
609	U.S.A .084 Westside # 1 1900 Wallace St. 7/14/2011					posted G Huff	Lynch Creek	2	2011 9203
610						posted G Huff	Lynch Creek	2	2011 30022
611	969 E. McDowell Rd. 8/5/2011					posted G Huff	Three Mile Creek	1	2011 3711
612	Adelle St. & Adelle Ct. 8/5/2011					posted G Huff	Town Creek	4	2011 3708
613	5136 Gertrude Dr. 8/5/2011					posted G Huff	Caney Creek	1	2011 3727
614	5136 Gertrude Dr. 8/8/2011					posted G Huff	Caney Creek	1	2011 3733
615	2749 Woodside Dr. 8/8/2011					posted G Huff	Caney Creek	1	2011 3730
616	887 Brandon Ave. 8/8/2011					posted G Huff	Lynch Creek	2	2011 3741
617	California Ave. & Ohio St. 8/8/2011					posted G Huff	Town Creek	3	2011 3740
618	Willow Way 8/9/2011					posted G Huff	Three Mile Creek	1	2011 10563
619	3957 Californie Ave. 8/12/2011					posted G Huff	Town Creek	3	2011 3815
620	4161 Wapitel St. 8/12/2011					posted G Huff	Lynch Creek	2	2011 3814
621	3411 M. L. King Dr. 8/10/2011					posted G Huff	Town Creek	3	2011 3175
622	1644 Camellias Ln. 8/10/2011					posted G Huff	Lynch Creek	1	2011 3770
623	270 Lea Cir. 8/10/2011					posted G Huff	Hardy Creek	1	2011 3784
624	2849 Robinson Rd. 8/15/2011					posted G Huff	Lynch Creek	1	2011 3648
625	689 Woody Dr. 8/15/2011					posted G Huff	Caney Creek	1	2011 3852
626	138 Valley St. 8/15/2011					posted G Huff	Lynch Creek	1	2011 3857
627	715 Kirkley Dr. 8/16/2011					posted G Huff	Eubanks Creek	3	2011 3883
628	1569 Watkins Rd. 8/16/2011					posted G Huff	Lynch Creek	2	2011 3872
629	1725 Camellia Dr. 8/16/2011					posted G Huff	Lynch Creek	1	2011 3870
630	1812 Willard Dr. 8/17/2011					posted G Huff	Three Mile Creek	1	2011 3895
631	4911 Belle Glade 8/17/2011					posted G Huff	Eastover Creek	4	2011 3899
632	Pleasant Ave & Bell St. 8/17/2011					posted G Huff	Town Creek	3	2011 3897
633	Monument St. & Capitol St. 8/17/2011					posted G Huff	Town Creek	2	2011 3893
634	1444 Kensington Ave. 8/18/2011					posted G Huff	Town Creek	1	2011 10933
635	232 Lea Cir. 8/18/2011					posted G Huff	Hardy Creek	1	2011 11111
636	2632 Key St. 8/18/2011					posted G Huff	Hardy Creek	1	2011 11099
637	1720 Camilla Dr. 8/23/2011					posted G Huff	Lynch Creek	1	2011 11309
638	1918 Carolina Dr. 8/22/2011					posted G Huff	Three Mile Creek	1	2011 21305
639	1657 McDowell Rd. 8/22/2011					posted G Huff	Caney Creek	1	2011 31945
640	Dead End of Eleanor Ave. 8/23/2011					posted G Huff	Town Creek	3	2011 3952
641	1023 Lamar Ave. 8/23/2011					posted G Huff	Town Creek	3	2011 3963
642	915 Sunset Ave. 8/23/2011					posted G Huff	Three Mile Creek	1	2011 3964
643	1411 Belle Glade 8/24/2011					posted G Huff	Eastover Creek	4	2011 31075
644	Behind Westland Plaza 8/24/2011					posted G Huff	Lynch Creek	2	2011 31530
645	595 Cedar Springs Dr. 8/24/2011					posted G Huff	Trahon Creek	1	2011 31522
646	523 Wilsell Rd. 8/28/2011					posted G Huff	Eubanks Creek	1	2011 4031
647	5345 Ridgewood Rd. 8/28/2011					posted G Huff	Hanging Moss Creek	4	2011 4028
648	202 E. Ridgeway St. 8/29/2011					posted G Huff	Town Creek	4	2011 4032
649	117 Clinton Park Dr. 8/29/2011					posted G Huff	Lynch Creek	1	2011 4042
650	1951 Shady Lane Dr. 8/29/2011					posted G Huff	Three Mile Creek	1	2011 4046
651	1681 Rainey Rd. 8/29/2011					posted G Huff	Caney Creek	1	2011 4026
652	Dorgan St. & Gunda St. 8/29/2011					posted G Huff	Hardy Creek	1	2011 4039
653	6112 Floral Dr. 8/29/2011					posted G Huff	Hanging Moss Creek	3	2011 4047
654	676 Robinwood Dr. 8/30/2011					posted G Huff	Trahon Creek	1	2011 4033
655	826 North St. 8/30/2011					posted G Huff	Town Creek	3	2011 4036
656	1257 Wood Village Dr. 8/30/2011					posted G Huff	Lynch Creek	2	2011 4049
657	2111 Castle Hill Dr. 8/27/2011					posted G Huff	Hardy Creek	1	2011 3770
658	4004 Northeast Dr. 8/27/2011					posted G Huff	Eubanks Creek	4	2011 3778
659	4613 Northside Dr. 8/11/2011					posted G Huff	Hanging Moss Creek	4	2011 10684
660	4358 California Ave. 7/28/2011					posted G Huff	Town Creek	3	2011 3907
661	4358 California Ave. 7/29/2011					posted G Huff	Town Creek	3	2011 20019
662	6112 Floral Dr. 8/30/2011					posted G Huff	Hanging Moss Creek	3	2011 20018
663	Broadmoor Dr. 8/31/2011					posted G Huff	Eubanks Creek	4	2011 32010
664	2816 Queens Road Ave. 8/31/2011					posted G Huff	Town Creek	3	2011 32026
665	3202 Newman Ave. 8/31/2011					posted G Huff	Eubanks Creek	3	2011 32082
666	I-55 at26 Crossings Ct & River Oaks Blvd. 8/4/2011					posted G Huff	Purple Creek	4	2011 30023
667	I-55 & I87 Westside 84 4919 Hwy. 80 West & Westhaven Blvd.					posted G Huff	Lynch Creek	2	2011 30024
668	320 Magnolia Rd. 9/5/2011					posted G Huff	Lynch Creek	2	2011 4144
669	160 Carter Ave. 9/5/2011					posted G Huff	Town Creek	3	2011 4120
670	241 Stokes Robertson Rd. 9/5/2011					posted G Huff	Caney Creek	1	2011 4137
671	1005 Auburn Dr. 9/5/2011					posted G Huff	White Oak Creek	4	2011 4142
672	2441 Martin Luther King, Jr., Drive 9/5/2011					posted G Huff	Town Creek	3	2011 4120
673	525 Northside Cir. 9/5/2011					posted G Huff	Eubanks Creek	3	2011 4117
674	2025 Raymond Rd. 9/5/2011					posted G Huff	Caney Creek	1	2011 4119
675	2005 Raymond Rd. 9/5/2011					posted G Huff	Caney Creek	1	2011 4121
676	3245 Medgar Evers Blvd. 9/4/2011					posted G Huff	Town Creek	3	2011 4114
677	Hartfield St. & West St. 9/1/2011					posted G Huff	Town Creek	4	2011 32085
678	976 Melanie Rd. 9/6/2011					posted G Huff	Lynch Creek	2	2011 32377
679	N Wabash Ave. & Ridgeway St. 9/6/2011					posted G Huff	Town Creek	3	2011 32486
680	617 N Park Ln. 9/6/2011					posted G Huff	Eubanks Creek	3	2011 32487
681	245 Lake of Pines Dr. 9/6/2011					posted G Huff	Hanging Moss Creek	3	2011 4681

City of Jackson, MS Sewer System

SSO Inspection Locations



City Of Jackson, Mississippi
Pump Station Potential Overflow Locations

City of Jackson, Mississippi
Department Of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-2001

No.	Potential Overflow Location	Station	Pump Station Location	Type	Receiving Waterway	Basin Priority
1	3539 Shellrock Drive	PS61	255 S. Shellrock	Potential	Bogue Chitto Creek	3
2	Cynthia Road	PS93	Presidential Hills	Potential	Bogue Chitto Creek	3
3	966 Flag Chapel Road	PS18	992 Flag Chapel Road	Potential	Bogue Chitto Creek	3
4	1820 Greenway Drive	PS39	2694 Moore Drive	Potential	Caney Creek	1
5	150 Hillview Drive	PS40	155 Hillview	Potential	Caney Creek	1
6	2117 Hickory Drive	PS24	2130 Hickory Drive	Potential	Caney Creek	1
7	2101 Raymond Road	PS53	2108 Raymond Road	Potential	Caney Creek	1
8	150 Timberlawn Road	PS73	132 Timberlawn Road	Potential	Trahon Creek	1
9	Highway 18	PS72	6115 Hwy. 18	Potential	Trahon Creek	1
10	120 Delray Drive	PS12	125 Delray Avenue	Potential	Caney Creek	1
11	1405 Canterbury Lane	PS87	Shannondale Drive	Potential	Trahon Creek	1
12	430 McCluer Road	PS34	500 McCluer Road	Potential	Caney Creek	1
13	4318 Lake Vista	PS15B	207 Elton Road	Potential	Caney Creek	1
14	893 Winthrop Circle	PS86	Whitestone Road	Potential	Hanging Moss Creek	3
15	6054 Floral Drive	PS46	6112 Floral Drive	Potential	Hanging Moss Creek	3
16	1396 Forest Avenue	PS19	1851 Forest Avenue	Potential	Eubanks Creek	3
17	2248 Sheffield Drive	PS59	2238 Sheffield Drive	Potential	Hanging Moss Creek	4
18	2 Old River Place	PS90	Old River Place	Potential	Belhaven Creek	2
19	1236 Zephyr Road	PS83	1914 US Hwy. 80 West	Potential	Lynch Creek	2
20	5551 Shaw Road	PS82	500 E. Browning Drive	Potential	Lynch Creek	2
21	Yarbrough Street	PS84	6325 Yarbrough Street	Potential	Lynch Creek	2
22	4218 Church Circle	PS81	4210 Church Circle	Potential	Lynch Creek	2
23	1801 Wallace Street	PS78	1790 Wallace Street	Potential	Lynch Creek	2
24	1885 Wallace Street	PS77	1900 Wallace Street	Potential	Lynch Creek	2
25	1911 Sivell Road	PS43	6186 mcRaven Road	Potential	Lynch Creek	2
26	4862 McRaven Road	PS41	4813 McRaven Road	Potential	Lynch Creek	2
27	4706 McRaven Road	PS42	4660 McRaven Road	Potential	Lynch Creek	2
29	1139 Plantation Court	PS51	Plantation Court	Potential	White Oak Creek	4
30	10 Greenwing Court	PS23	Greenwing Court	Potential	Purple Creek	4
31	1728 Brookhollow Circle	PS4	6675 Hwy 18	Potential	Trahon Creek	1
32	313 Woodcliff Drive	PS8	201 Cedarwood Drive	Potential	Trahon Creek	1
33	255 Western Hills Drive	PS25	561 Hillsdale Drive	Potential	Trahon Creek	1
34	170 Duranville	PS13	185 Duranville Drive	Potential	Trahon Creek	1
35	135 Stratford Drive	PS66A	139 Stratford Drive	Potential	Trahon Creek	1
36	137 Marshal Drive	PS31	160 Marshall Avenue	Potential	Trahon Creek	1
37	15 Nelson Circle	PS38	1665 McCluer	Potential	Trahon Creek	1
38	883 McCluer	PS36	887 McCluer	Potential	Trahon Creek	1
39	1074 McCluer	PS37	1077 McCluer	Potential	Trahon Creek	1
40	4052 Cenus Drive	PS27	4058 Venus Avenue	Potential	Trahon Creek	1
41	201 Red Hill	PS29	201 Red Hill Drive	Potential	Trahon Creek	1
42	176 Lakeshore Drive	PS26	174 Lakeshor Road	Potential	Trahon Creek	1
71	4630 Terry Road	PS71	174 Lakeshor Road	Potential	Trahon Creek	1
44	154 Holly Hill Drive	PS32	Holly Hill Drive	Potential	Trahon Creek	1
45	4838 Old Byram	PS48	4837 Old Byram Road	Potential	Trahon Creek	1
46	113 Scottdale Drive	PS57	112 Scottdale Drive	Potential	Trahon Creek	1
47	7 Rob Lane	PS58	10 Rob Lane	Potential	Trahon Creek	1
48	342 Amanda Lane	PS2	Amanda Lane	Potential	Big Creek	1
49	837 Robinwood Drive	PS33	Robinwood Drive	Potential	Trahon Creek	1
50	4351 Putnam Street	PS50	Putnam Street	Potential	Bogue Chitto Creek	3
51	3844 Northside Drive	PS47	3700 W. Northside Drive	Potential	Bogue Chitto Creek	3
52	1205 Country Club Drive	PS11	1452 Country Club Drive	Potential	Bogue Chitto Creek	3
53	15 South	TP1	15 South	TP	Hardy Creek	1
54	Amanda Lane	PS2	Amanda Lane	PS	Big Creek	1
55	Brookhollow Drive L 160	PS3	Brookhollow Drive L 160	PS	Trahon Creek	1
56	6675 Hwy 18	PS4	6675 Hwy 18	PS	Trahon Creek	1
57	2102 Thousand Oak	PS5	2102 Thousand Oak	PS	Trahon Creek	1
58	Robway Cove	PS6A	Robway Cove	PS	Trahon Creek	1
59	201 Cedarwood Drive	PS6B	201 Cedarwood Drive	PS	Trahon Creek	1
60	461 Greenmount Drive	PS7	461 Greenmount Drive	PS	Trahon Creek	1
61	201 Cedarwood Drive	PS8	201 Cedarwood Drive	PS	Trahon Creek	1
62	140 Chasewood Avenue	PS9	140 Chasewood Avenue	PS	Trahon Creek	1

City Of Jackson, Mississippi
Pump Station Potential Overflow Locations

City of Jackson, Mississippi
Department Of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-1799

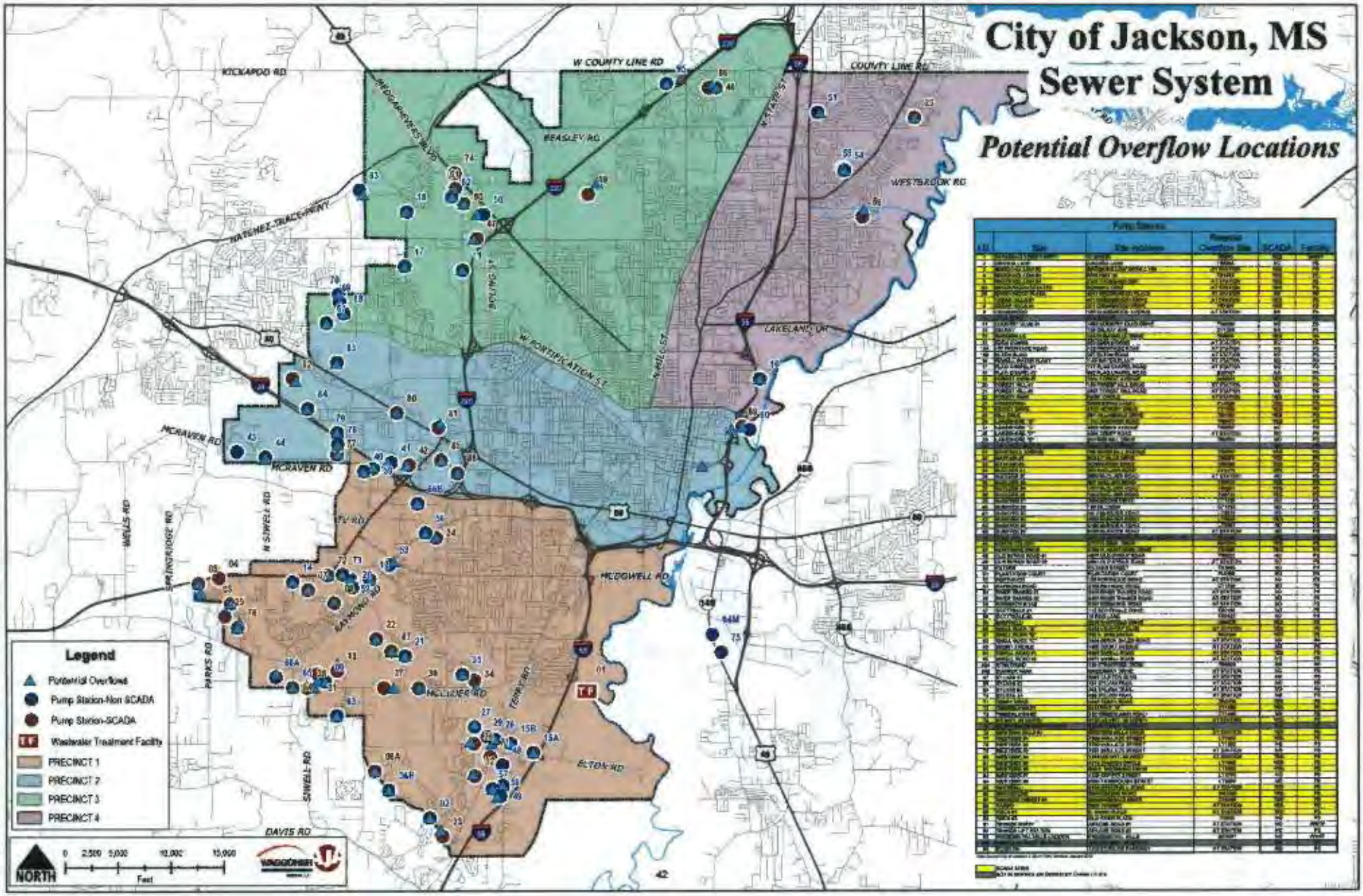
No.	Pump Station/Facility Location	PS No.	Potential Overflow Location	Type	Receiving Waterbody (Basin)	Public Property
63	1452 Country Club Drive	PS11	1452 Country Club Drive	PS	Bogue Chitto Creek	3
64	125 Delray Avenue	PS12	125 Delray Avenue	PS	Caney Creek	1
65	185 Duranville Drive	PS13	185 Duranville Drive	PS	Trahon Creek	1
66	553 Eden Downs	PS14	553 Eden Downs	PS	Trahon Creek	1
67	I-55 Frontage Road	PS15A	I-55 Frontage Road	PS	Caney Creek	1
68	207 Elton Road	PS15B	207 Elton Road	PS	Caney Creek	1
69	I-55 Water Plant	PS16	I-55 Water Plant	PS	Belhaven Creek	4
70	717 Flag Chapel Road	PS17	717 Flag Chapel Road	PS	Bogue Chitto Creek	3
71	992 Flag Chapel Road	PS18	992 Flag Chapel Road	PS	Bogue Chitto Creek	3
72	1851 Forest Avenue	PS19	1851 Forest Avenue	PS	Eubanks Creek	3
73	155 Forest Hill Drive	PS20	155 Forest Hill Drive	PS	Trahon Creek	1
74	3557 Forest Hill Road	PS21	3557 Forest Hill Road	PS	Trahon Creek	1
75	2285 Forest Park Drive	PS22	2285 Forest Park Drive	PS	Trahon Creek	1
76	Greenwing Court	PS23	Greenwing Court	PS	Purple Creek	4
77	2130 Hickory Drive	PS24	2130 Hickory Drive	PS	Caney Creek	1
78	561 Hillandale Drive	PS25	561 Hillandale Drive	PS	Trahon Creek	1
79	174 Lakeshor Road	PS26	174 Lakeshor Road	PS	Trahon Creek	1
80	4058 Venus Avenue	PS27	4058 Venus Avenue	PS	Trahon Creek	1
81	4393 Terry Road	PS28	4393 Terry Road	PS	Caney Creek	1
82	201 Red Hill Drive	PS29	201 Red Hill Drive	PS	Trahon Creek	1
83	160 Marshall Avenue	PS31	160 Marshall Avenue	PS	Trahon Creek	1
84	Holly Hills Drive	PS32	Holly Hills Drive	PS	Trahon Creek	1
85	Robinwood Drive	PS33	Robinwood Drive	PS	Trahon Creek	1
86	500 McCluer Road	PS34	500 McCluer Road	PS	Caney Creek	1
87	3890 McCluer Road	PS35	3890 McCluer Road	PS	Caney Creek	1
88	887 McCluer Road	PS36	887 McCluer Road	PS	Trahon Creek	1
89	1077 McCluer Road	PS37	1077 McCluer Road	PS	Trahon Creek	1
90	1665 McCluer Road	PS38	1665 McCluer Road	PS	Trahon Creek	1
91	2694 Moore Drive	PS39	2694 Moore Drive	PS	Caney Creek	1
92	155 Hillview	PS40	155 Hillview	PS	Caney Creek	1
93	4813 McRaven Road	PS41	4813 McRaven Road	PS	Lynch Creek	2
94	4660 McRaven Road	PS42	4660 McRaven Road	PS	Lynch Creek	2
95	6186 McRaven Road	PS43	6186 McRaven Road	PS	Lynch Creek	2
96	600 McRaven Road	PS44	600 McRaven Road	PS	Lynch Creek	2
97	6112 Floral Drive	PS46	6112 Floral Drive	PS	Hanging Moss Creek	3
98	3700 W. Northside Drive	PS47	3700 W. Northside Drive	PS	Bogue Chitto Creek	3
99	4837 Old Byram Road	PS48	4837 Old Byram Road	PS	Trahon Creek	1
100	4681 Old Byram Road	PS49	4681 Old Byram Road	PS	Trahon Creek	1
101	Putnam Street	PS50	Putnam Street	PS	Bogue Chitto Creek	3
102	Plantation Court	PS51	Plantation Court	PS	White Oak Creek	4
103	155 Portwood Drive	PS52	155 Portwood Drive	PS	Trahon Creek	1
104	2108 Raymond Road	PS53	2108 Raymond Road	PS	Caney Creek	1
105	5440 River Thames Road	PS54	5440 River Thames Road	PS	White Oak Creek	4
106	5407 River Thames Road	PS55	5407 River Thames Road	PS	White Oak Creek	4
107	5297 Robinson Road	PS56	5297 Robinson Road	PS	Caney Creek	1
108	112 Scottdale Drive	PS57	112 Scottdale Drive	PS	Trahon Creek	1
109	10 Rob Lane	PS58	10 Rob Lane	PS	Trahon Creek	1
110	2238 Sheffield Drive	PS59	2238 Sheffield Drive	PS	Hanging Moss Creek	4
111	6340 Country Club	PS60	6340 Country Club	PS	Bogue Chitto Creek	3
112	255 S. Shellrock	PS61	255 S. Shellrock	PS	Bogue Chitto Creek	3
113	3458 Dixion Sykes Road	PS62	3458 Dixion Sykes Road	PS	Bogue Chitto Creek	3
114	1465 Short Avenue	PS63	1465 Short Avenue	PS	Trahon Creek	1
115	4095 Sewell Road	PS64	4095 Sewell Road	PS	Big Creek	1
116	4071 Sewell Road	PS65	4071 Sewell Road	PS	Trahon Creek	1
117	139 Stratford Drive	PS66A	139 Stratford Drive	PS	Trahon Creek	1
118	2010 Chadwick Drive	PS66B	2010 Chadwick Drive	PS	Caney Creek	1
119	6065 Clinton Boulevard	PS67	6065 Clinton Boulevard	PS	Lynch Creek	3
120	151 Sylvan Trail	PS68	151 Sylvan Trail	PS	Lynch Creek	3
121	351 Sylvan Trail	PS69	351 Sylvan Trail	PS	Lynch Creek	3
122	498 Sylvan Trail	PS70	498 Sylvan Trail	PS	Trahon Creek	3
123	4640 Terry Road	PS71	4640 Terry Road	PS	Trahon Creek	1

City Of Jackson, Mississippi
Pump Station Potential Overflow Locations

City of Jackson, Mississippi
Department Of Public Works
Post Office Box 17
Jackson, MS 39205
601-960-2091

No.	Potential Overflow Location	PS No.	Pump Station Location	Type	Receiving Waterway (Basin)	Police Precinct
124	6115 Hwy. 18	PS72	6115 Hwy. 18	PS	Trahon Creek	1
125	132 Timberlawn Road	PS73	132 Timberlawn Road	PS	Trahon Creek	1
126	6159 US Hwy. 49 North	PS74	6159 US Hwy. 49 North	PS	Bogue Chitto Creek	3
127	Western Hills Drive	PS75	Western Hills Drive	PS	Trahon Creek	1
128	1900 Wallace Street	PS76	1900 Wallace Street	PS	Lynch Creek	1
129	1790 Wallace Street	PS77	1790 Wallace Street	PS	Lynch Creek	2
130	1651 Wallace Street	PS78	1651 Wallace Street	PS	Lynch Creek	2
131	1914 US Hwy. 80 West	PS79	1914 US Hwy. 80 West	PS	Lynch Creek	2
132	4210 Church Circle	PS80	4210 Church Circle	PS	Lynch Creek	2
133	500 E. Browning Drive	PS81	500 E. Browning Drive	PS	Lynch Creek	2
134	1238 Zephyr Street	PS82	1238 Zephyr Street	PS	Lynch Creek	2
135	6325 Yarbrough Street	PS83	6325 Yarbrough Street	PS	Lynch Creek	2
136	4180 Whitehall Road	PS84	4180 Whitehall Road	PS	Lynch Creek	2
137	Whitestone Road	PS85	Whitestone Road	PS	Hanging Moss Creek	2
138	Shannondale Drive	PS86	Shannondale Drive	PS	Trahon Creek	3
139	3855 Yarbro	PS88	3855 Yarbro	PS	Lynch Creek	2
140	E. River Place	PS89	E. River Place	PS	Belhaven Creek	2
141	Old River Place	PS90	Old River Place	PS	Belhaven Creek	2
142	Apache Road #1	PS91	Apache Road #1	PS	Big Creek	1
143	Apache Road #2	PS92	Apache Road #2	PS	Big Creek	1
144	Presidential Hills	PS93	Presidential Hills	PS	Bogue Chito Creek	3
145	1235 Echelon Parkway	PS95	1235 Echelon Parkway	PS	Hanging Moss Creek	3

City of Jackson, MS
Sewer System
Potential Overflow Locations



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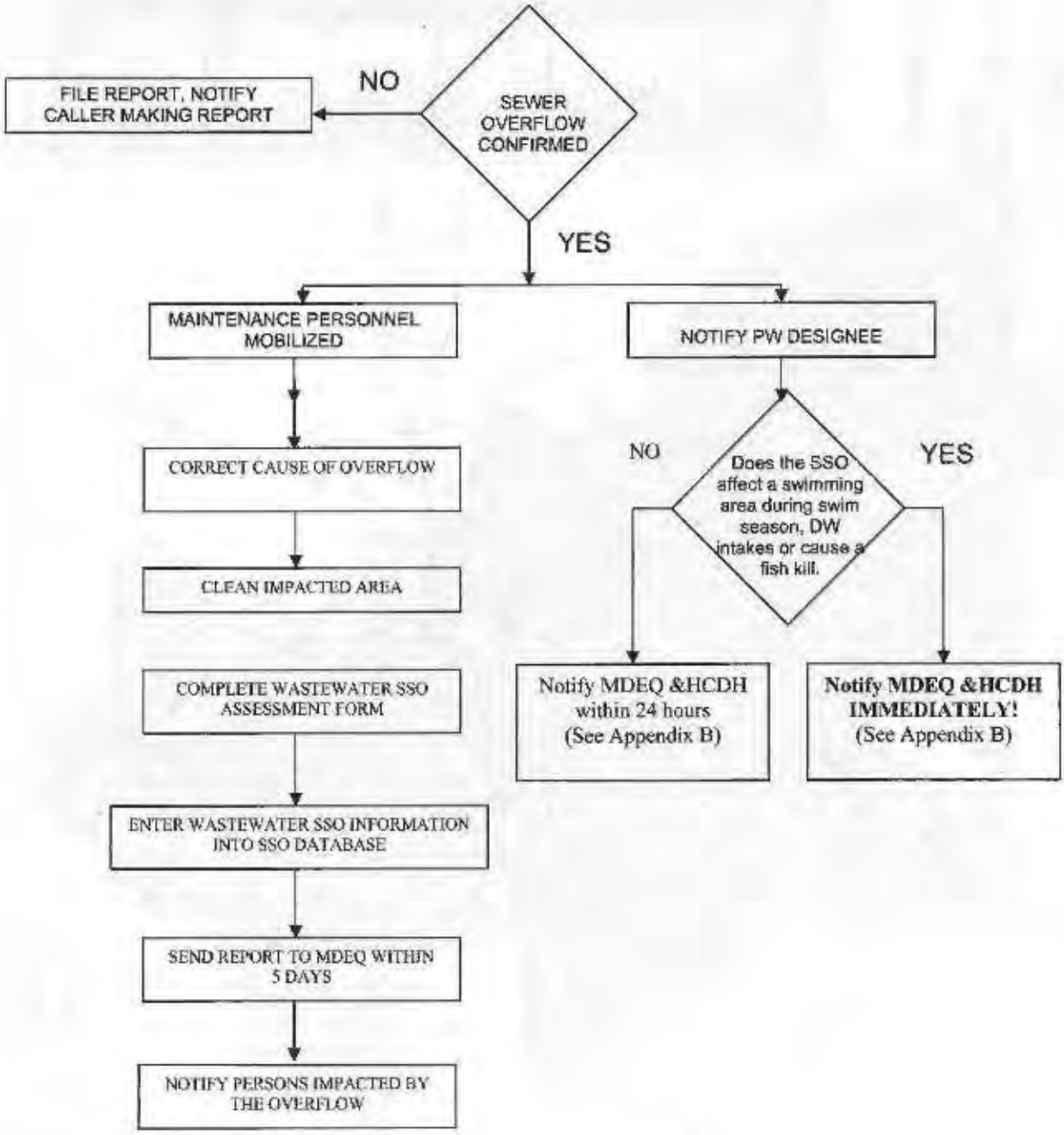
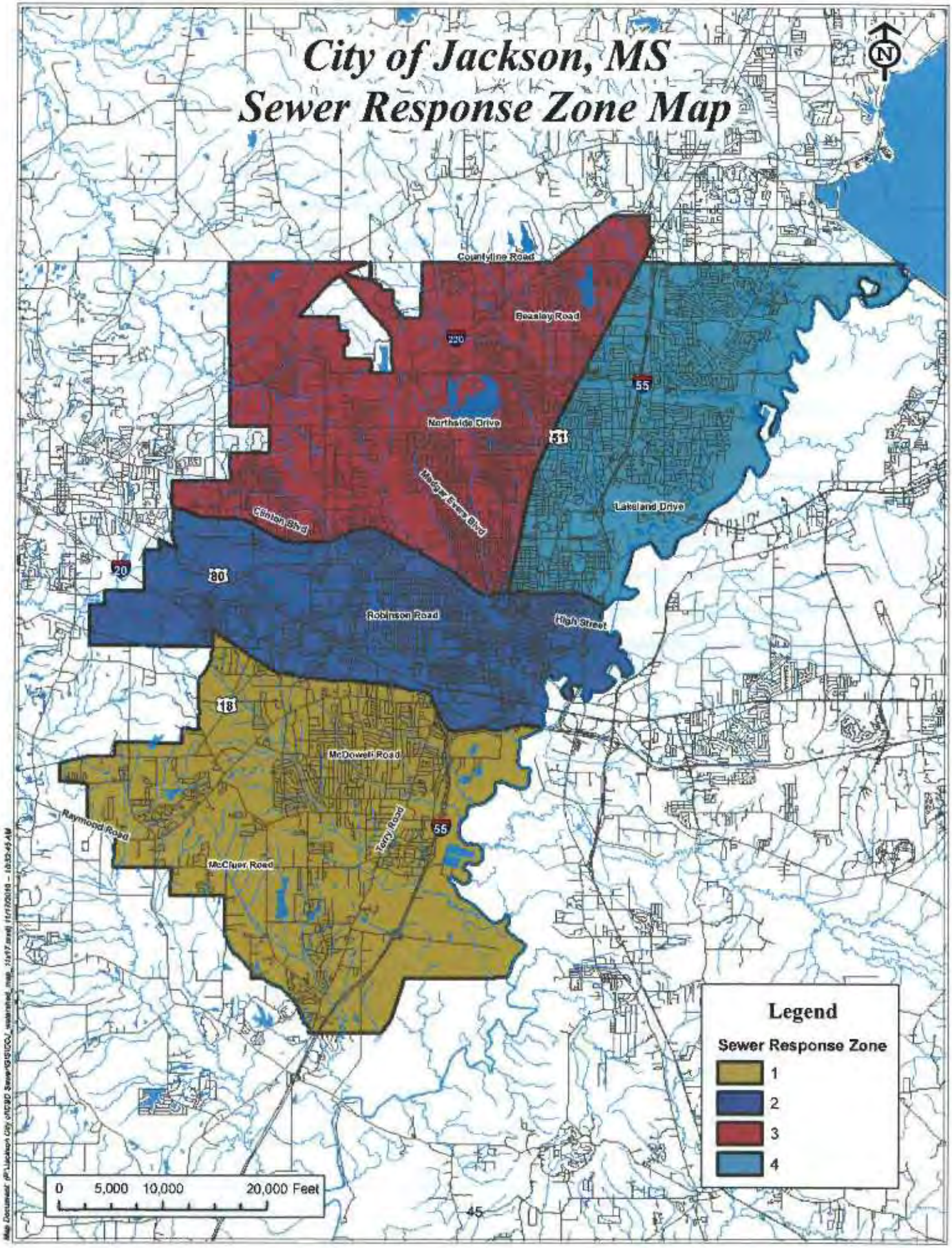
APPENDIX D – SEWER OVERFLOW RESPONSE INTERNAL NOTIFICATION AND TRACKING PROTOCOL

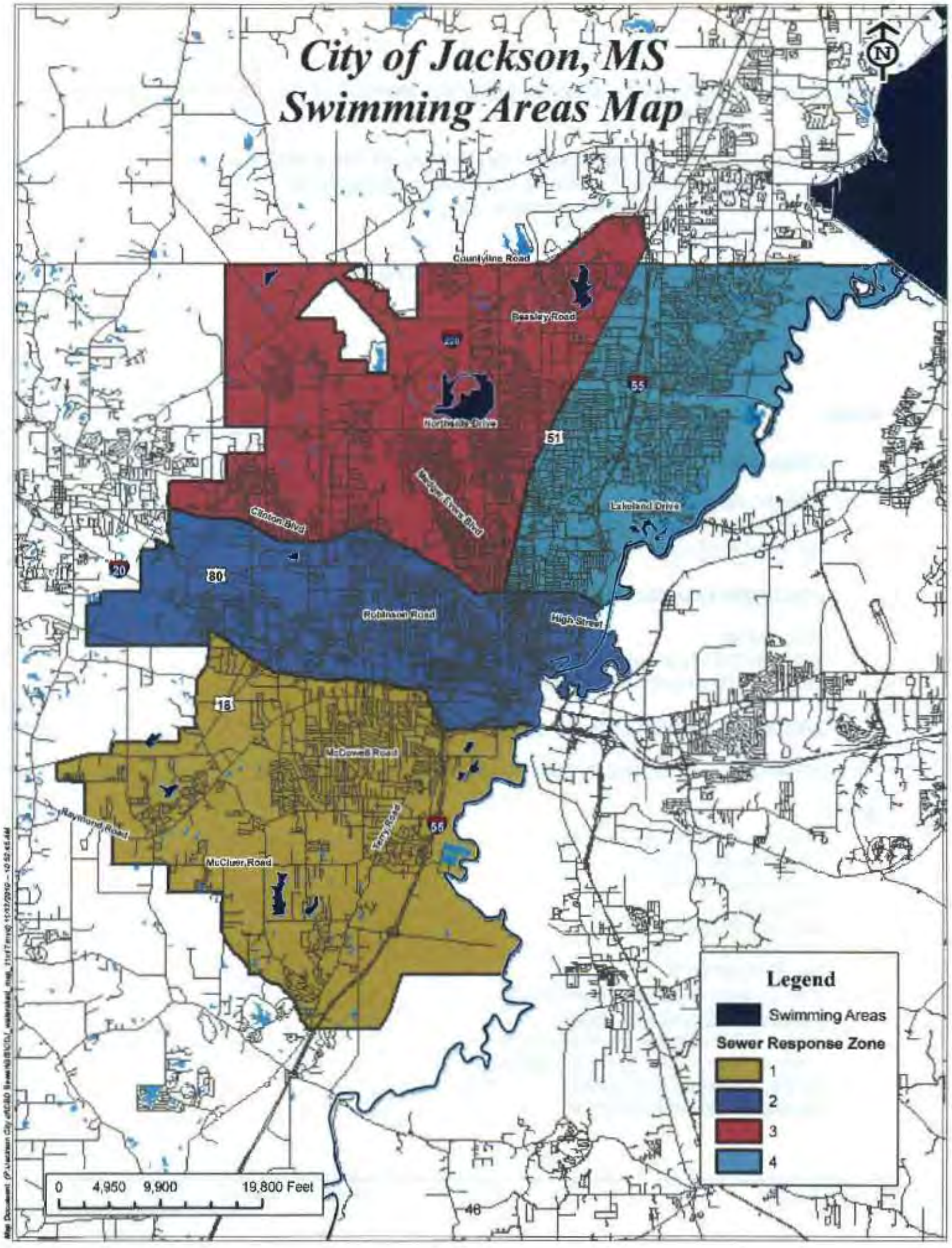
SEWER OVERFLOW INTERNAL NOTIFICATION FLOW CHART



SEWER OVERFLOW (SSO) RESPONSE TRACKING PROTOCOL

1. Report of possible SSO received by the COJ personnel.
2. COJ dispatch office deploys maintenance personnel to confirm reported SSO.
3. Maintenance personnel report back to the supervisor the significance of the overflow.
4. The COJ Superintendent, Wastewater Collections Engineer or authorized designee shall provide oral report to MDEQ within 24 hours. MDEQ becomes aware of the SSO notifying them of the location by street address or any other appropriate method (i.e. latitude-longitude)
5. If the overflow will affect recreational areas, public drinking water intakes, or results in a fish kill the COJ shall notify the MDEQ contact person and the HCDH contact person orally, and MEMA if after normal business hours, immediately upon confirming the discharge.
6. Within 5 days the COJ Superintendent, Wastewater Collections Engineer or authorized designee prepares the Wastewater SSO Assessment Form. The Utilities Manager is responsible for submission to MDEQ.
7. Data from Wastewater SSO Assessment Form are entered into a permanent record on file at the Sewer Maintenance Division. Records are maintained for a minimum of five years.
8. Detailed resource plan and milestone schedule for permanent corrective action are submitted with the monthly Discharge Monitoring Report.


City of Jackson, MS
Sewer Response Zone Map
Countyline Road
Beasley Road
220
55
Northside Drive
51
Madgar Evers Blvd
Clinton Blvd
Lakeland Drive
20
80
Robinson Road
High Street
18
McDowell Road
Raymond Road
Terry Road
55
McCluer Road
45
Legend
Sewer Response Zone
1
2
3
4
0
5,000
10,000
20,000 Feet


City of Jackson, MS
Swimming Areas Map
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Countyline Road
Beasley Road
Northside Drive
Medgar Evers Blvd
Lakeland Drive
Clinton Blvd
Robinson Road
High Street
McDowell Road
Raymond Road
Terry Road
McCluer Road
20
80
18
55
51
Legend
Swimming Areas
Sewer Response Zone
1
2
3
4
0
4,950
9,900
19,800 Feet

APPENDIX E - REGULATORY AGENCY CONTACT INFORMATION AND NOTIFICATION PERIOD

Overflows requiring 24-Hour Verbal Notification (MDEQ, HCDH, & MEMA)

- impact or closure of swimming area during swimming season
- impact of closure of public drinking water intake
- results in a fish kill

Overflows Requiring 24-Hour Verbal Notification (MDEQ only)

- gravity sewer manhole
- pump station
- sewer siphon
- treatment plant bypass

MDEQ

During Normal Operating Hours – 8:00 a.m. – 5:00 p.m.

MDEQ Operator – 601-961-5171
MDEQ ECED Municipal & Private Facilities Branch Manager – 601-961-5588
MDEQ ECED Engineer for Jackson – 601-961-5319

After Normal Operating Hours (non-emergency)

(Voice Mail)
MDEQ ECED Municipal & Private Facilities Branch Manager – 601-961-5588
MDEQ ECED Engineer for Jackson – 601-961-5319

After Normal Operating Hours (emergency)

MEMA 24-hour State Warning Point – 1-800-222-6362

HCDH

Hinds County Health Department
Environmental Health
539 E Beasley Road
PO Box 20
Jackson, MS 39205-0020
Phone: (601)-957-1026
Fax: (601)-957-1053
Sherrie Payne, Regional Environmentalist
sherrie.payne@msdh.state.ms.us
Marvin Bolden, County Environmentalist
Lakeshia Paige, County Environmentalist
marvin.bolden@msdh.state.ms.us
lakeshia.paige@msdh.state.ms.us

Emergency Contact Numbers:

- Mississippi Department of Environmental Quality (MDEQ): - (601) 961 5171
- Entergy (Power Loss); Customer service and emergencies: 1-800-368-3749 (1-800-ENTERGY). Power outages: 1-800-968-8243 (1-800-9OUTAGE).
- Highway Patrol & Fire Department: - 911
- United States Environmental Services (USES): - (601) 372 3232
- Hinds County - (601)957-1026

City of Jackson

- Wastewater Operations Engineer: Anthony Harkless: – (601) 720-5944
- Wastewater Collections Engineer: Vacant
- Sewer Maintenance Superintendent: Butch Mayfield – (601)-960-1875

United Water

- Project Manager: - Jerry Jones - (317) 490-6854
- Operations Manager: Ralph Gorenflo - (601) 340-2803
- Maintenance Manager: - Jackie Kiser - (601) 287-6116
- Maintenance Assistant Manager: - Darnell Gray (601) 896-6365
- Lift Station Supervisor: - Willie Wilson (601) 896-6380

APPENDIX F – PERSONNEL TRAINING DOCUMENTS

Sewer Overflow Response Plan (SORP) Training Plan

Training Topics

I. What are Sanitary Sewer Overflows?

II. Why do Sewers Overflow?

1. Infiltration and Inflow
2. Undersized Systems
3. Pipe Failures
4. Equipment Failures
5. Lack of Maintenance
6. Deteriorating Sewer System

III. Why Control Sanitary Sewer Overflows?

1. Environmental Concerns and Health Risk
   - A. Contaminated Drinking Water Supply
   - B. Contaminated Fish and Shellfish
   - C. Direct Contact
     - Recreation Activities in Contaminated Waters
     - Sewer Backups in Homes
     - SSOs in Streets and Public Access Areas (e.g. Parks, Schoolyards, etc.)
   - D. Natural Resources Impacted
     - Waterways
     - Aquatic Life

IV. What is SORP?

V. Who needs SORP Training?

VI. SORP Requirements

1. Preventive Maintenance
   - A. Collection System Maintenance
   - B. Equipment Maintenance

2. Overflow Response, Containment, and Recovery
   - A. Sewer Overflow Response Tracking Protocol
   - B. Directions for Completing Wastewater Assessment Forms
     - Sewer System Work Order Form
     - Wastewater Overflow Assessment Form

C. Estimating Sanitary Sewer Overflow Volume
   - San Diego Method
   - Measured Volume
     i. Units
     ii. Conversion factors
     iii. Wastewater Formulas (Area, Volume, Flow, etc.)
   - Duration and Flow

3. Reporting and Record Keeping
   A. Notification – When, Who, and How?
   B. Importance of Proper Record Keeping

Training Sessions

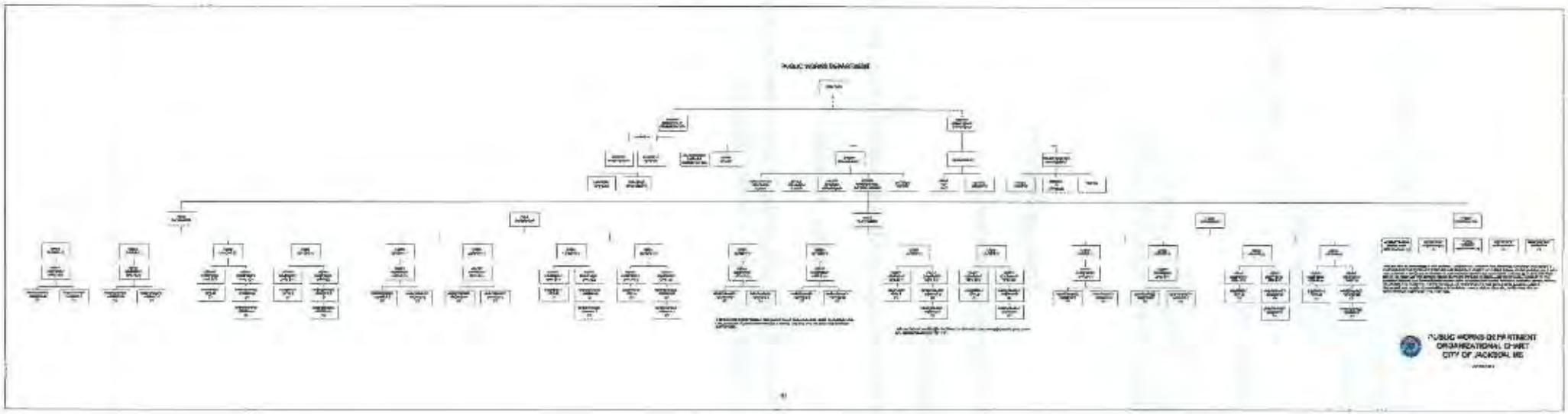
4 Hr Session Covering Overflow Response Procedures

2 Hr Session Covering Reporting Procedures

Training Sessions shall begin within 60 days of MDEQ's approval of this SORP

Training Attendees

The attached personnel chart shows all positions in the Wastewater Division. All employees from Public Works Director to Crew Leader will receive SORP Training.



PUBLIC WORKS DEPARTMENT
ORGANIZATIONAL CHART
CITY OF JACKSON, MS

APPENDIX F

APPENDIX F

SUPPLEMENTAL ENVIRONMENTAL PROJECT

A. PURPOSE OF THE SEP

The purpose of the Supplemental Environmental Project ("SEP") is to reduce extraneous flows entering the WCTS through defective residential Private Laterals and through illicit connections from residential properties of eligible property owners. For purposes of this SEP, an illicit connection is any residential connection to the WCTS that discharges any substance or solution that is not intended to be transferred via the WCTS, such as stormwater, surface water runoff and roof runoff. The WCTS becomes a conduit for stormwater when defective Private Laterals or illicit connections allow rain or groundwater to enter the WCTS. Certain components of the WCTS Evaluation Plan required by Section VIII. of the Consent Decree will assist the City in identifying defective Private Laterals in need of repair or replacement and illicit connections to the WCTS.

B. SEP WORK

The City may perform the repair or replacement of defective Residential Private Laterals of eligible property owners itself or may use contractors or consultants in implementing this SEP.

In implementing this SEP, the City shall do the following, in accordance with the schedule set forth below:

- Draft and submit a proposed Escrow Agreement for EPA review.
- Establish and fund the Escrow Account and provide EPA with a copy of the Escrow.

- Provide information to residential property owners advising of the potential availability of the SEP work and contact information if they are interested in participating; develop financial hardship qualifications to identify eligible residential property owners for work under this SEP, using 2010 census information to identify moderate, low and very low income levels eligible; and determine which residential property owners meet the financial hardship qualifications and are accepted to participate in the SEP and notify the owners. In the event that more eligible residents apply for the SEP than there are funds available, preference shall be given to eligible very low income residents, then eligible low income residents and then eligible moderate income residents.

- Direct the Contractor performing the repair or replacement of a Private Lateral under this SEP to secure appropriate permits for the work.

- Determine actions necessary to repair or replace Private Laterals or remove illicit connections pursuant to this SEP and ensure that all work is undertaken in a timely manner and in conformity with appropriate standards.

- Ensure SEP completion on time.

- Report as required by Consent Decree.

- Maintain records of deposits into the SEP Escrow; work performed; and payments made from the Escrow.

- Prepare monthly status reports to provide City program manager with pertinent information for preparation of Consent Decree progress reports to allow City program manager to monitor compliance with SEP.

C. SEP COSTS

The City shall spend at least $875,000.00 in eligible SEP costs for the repair and/or replacement of Private Laterals or removal of illicit connections for eligible residential property owners. Eligible SEP costs cover only the costs of actual plumbing services on Private Laterals and illicit connections owned by private residential customers only. If the City utilizes its own employees and equipment to perform the SEP, the City shall only be given credit against the total funding obligation if the activity is not something that otherwise would have been performed by the City's employees and if any such work is supported by time and expense records which are subject to review by EPA. The credit received by the City for using its own employees and equipment to perform the SEP will be reflected as a reduction in the next

scheduled Escrow deposit following the performance of the SEP activities. The intention is that the funds deposited into Escrow for the SEP, combined with any eligible SEP costs for SEP activities performed using City employees and equipment will total at least $875,000.00.

The average cost of the Services on each private residential property is expected to range from $1,500 to $2,500 for repair or replacement of a defective Private Lateral and $750 to $1,000 for removal of an illicit connection. Actual costs will depend on negotiated costs with Plumbers, length of Private Lateral, surface and sub-surface interferences to the Private Lateral, and other pertinent factors. While initial expectations anticipate repair or replacement of 394 Private Laterals and removal of 100 illicit connections, the actual number of Private Laterals repaired or replaced and illicit connections removed pursuant to this SEP may be higher or lower.

D. PROGRAM SCHEDULE

1. Payments into the SEP Escrow

The City shall deposit $875,000.00 to an interest-bearing escrow account ("SEP Escrow") to be used for performance of the SEP, in accordance with the schedule below, and subject to any credit for eligible SEP costs of City employees or equipment under Paragraph C. The City shall allow the United States to review the proposed Escrow Agreement prior to depositing any funds in the SEP Escrow. The City shall provide a copy of the executed Escrow Agreement within thirty (30) Days of the City's initial deposit to the SEP Escrow. The City shall provide EPA with documentation of the deposits to the SEP Escrow within thirty (30) Days of each such deposit. The interest earned on the SEP Escrow funds, along with the City's deposits

equaling $875,000.00 shall be used in performance of this SEP. The City shall make deposits to the SEP Escrow according to the following schedule:

Six (6) Months after Date of Entry	$175,000.00
Eighteen (18) Months after Date of Entry	$100,000.00
Thirty (30) Months after Date of Entry	$100,000.00
Forty-two (42) Months after Date of Entry	$100,000.00
Fifty-four (54) Months after Date of Entry	$100,000.00
Sixty-six (66) Months after Date of Entry	$100,000.00
Seventy-eight (78) Months after Date of Entry	$100,000.00
Ninety (90) Months after Date of Entry	$100,000.00

Provided, however, that the City shall make accelerated deposit of an upcoming payment if the amount of funds in the SEP Escrow account drops below $100,000.00 due to disbursements.

2. Project Implementation

The City shall perform the following tasks according to the following schedule:

Months 1 through 24 after Date of Entry:

- Develop list of Plumbers who will perform Services at agreed-upon costs for standard scopes of work and in accordance with current plumbing code requirements.
- Develop scopes of work, fee schedule, forms, and contracts to be used in implementation of the SEP.
- Notify property owners of the program.
- Develop financial hardship qualifications for eligibility for the SEP.
- Determine which residents will be included in the SEP and notify those residents.
- Develop a system to maintain records of disbursement of funds from escrow and records of location data of residential property owners who have had Services performed on their property as part of the SEP program.

No later than 25 Months after Date of Entry and ongoing until completion of the SEP:

- Begin performing work under the SEP.

- Track work performed pursuant to the SEP and maintain records of all work performed, including, at a minimum, the names and addresses of all property owners receiving services.

- Track amounts disbursed from the SEP Escrow and maintain records of all deposits to the SEP Escrow, disbursements from the SEP Escrow, and eligible SEP Costs for SEP activities performed using City employees and equipment which may be eligible for a credit towards the SEP Escrow under Paragraph C.

No Later than 72 Months after Date of Entry:

- The City shall use best efforts to ensure that the SEP is performed expeditiously and that approximately 50% ($437,500) of the SEP funds are made available to eligible participants within 72 months after the Date of Entry.

3. Reporting Schedule

The City shall provide semiannual reports to EPA within one (1) Month after the second and fourth Calendar Quarters of each year on the status of implementation of the SEP, including documentation of the following that has occurred during the preceding six (6) Months:

- Deposit of funds to the SEP Escrow by the City.

- Disbursement of funds from the SEP Escrow by the Escrow Agent to pay Plumbers for Services completed.

- The balance of funds in the SEP Escrow.

- Locations of private residential properties where Services have been performed under the SEP program, including the property address and the name and address of the owner of the property.

- Description of other tasks required performed to implement the SEP during the past two (2) Calendar Quarters.

On or before nine (9) years after Date of Entry, the City shall submit a Final Completion Report to EPA as provided in the Consent Decree, Paragraph 50.

Appendix C

Design Flow Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Design Flow
Technical Memorandum

April 2016

CDM Smith

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Section 1
Existing System Flow

1.1 Introduction

The purpose of this Technical Memorandum is to evaluate Savanna Street Wastewater Treatment Plant (SSWWTP) flow data collected since issuance of the Comprehensive Performance Evaluation (CPE) report; compare this data against the CPE data; and update and refine, as necessary, the flow criteria to be used for the upgrades at the SSWWTP. Both the original plant design and the 1999 nitrification upgrade design were based on an average flow rate of 46 million gallons per day (MGD) and a design peak hydraulic flow of 90 MGD. Savanna Street WWTP is currently permitted to discharge 46 MGD monthly average flow for the months of May through October and 60 MGD monthly average flow for the months of November through April. The plant discharges into the Pearl River and for the past 60 months has treated an annual average daily flow of 48.67 MGD, with 12 month reporting period averages varying between 43.26 and 53.92 MGD (See Table 1-1 below).

Table 1-1 Historical Flows and Peaking Factors (October 1, 2010 to September 30, 2015)

Year	AADF (MGD)	MMADF (MGD)	MWF (MGD)	MDF (MGD)	MMADF/ AADF	MWF/ AADF	MDF/ AADF
10/10 – 9/11	43.26	63.00	98.32	140.87	1.46	2.27	3.26
10/11 – 9/12	48.02	65.20	91.19	117.99	1.51	2.11	2.73
10/12 – 9/13	53.92	95.17	140.30	163.20	1.77	2.60	3.03
10/13 – 9/14	49.55	84.65	115.72	162.38	1.71	2.34	3.28
10/14 – 9/15	48.58	68.19	95.16	129.61	1.40	1.96	2.67
Average	**48.67**	**75.24**	**108.14**	**142.81**	**1.55**	**2.22**	**2.93**

The analysis used to generate the findings herein consisted of a detailed evaluation of the plant operational data, including total plant flow, for October 1, 2010 to September 30, 2015. The historical flow data for SSWWTP was provided by United Water Services Mississippi, LLC. The total plant flow data was recorded by the plant's effluent Parshall flume and the equalization basin Parshall flume. This data was then compared to the CPE flow data and design flow criteria were modified as detailed within the memorandum.

1.2 CPE Summary and Conclusions Concerning Design Flows and CPE Basis of Evaluation

The CPE provided a peak design flow of 120 MGD with 90 MGD quantified as peak hydraulic capacity of the mechanical portion of SSWWTP following the completion of upgrades/modifications as required by the Consent Decree. The remaining 30 MGD of the peak design flow was to be pumped into the equalization basins and subsequently returned to the West Bank Interceptor (WBI) for treatment. This conclusion was based on the review of the existing flow data (which was effluent flow data; reliable, measured influent flow data did not

exist) and engineering judgment that the toppled 48" manhole riser section of a Lynch Creek Interceptor manhole was allowing large quantities of inflow into the Wastewater Collection and Transmission System (WCTS), where it was ultimately conveyed to the SSWWTP. It was noted in the CPE that, due to the plant flow data limitations (i.e., no reliable influent flow measurement) and the high level of uncertainty in the magnitude of the infiltration/inflow (I/I) impact to the system, the design flow would need to be re-evaluated during the CCP phase. Consequently, the request was made to install influent flow measuring equipment in order to provide more accurate flow data to be assessed as part of the re-evaluation.

1.3 Infiltration/Inflow and Regulatory Requirement Impact on Design Flow

Evaluation of flow data after the repair of the Lynch Creek toppled manhole riser section (summer of 2013) still indicates that other large infiltration/inflow sources are present in the WCTS and the WBI. These sources continue to contribute to SSWWTP daily flow reaching a peak of 162 MGD including 89 days above 60 MGD, 25 days above 100 MGD, and 2 days above 138 MGD in the period studied, October 1, 2010 to September 30, 2015. Additionally, there exist within the WBI large SSOs that are expected to be eliminated once segments of the WBI are rehabilitated and the hydraulic capacity of SSWWTP is increased.

The WCTS is currently being modeled and studied for infiltration/inflow reduction and SSO reduction/elimination. The WBI Phase 1 Rehabilitation work is currently scheduled to be complete by mid-year 2022. Phase 1 consists of cleaning of debris accumulated in the WBI and repairs throughout the length of the WBI that have been evaluated as being necessary to prevent imminent structural failure or have been evaluated as necessary to correct a major structural defect, including sources of excessive infiltration/inflow (I/I). Phase 1 work on the WBI shall also include total rehabilitation of at least 20% of the total length of the WBI, or a lesser amount as approved by EPA based upon justification by the City in the WBI Work Plan. The WBI Phase 2 Rehabilitation work is scheduled for completion mid-year 2031. Sewersheds in Group 1 shall include the areas with the most severe I/I and contain at a minimum at least 30% of the estimate of total I/I within all sewersheds and sewersheds in Group 2 shall contain at a minimum 40% of the estimate of total I/I within all sewersheds. Sewersheds in Group 1 is currently scheduled for construction completion by the end of 2023. Sewersheds in Group 2 is currently scheduled for construction completion by mid-year 2030.

The WBI and WCTS construction timeline summary shows that the SSWWTP upgrades, which are scheduled for completion by mid-year to year end 2021, have to be completed before any significant I/I reduction or SSOs elimination is realized from the rehabilitation work. Per the Consent Decree, the SSWWTP upgrades shall include a design capacity to adequately treat 100% of the peak wet weather flow, including providing Secondary Treatment for all flows without experiencing a Prohibited Bypass. The design must also meet requirements necessary to treat sewage to the level established by the most current (2012) MDEQ effluent permit requirements, including nutrient limits and to the extent feasible any planned TMDLs to be implemented by Mississippi Department of Environmental Quality.

In summary, flow data indicating that large I/I still exists after correction of the toppled Lynch Creek manhole, the Consent Decree treatment and flow requirements, and the fact that there will be little or no I/I flow reduction prior to placing SSWWTP Consent Decree improvements into service, clearly shows that revision is needed to the CPE design flow.

1.4 Recent Flow Data Collection and Impacts to Design Flow Conclusions

The CPE stated that flow meters on the WBI, Caney Creek Interceptor, and West Rankin Force Main would be installed by early 2014. The WBI temporary flow meters were installed in early 2014 as part of the WBI Flow Monitoring Program. The Caney Creek temporary flow meter was installed in August 2015. The West Rankin Force Main has two flow meters permanently installed, one at the SSWWTP and one at the West Rankin Pump Station.

The delay in installation of the Caney Creek Interceptor meter prevents a truly accurate influent flow analysis at this time; there is not enough data history to develop a reliable analysis. As such, the flow data analysis has to be performed using the two SSWWTP effluent Parshall flumes. While this is not a true representation of day to day influent flow – i.e., flow in does not always equal flow out – it does provide an acceptable level of accuracy when measuring annual average flows.

It is recommended that, during detailed design, the flow data from all three sources be used to confirm the assumptions made in this Technical Memorandum. There will be a full data set for at least one year.

1.5 Existing Wastewater Flows and Peaking Factors

Knowledge of flow variations is important for assessing plant capacity and facility planning. Flow variations are typically expressed in terms of the ratio to the annual average daily flow, commonly referred to as peaking factors. Annual average daily flow is determined as the total flow for the year divided by 365 days, or more commonly, as the average of the average monthly flows for 12 consecutive months as described in Water Environment Federation (WEF) Manual of Practice No. 8. Peaking factors of interest in the evaluation and future upgrades of this treatment facility include the following: maximum month, maximum week, maximum day, and peak hour.

Daily historical influent flow data was reviewed from the past five years (October 1, 2010 through September 30, 2015) to generate influent flow peaking factors relative to the annual average daily flow (AADF). Figure 1-1 displays the daily total flow for October 1, 2010 through September 30, 2015. Figure 1-2 shows the historical monthly average daily flow for this same time period. Figure 1-3 shows the rolling annual average daily flow for this same time period. As illustrated by these figures, there are no apparent trends for the influent flow for the past five years. Figure 1-4 shows the 30-Day Rolling Average Daily Flow for this same time period.

Historical flows and peaking factors for the past 5 years are summarized in Table 1. The maximum month average daily flow (MMADF), maximum week flow (MWF), and maximum day flow (MDF) peaking factors for the historical data are also presented in Table 1. Per the flow data for the five year period, the SSWWTP has experienced significantly high peak flows relative to the average.

In addition to examination of the annual data, the flow peaking factors were evaluated using probability analysis of the historical data. The daily flow data for each of the past five years were averaged to determine the AADF for each year. A ratio of daily flow to each year's AADF was then calculated for each data point, which was then utilized to generate a plot of the ratios (as shown in Figure 1-5) for frequency distribution analysis. Based on WEF Manual of Practice No. 8, the MMADF, MWF, and MDF peaking factors were estimated by looking at the ratios at the 91.7th, 98th, and 99.7th percentile, respectively. A summary of the peaking factors determined through this method is shown in Table 1-2.

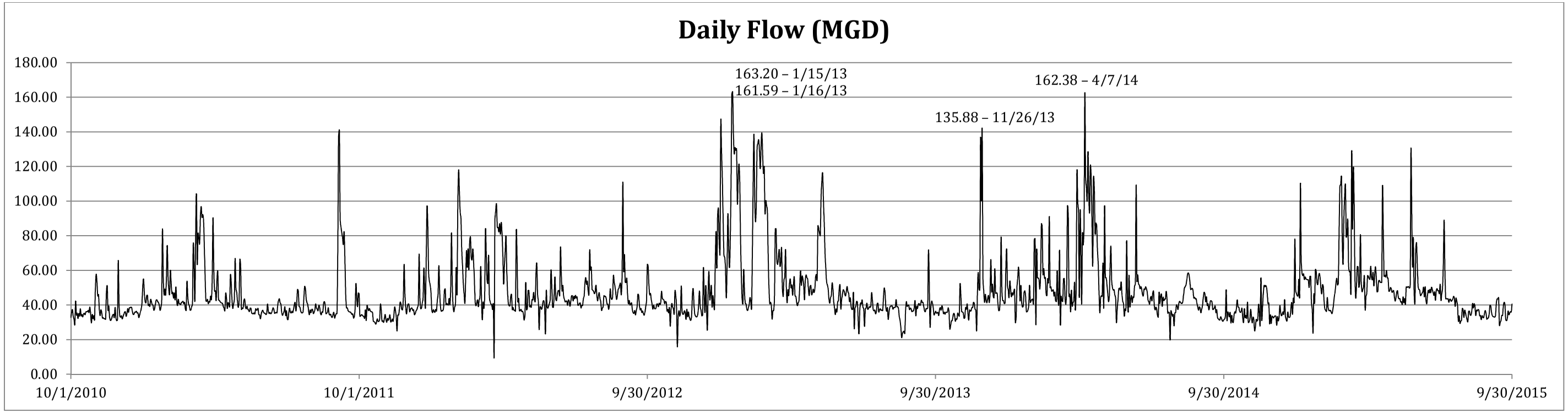

Figure 1-1
Historical Daily Flow

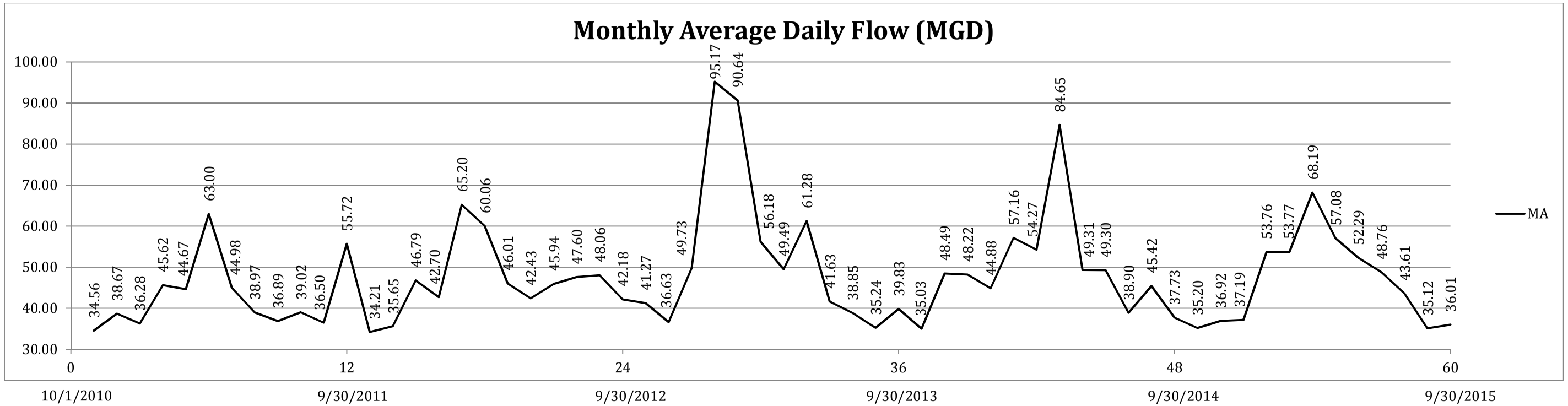

Figure 1-2
Historical Monthly Average Daily Flow

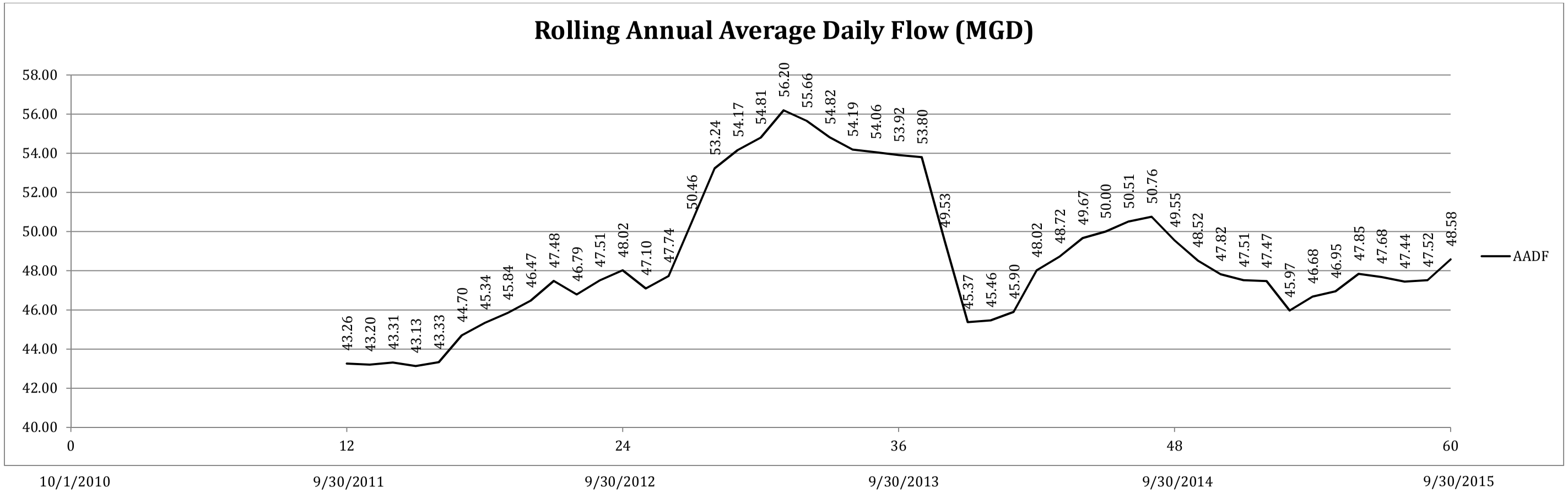

Figure 1-3
Historical Rolling Annual Average Daily Flows

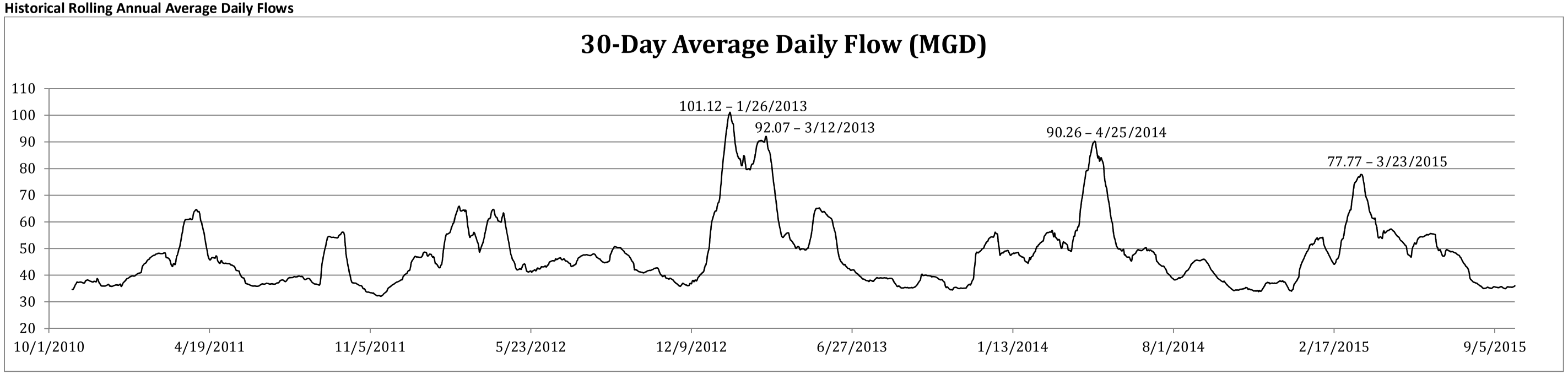

Figure 1-4
30-Day Rolling Average Daily

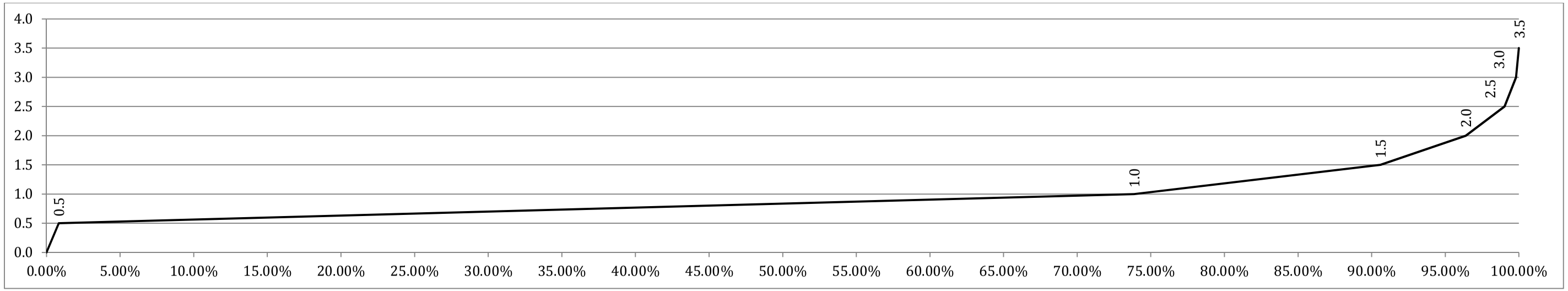

Figure 1-5
Flow Peaking Factor Frequency Distribution

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Table 1-2 Flow Peaking Factors from Frequency Distribution Analysis

Ratio	Percentile	Peaking Factor
MMADF/AADF	91.7th	1.60
MWF/AADF	98th	2.30
MDF/AADF	99.7th	2.90

As demonstrated in Table 1-1 and Table 1-2, both analyses resulted in similar results.

Peaking factors from Table 1-2 will be used for the SSWWTP upgrades design.

No data was available to perform a peak hour flow analysis. Peak hour flow will be determined from industry standards and is shown in the following section.

Figure 1-6 shows the daily flow frequencies for 10 MGD flow range intervals for the past 60 months. Based on the flow frequencies in Figure 6, during this 60 month period, the daily flow into the plant has been less than/equal to the current 46 MGD rated capacity of SSWWTP approximately 65% of the time. Moreover, the SSWWTP daily flow has been below 60 MGD 90% of the time, below 90 MGD 95.0% of the time, and below 140 MGD 99.8% of the time.

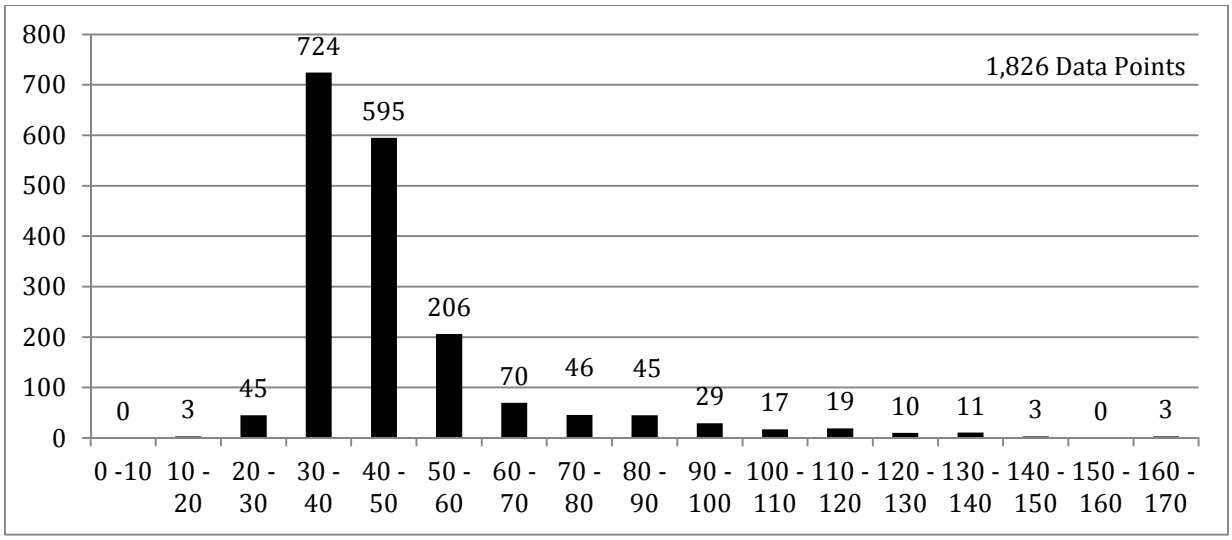

Figure 1-6
SSWWTP Daily Flow Frequencies

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Section 2
Projections

2.1 Proposed Wastewater Flows

The flow data in Figures 1, 2 and 3 conclusively demonstrate that the current 46 MGD AADF capacity of SSWWTP is no longer adequate and thus, will need to be increased. The SSWWTP upgrades design will incorporate two influent peaks; a design hydraulic peak and a design biological process peak. The peak hour flow is industry standard for hydraulic capacity of a WWTP but due to the SSWWTP's equalization basin system, the peak hour design can be reduced to the maximum week daily flow, with the peak hour and maximum daily flow temporarily stored in the equalization basins for eventual routing back into the SSWWTP for treatment. Therefore, the physical size of the required upgrades to the plant can be reduced, thus lessening/minimizing overall construction cost. The design biological process peak is based on the maximum month and week as defined in the NPDES permit.

Using the AADF of 48.67 MGD, the peak rolling AADF of 56.20 MGD, the peak daily flows from October 1, 2010 to September 30, 2015, the timing of the rehabilitation of the WBI and WCTS (plant improvements are required to be online prior to receiving any I/I reduction benefit from collection system repair projects), and 20% excess capacity, the SSWWTP design flows are shown in Table 2-1.

Table 2-1 SSWWTP Design Flows

Parameter	Peaking Factor	Flow
Annual Average Daily Flow (AADF)	1.0	60 MGD
Maximum Month Average Daily Flow (MMADF)	1.6	96 MGD
Maximum Week Daily Flow (MWF)	2.3	138 MGD
Maximum Daily Flow (MDF)	2.9	174 MGD
Peak Hour Flow (PHF)	3.6	216 MGD

Note: 138 MGD flow to plant for full treatment with excess flow being temporarily stored within equalization basins.

Additionally, it is recommended that SSWWTP's NPDES permit Effluent Flow parameter be modified and defined as follows:

> "This is an annual average limit, which shall be reported as a rolling average. The first value will be calculated using the monthly average flow for the first full month ending after the effective date of the permit and the 11 previous monthly flows. Each subsequent month's discharge monitoring report will report the annual average flow that is calculated from that month and the previous 11 months."

The Total Nitrogen and Total Phosphorus parameter would need to be an annual average limit as well.

If, for any reason, the permit cannot be modified to accommodate the aforementioned reporting limit, it will be required that the NPDES permit Effluent Flow parameter be increased to the

maximum month flow of 96 MGD in order to eliminate the permit violation that would occur if the AADF is established as the monthly effluent flow parameter. Defining the Effluent flow as maximum month flow would cause the Total Nitrogen and Total Phosphorus treatment level, in terms of pollutant concentration, to become very low during the wet weather months.

As the Waste Collection and Transmission System is studied and modeled, the design flows for Savanna Street WWTP must be adjusted and/or confirmed.

2.2 Potential Impact of Future Flows and Wholesale Contributors

The CCP design flows are based on the maintenance of existing flow streams (the City's collection system flows, the flows from the West Rankin Utility Authority, and Madison County Municipalities) and the planning data from the Jackson area, which indicates no discernable growth in the planning period. As such, no additional or future service areas were encompassed as part of this memorandum. The flow conditions used in the development of the final design flows are those that existed up to the time of this memorandum, and by which are expected to remain in force for the near future. However, it should be noted that there are three situations currently being discussed or negotiated which could impact future flows to the SSWWTP. If one or any combination of these flow situations are realized, there would be an imminent impact to the SSWWTP and further evaluation would be required. These situations are described in the following three subsections.

2.2.1 West Rankin Utility Authority (WRUA)

The West Rankin Utility Authority (WRUA) has been performing rehabilitation of their main interceptor, resulting in some reduction of I/I within this reach of pipe. However, the member municipalities have not performed much rehabilitation of the collection system and this trend is expected to continue. As such, the anticipated flow from WRUA is expected to remain approximately the same. Flow data obtained from WRUA, which spanned from June 2014 through September 2015, as well as design flows used for the CCP, are presented in Table 2-2:

Table 2-2 WRUA Measured Flows, June 2014 to September 2015, and Design Flows

Parameter	Measured Flow, June 2014 to September 2015	Design Flow
Annual Average Daily Flow (AADF)	9.23 MGD	10
Maximum Month Average Daily Flow (MMADF)	13.03 MGD	16
Maximum Week Daily Flow (MWF)	N/A	23
Maximum Daily Flow (MDF)	27.76 MGD	29
Peak Hour Flow (PHF)	N/A	35

WRUA is currently considering alternatives to transmitting their wastewater to SSWWTP for treatment; most notably, the construction of a WWTP owned and operated by WRUA. If WRUA elects to construct a new WWTP (and the decision receives approval by MDEQ and EPA), the above-mentioned flows would be removed from the SSWWTP.

2.2.2 City of Byram

The Byram district is currently treating their sewage flows using lagoons; however, MDEQ has mandated that the Byram district modify their treatment philosophy by 2019. One alternative for treatment of their wastewater flow, which is currently being considered, is to transmit their flows to the Trahon WWTP. Yet, there still exists the possibility that Byram's wastewater flow be routed, instead, to the SSWWTP for treatment. If this flow is added to the SSWWTP, the WWTP design flow criteria would have to be reviewed based on this new information.

2.2.3 Byram Clinton Corridor

The Byram Clinton Corridor is a planning area of the Hinds County Board of Supervisors. The Byram Clinton Corridor is currently not in the SSWWTP service area; however, it could be decided that wastewater from the District be pumped either into the SSWWTP service area, or, directly to the plant. Development of this district is still some years away, but if flow from the Byram Clinton Corridor is added to the SSWWTP, the WWTP design flow criteria would have to be reviewed based on this new information.

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Appendix D

Hydraulics Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Hydraulics Issues
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

The purpose of this Technical Memorandum (TM) is two-fold: (1) to discuss hydraulic issues and concerns associated with the corrective actions identified for the Savanna Street Wastewater Treatment Plant (SSWWTP) in the Comprehensive Performance Evaluation (CPE) report and (2) to identify hydraulic issues and concerns that may be present in the design improvements required to meet the Consent Decree. Details of the corrective actions can be found in the CCP or in the accompanying TMs.

Currently, raw wastewater is conveyed to the SSWWTP through the Influent Pump Station (IPS) to the headworks facility, which consists of mechanical bar screens and a grit removal system. The wastewater then flows through a small anoxic selector before being distributed to ten aeration basins. The flow then combines in a splitter box where it is distributed to five clarifiers. Downstream of the clarifiers, the flow is conveyed through a chlorination application structure and onwards to the gravity discharge channel (under normal hydraulic conditions) or to the effluent pump station (when the channel is flooded).

The discussion below identifies current hydraulic limitations and briefly summarizes the corrective actions proposed to address the deficiencies noted in the CPE report. The discussion also includes a review of all proposed corrective actions from a hydraulic perspective to find potential areas that will be reviewed during the design phase to mitigate hydraulic issues in the proposed designs.

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Section 2

Hydraulic Issues and Concerns

2.1 Influent Pump Station

2.1.1 Current Hydraulic Conditions

The existing Influent Pump Station (IPS) was designed in the early 1970s with a screening system composed of four manual trash screens upstream of a wet well that feeds four wet-pit/dry-pit centrifugal pumps. Three dry-weather pumps have a rated capacity of 31.7 million gallons per day (MGD), and one wet-weather pump has a rated capacity of 100 MGD. Assuming all pumps are operational, the current total rated capacity is 195 MGD, but the firm capacity (largest pump out of service) is only 95 MGD. This firm capacity is insufficient to meet current or future flows.

As stated in the Design Flow TM, the peak hourly flow into the SSWWTP is 216 MGD. The plant treatment process is being designed to treat the maximum week daily flow of 138 MGD; the remainder of the flow will be diverted to the equalization basins for temporary storage. There are currently two means of diverting flow to the equalization basins: 1) upstream of the IPS, the West Rankin Force Main flow (up to 30 mgd) can be pumped directly to the basin and 2) downstream of the IPS via an 84-inch pipeline that must have a carrying capacity of 48 MGD. Accounting for the West Rankin diversion capacity, the IPS is required to convey a peak design flow of 186 MGD.

As discussed in the IPS TM, the existing manual trash screens in the IPS influent channels surcharge during high flow periods. The screens create a hydraulic restriction due to screen clogging and causes a bypass overflow over the top of the screen. As noted above, the existing pumps also lack reliability and are incapable of pumping peak future flow rates.

It is noted that the 84-inch diversion pipeline is fracturing and needs major rehabilitation or replacement. This improvement will be made as part of the Consent Decree work; a 60-inch DIP pipe will be installed to convey the required 48 mgd. It is assumed that there are no issues with the West Rankin Force Main and the force main is structurally sound.

2.1.2 Proposed Long Term Corrective Action Alternatives

The hydraulic design of the existing IPS structure limits the potential for increasing the existing station's pumping capacity. Specifically, the width of the influent channel restricts the ability to rehabilitate the IPS to meet the peak hourly flow rate of 186 MGD.

Both short term and long term corrective actions are to be performed at the IPS, but only the long term corrective action of the pump station expansion is evaluated herein. Two viable alternatives were identified to increase the pumping capacity of the IPS:

- Alternative 1- Construction of a new 186 MGD firm capacity IPS to handle the entire anticipated peak flow, with decommissioning of the existing IPS.
- Alternative 2- Construction of a new 90 MGD firm capacity IPS and rehabilitation of the existing IPS for 96 MGD firm capacity.

Hydraulic Institute standards will be followed for all new designs.

In both cases, the 84-inch diversion pipe to the equalization basins will be replaced with a 60-inch DIP pipe, as noted above. If Alternative 2 is selected, the existing IPS would be furnished with new trash racks. It is understood that one of the existing 32-MGD pump has recently been replaced and is capable of providing long term service. Therefore, Alternative 2 proposes to only replace the two remaining 32-MGD pumps and downsize the existing wet-weather, 100-MGD pump to 32 MGD. Therefore, there would be one recently replaced 32-MGD pump and three new 32-MGD pumps for a rated capacity of 128 MGD, and a firm capacity of 96 MGD.

2.1.3 Hydraulic Evaluation of Long Term Corrective Action Alternatives

With both alternatives, flow control must be implemented so that all flows exceeding the plant's mechanical treatment capacity of 138 MGD are diverted to the equalization basins. There are currently working flow meters installed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to monitor flows upstream of the existing IPS. However, the West Bank and Caney Creek meters become inoperable when the interceptors surcharge and they would need to be replaced with a more reliable metering technology if they were to be used as a control meter. A new flow control plug valve controlled by the flow metering system (totalized flow from all 3 meters) will be needed to divert excess flow into the equalization basins.

With Alternative 2, flow metering and control will be required to limit the influent flow to the new IPS to 90 MGD and divert excess flows to the existing IPS. And, flow metering and control will be required to limit the discharge from both the new IPS and existing IPS to a total flow of 138 MGD and divert excess flows to the equalization basins.

All existing trash racks must be replaced. The new racks will be selected to prevent surcharge and overflow conditions. For the hydraulic profile modeling of the plant, the design shall include the headloss specified by the manufacturer, associated with maximum percent blockage prior to cleaning.

Discharge flow leaving the IPS shall enter the headworks feed channel without causing severe turbulence. The discharge piping from the IPS will be evaluated for a configuration that will diffuse the high velocities and reduce turbulence.

2.2 Preliminary Treatment Facility

2.2.1 Current Hydraulic Conditions

The plant's preliminary treatment facility (PTF), or existing headworks facility, consists of mechanical bar screens and vortex grit removal systems. The facility has three parallel channels that are fed by an influent chamber where flow enters from the IPS. The north and south (outer) channels contain a mechanical bar screen and a vortex grit removal system while the center channel has a manual bar screen and is used for bypass into the anoxic selector in the event that one of the mechanical trains is not in operation. In theory, each train has a hydraulic capacity of 50 MGD. This would provide for a theoretical hydraulic capacity of 150 MGD, a firm hydraulic capacity of 100 MGD, and a firm treatment capacity of 50 MGD. In reality, though, hydraulic restrictions are observed when the flow reaches 55-60 MGD, even with both mechanical channels open.

Currently under high flow conditions, the raw wastewater entering the influent chamber rises and overflows the chamber wall, flooding the walkway-grating on top of the headworks facility. The high water level could be the result of multiple design issues, such as excessive screen blockage, insufficient freeboard in the influent chamber, and intermittent mechanical issues with the mechanical bar screens or grit removal system. This has been reported to occur at approximately 55 to 60 MGD, far below the 100 MGD maximum capacity the headworks facility was designed handle.

In recent years, the bar screens have experienced increased mechanical malfunctions, at times resulting in the need to take both mechanical bar screens offline for repairs. This requires all influent flow to be routed through the center bypass channel. In addition to bar screen maintenance, the aging grit removal system has been malfunctioning. In instances where the equipment is out of service, the hydraulics within the headworks is negatively impacted, contributing to the high water level issues. Additionally, if the grit removal system is not reliable, the buildup and accumulation of grit in the downstream processes may create a hydraulic reduction of tank volume that impacts the overall treatment capacity of the plant.

In summary, the existing preliminary treatment system cannot meet current or future hydraulic conditions.

2.2.2 Proposed Long Term Corrective Action

Both short term and long term corrective actions are required for the PTF, but only the long term corrective action to replace the existing PTF with a new PTF is evaluated herein. The short term corrective actions are “quick-fixes” to the existing preliminary treatment facility to improve functionality and safety until the new preliminary treatment facility is online.

Although replacing and rehabilitating the mechanical bar screens and grit removal systems will address the concerns of overtopping that caused a lack of equipment reliability, the current facility does not have the capacity to handle the proposed 138 MGD flows because of the current maximum firm capacity limitations (100 MGD hydraulic, 50 MGD treatment). Therefore, a new PTF is proposed. The new PTF will include a Fine Screen Facility (FSF), a Grit Removal Facility (GRF), and a Preliminary Treatment Building (PTB). The facility will consist of three process trains with each train having a peak flow capacity of 69 MGD to provide 138 MGD firm capacity. It is noted that the minimum flow capacity of each train is 15 MGD.

2.2.3 Hydraulic Evaluation of Long Term Corrective Action

By constructing a new PTF, the plant will be able to meet the required firm treatment capacity of 138 MGD and mitigate the issue of overtopping in the current facility. Overall, the new facility’s hydraulic profile shall provide sufficient freeboard, minimize system losses, and be constructed at a high enough elevation to maintain gravity flow through the system to the discharge channel.

As discussed above, there may be two IPS facilities, thus requiring multiple PTF influent pipelines. These pipelines shall be isolated using sluice gates with manual actuators.

The FSF will include a common influent chamber designed to distribute flow to the screens. To prevent grit accumulation within the channel, two sets of pressurized non-potable water piping shall be installed to allow resuspension of grit on the bottom of the channel. Downstream of the

influent chamber, the flow will be distributed into three separate channels with drum screens sized to handle 69 MGD each, ensuring that if one were taken offline, the other two will handle the plant flow of 138 MGD. The screening channels will be equipped with influent and effluent sluice gates with manual actuators to be able to take any of the units offline for maintenance.

After flowing through the drum screens in the FSF, the wastewater will flow by gravity into the GRF influent channel that distributes flow to three parallel grit removal units. Each unit will be sized to handle a peak flow of 69 MGD to allow for two systems to service the flows in the event that one channel is taken offline. The grit removal channels will also be equipped with influent and effluent sluice gates with manual actuators to be able to take any of the units offline. The three grit effluent channels will discharge into a common channel that discharges to three parallel pipes that lead to the existing flow distribution network in the Biological Treatment Facility (BTF).

The hydraulic design of both the FSF and GRF will require a flow distribution analysis to provide an equal flow split between the parallel treatment trains.

2.3 Biological Treatment Process

2.3.1 Current Hydraulic Conditions

The existing biological treatment system consists of an anoxic selector, aeration basins, and five clarifiers with return activated sludge (RAS) systems. The system is designed to handle a peak flow of 90 MGD. According to the CPE, the anoxic selector's discharge channel openings create a hydraulic restriction where the openings are not large enough to handle the 90 MGD flows. As discussed in the Biological Treatment Process TM, another hydraulically limiting unit process in the existing biological treatment system that is preventing treatment of high wet weather flows is secondary clarification volume. The need for additional secondary clarifier capacity has been identified.

2.3.2 Proposed Long Term Corrective Action Alternatives

The Biological Process TM proposed four alternatives for modifying the biological treatment process to treat a design capacity of 138 MGD:

- Alternative 1- Maintain the existing biological treatment process as it is operating today and install new secondary clarifiers;
- Alternative 2- Convert the existing biological treatment process to a traditional biological nutrient removal (BNR) process and install new secondary clarifiers;
- Alternative 3- Convert the existing biological treatment process to a BNR oxidation ditch technology known as the VertiCel™ and install new secondary clarifiers; and
- Alternative 4- Add new primary clarifiers and anaerobic digestion which will negate the need for additional clarification.

2.3.3 Hydraulic Evaluation of Long Term Corrective Action Alternatives

Regardless of which alternative is chosen to replace or augment the biological treatment processes of the plant, the major concern hydraulically is to ensure that gravity flow is maintained in the system. Piping losses in and out of the treatment tanks should be minimized and all modifications to the system must be accounted for when evaluating the proposed hydraulic grade line. In addition, the treatment process must be able to handle a flow range between 30 MGD and 138 MGD.

Alternative 1 maintains the existing aeration basins with upgrades to the diffuser and aeration systems. This is not believed to pose any issues hydraulically. With the addition of three clarifiers to the system, the downstream clarifier splitter box would need to properly address the split of flow to a total of eight clarifiers (See Section 2.4). The flow from the anoxic selector would need to be evaluated and addressed to handle the increased flow of 138 MGD.

Alternative 2 incorporates different treatment zones within the footprint of the existing aeration basins. This alternative would retrofit the existing aeration basins with anaerobic and anoxic zones. The current anoxic selector would be abandoned and bypassed. Three additional clarifiers would be added to the treatment system. This alternative would require modifications to the clarifier splitter box and the piping from the new PTF need to be able to handle the 138 MGD flow by gravity.

Alternative 3 proposes to replace the existing aeration basins with a proprietary treatment technology, and install three additional clarifiers. Similar to Alternative 2, the anoxic selector would be abandoned and bypassed. Losses through the proprietary system would need to identified by the manufacturer and accounted for in the hydraulic evaluation. This alternative would require modifications to the clarifier splitter box and the piping from the new PTF need to be able to handle the 138 MGD flow by gravity.

Alternative 4 adds primary clarification upstream of the aeration basins and adds anaerobic digestion to the solids handling process. This alternative does not require additional secondary clarification, maintaining the five existing secondary clarifiers. Therefore, the overflow rates of the existing secondary clarifiers would increase to accommodate a capacity of 138 MGD. And, minor modifications to the clarifier splitter box would be required to account for the increased flow.

It is noted that the addition of primary clarifiers would necessitate an additional pumping step. Effluent from the primary clarifiers would have to be pumped via high-volume, low-head pumps to get to the process aeration tanks.

2.4 Clarifier Splitter Box

2.4.1 Current Hydraulic Conditions

From the aeration basins, wastewater flows by gravity via two 54-inch pipelines that discharge into a common basin in the middle of the clarifier splitter box. The splitter box currently distributes flow to the existing five secondary clarifiers using weirs that control the flow to five boxes that discharge to five 48-inch clarifier influent pipelines. The splitter box also has a sixth box reserved for a future, sixth clarifier.

The clarifier splitter box is known to present a significant hydraulic restriction in the system. During wet-weather events, the box that conveys flow to Clarifier No. 5 submerges the weir and overflows the structure where a portion of the top rim of the splitter box experiences overtopping. It is expected that this is caused by excessive headloss incurred in the piping to Clarifier No. 5 since the piping is significantly longer than the piping to Clarifier Nos. 1 through 4. The unequal flow split could be due to the weir submergence, but also may be attributed to the configuration of the 54-inch influent piping entering the splitter box. The 54-inch pipeline comes from the aeration basins to the south and momentum may force more flow over the northern weirs (to Clarifier Nos. 2, 3 and 4, and most predominantly to the middle weir to Clarifier No. 2).

2.4.2 Proposed Long Term Corrective Action

Regardless of which biological treatment process is chosen, the splitter box deficiencies must be addressed to properly split the future peak flow of 138 MGD into the clarifiers. While a sixth clarifier was planned for as part of the 1999 plant improvements, Biological Treatment Alternatives 1, 2, and 3 would require the addition of three clarifiers, resulting in a total of eight clarifiers. Therefore, the splitter box will need to accommodate a flow split to eight clarifiers. For Biological Treatment Alternative 4, the splitter box would be required to mitigate the current issues of flow maldistribution and overtopping of the structure.

2.4.3 Hydraulic Evaluation of Corrective Action

For current operations, the existing clarifier splitter box incurs a significant hydraulic deficiency for the plant and needs to be properly addressed regardless of which corrective action alternative for the biological treatment process is selected.

For Biological Treatment Alternatives 1, 2 and 3, the clarifier splitter box would need to be modified or potentially replaced to be able to distribute flow to eight clarifiers. The design of the splitter box must be evaluated hydraulically to provide equal flow distribution, prevent weir submergence, and provide sufficient freeboard to avoid overtopping of the structure. The design will need to accommodate the distance that the wastewater will be conveyed to the new clarifiers.

For Biological Treatment Alternative 4, the existing splitter box would need to be modified to improve flow distribution to the existing clarifiers, avoid weir submergence, and mitigate the issue of overtopping.

For all alternatives, the use of adjustable weirs will be considered during the detailed design process, after the biological process alternative has been selected. Adjustable weirs offer the primary advantage of being able to adjust to real world conditions to achieve equal flow split.

2.5 Disinfection Facilities

2.5.1 Current Hydraulic Conditions

Downstream of the clarifiers, effluent is combined and currently disinfected in the Chlorine Application Structure. The Mississippi Department of Environmental Quality (MDEQ) mandates a 15 minute contact time after thorough mixing. Assuming thorough mixing is achieved at the Chlorine Application Structure, the contact time needs to be achieved via 135 feet of 60-inch pipe and approximately 770 feet of 96-inch pipe. Even at the current minimum flow of 30 MGD, the

contact time barely meets the 15 minute CT time. At the new peak flow of 138 MGD, the contact time is only 3 minutes. More contact time is required.

2.5.2 Proposed Long Term Corrective Action

A new chlorine contact basin with serpentine channels is proposed to be placed in the location of the current unused UV disinfection structure. This would allow the plant to meet the required chlorine contact time of 15 minutes for the new design flow. As identified in the Disinfection Systems TM, the tank volume would be approximately be 235,000 cubic feet when accounting for the current contact time in the existing piping and assuming the 138 MGD flow.

2.5.3 Hydraulic Evaluation of Long Term Corrective Action

The introduction of a new chlorine contact basin will need to be carefully designed to maintain proper flow through the plant. The addition of the contact basin will impact the hydraulic grade line of all upstream processes. A hydraulic evaluation will be required to prevent submergence of the clarifier weirs. While making the basin deeper may maintain water levels upstream, this may not accommodate the use of the existing piping to convey flow to the existing plant discharge channel. The hydraulic impact of the chlorine contact basin on the hydraulic grade line will need to be assessed very carefully.

2.6 Effluent Pump Stations

2.6.1 Current Hydraulic Conditions

There are two existing effluent pump stations (EPS) that are used when gravity flow to the Pearl River is not possible. This typically occurs during wet weather events when the Pearl River is flowing above the outlet invert elevation 239 ft. The EPS that was constructed in 1982 consists of four screw pumps, each with a rated capacity of 46.7 MGD. In addition to this pump station, the original plant EPS is available to handle overflows. This pump station consists of two vertical turbine pumps, each with a rated capacity of 59.9 MGD.

2.6.2 No Corrective Action Proposed

According to the CPE, no corrective actions were identified for the EPS. The existing EPS with screw pumps has a firm capacity excess of the proposed 138 MGD peak flows. With one screw pump on standby, the remaining three would have a total capacity of 140 MGD. With two screw pumps out of service, the peak flows could be handled with the other two screw pumps and one vertical turbine pump at the other existing EPS. Therefore, the EPS is adequate to handle the proposed flows and does not have any foreseeable hydraulic impacts.

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Section 3
Conclusions

The overall hydraulic capacity of the treatment facility downstream of the IPS is 138 MGD. During wet weather events, the IPS will have a firm capacity of 186 MGD with the ability to divert flows in excess of 138 MGD to the equalization basins for temporary storage. Hydraulic profile modeling will be required during the design phase to determine how the long term corrective actions will be incorporated into the existing system to alleviate existing hydraulic restrictions and prevent future hydraulic restrictions. The modeling will be used to confirm that the proposed system can achieve gravity flow from the IPS to the EPS with sufficient freeboard to prevent overtopping any structures. The exception to this would be in the case of biological treatment Alternative 4, where additional pumping would be required to convey the flow from the primary clarifiers to the process aeration tanks. In addition, the following hydraulic considerations shall be evaluated during the design phase:

- Influent Pump Station
    - Flow metering and control will be required to limit flow to the headworks facility to 138 MGD, and divert excess flows to the equalization basins;
    - Hydraulic profile modeling will account for maximum blockage of the trash racks;
    - Rehabilitation of the 84-inch diversion pipeline will be necessary to achieve full flow capacity; and
    - Conveyance pipeline from the IPS will discharge with minimal turbulence to the receiving channel in the headworks facility.
- Preliminary Treatment Facility
    - The existing headworks must be replaced to maintain the 138 MGD design flow through the plant;
    - Open channels shall be designed with sufficient freeboard;
    - Three process trains through the FSF and the GRF will be sized for two process trains to handle the design flow and maintain one stand-by train;
    - Influent and effluent sluice gates will be used to isolate any of the three process trains and individual treatment units within a train; and
    - FSF and GRF influent design require a flow distribution analysis to optimize equal flow split between the parallel treatment trains.
- Biological Treatment Process

- Achieve the firm capacity of 138 MGD for any existing treatment facilities that will remain in operation and for the new treatment facilities; and
- Minimize headloss associated with piping changes to the existing system

- Clarifier Splitter Box
  - Modify the existing clarifier splitter box either to distribute flow to additional clarifiers or to account for the increased flow to the existing clarifiers.
  - Optimize flow distribution to the individual clarifiers;
  - Prevent weir submergence; and
  - Provide sufficient freeboard to avoid overtopping of the structure.
- Disinfection Facility
  - Proposed hydraulic grade line cannot result in clarifier weir submergence; and
  - Design the chlorine contact basin to achieve 15 minutes of contact time.

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Appendix E

Influent Pump Station CCP

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Influent Pump Station
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

1.1 Purpose / IPS History

The purpose of this Technical Memorandum (TM) is to propose corrective actions to address the performance-limiting factors of the Savanna Street Wastewater Treatment Plant's (SSWWTP) Influent Pump Station (IPS), as identified within the 2014 Comprehensive Performance Evaluation (CPE). In following with the CPE numeric designations, the proposed corrective actions detailed herein shall be classified as either short-term (Type 2) or long-term (Type 3) corrective approaches.

The existing IPS was designed and constructed in the early 1970s as part of the facility's conversion from the original lagoon treatment system to the current activated sludge-style mechanical treatment plant. The IPS, located in the northwest section of the plant facilities, is a wet well/dry pit pump station, with four manual trash screens positioned upstream of the wet well. Within the station, the pumping system consists of four dry pit pumps; three pumps rated for 22,000 gpm (31.7 MGD) @ 60' TDH; and one pump rated for 69,500 gpm (100 MGD) @ 52'. Assuming all pumps and associated appurtenances are operational and functioning at specified performance, the total installed capacity of the influent pump station is 195 MGD, with a firm capacity of 95 MGD (largest pump out of service). As such, the current capacity of the influent pump station is inadequate to convey future flows.

As detailed in the CPE report, multiple components of the IPS have surpassed their operational life; and as a result, the station's condition compromises the plant's ability to adequately receive and treat the region's wastewater. The station's performance-limiting factors are outlined in the following section.

1.2 CPE Summary for the IPS

Table 1-1 identifies the following performance-limiting factors of the IPS:

Table 1-1 Influent Pump Station Performance Limiting Factors for Savanna Street WWTP

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Reliability of Station Pumps	A	Type 2
Reliability of Trash Racks	B	Type 2
Structural Deterioration	A	Type 2
Reliability of 84" Line to EQ Basins	B	Type 2
Reliability of Station's Electrical System	B	Type 3
Lack of HVAC/Odor Control System	B	Type 3
Lack of Hydraulic Control and Ability to Isolate Station	B	Type 3

Sections 3 and 4 provide a summary of the corrective actions proposed for the IPS. These corrective actions are intended to satisfy the requirements of the City's Consent Decree and provide the City with a modern IPS system that will meet today's industry and hydraulic standards for large pump stations.

The objective for each of the corrective actions described herein, whether they be Type 2 or 3, is that they be sustainable; thus contributing to the goal of providing for a long-term influent pumping solution that is both reliable and efficient. Additionally, the proposed improvements must also facilitate the influent pumping system's ability to handle periods of peak flows (such as during wet-weather events).

1.3 Design Peak Hourly Flow

As detailed in the Design Flow TM, the peak hourly flow rate for the SSWWTP is 216 MGD, with the mechanical portion of the plant receiving 138 MGD and the remaining flow being diverted to the equalization basins for temporary storage. Flow from West Rankin Utility Authority, which has a peak hour flow rate of approximately 30 mgd, can be directly pumped to the storage ponds. Therefore, based on the 216 MGD value, the upgraded influent pumping system must be capable of conveying a peak hour design flow of 186 MGD.

Section 2

Existing IPS Equipment and Facilities

2.1 Bypass Pump Station – Constructed Wetwell

For a much of 2014 and 2015, a bypass pump system was in use at the SSWWTP due to mechanical issues within the existing IPS. The bypass pumps have been removed; however, the temporary wetwell, which was constructed by driving sheet piling, excavating over IPS inlet piping, and cutting the pipe open once the excavation was completed, remains open. It is suggested that this excavated area remain in place, in the event that a pumping emergency dictates that temporary IPS bypass pumping must be re-initiated.

2.2 Trash Racks

The IPS has two influent channels, each with two manually operated and cleaned trash racks in series, for a total of four (4) trash racks. Due to their original design, these racks provide insufficient protection of the pumps from floating debris during high flow periods. When a high flow event occurs, the raw wastewater in the channels often rises above the top of the screens, to a level of 8-12 feet above the intermediate floor height. When the water within the channels surcharges over the screens, it results in the following issues: (1) the screens cannot be cleaned during these periods, which further impedes hydraulic restriction within the channels; (2) floatable debris is allowed to flow over the top of the submerged screens, thus endangering the pumps. As solids screening is not adequately achieved during wet weather flow events, the racks are considered to be obsolete and in need of replacement.

2.3 Pumps

The station contains three 31.7 mgd pumps and one 100 mgd pump. The intent of the original pump station design was that the 31.7 mgd pumps be operated to handle all dry weather flows, as well as low intensity wet weather flow. The 100 mgd pump would be activated only during high intensity wet weather flows. Due to the age and condition of the pumps, the station can no longer be operated in this fashion and is not considered reliable for conveying the region's influent raw wastewater flows. Therefore, the pumping system has been identified as obsolete and in need of replacement.

2.4 Building Electrical and Generators

The building electrical system is in need of a complete overhaul. The majority of equipment is either past its useful service life, positioned in inappropriate locations, or both. Generators dedicated to providing backup power to the station are also past their useful service life and are in a state of disrepair.

Additional information related to the IPS electrical system, including the generator system, is included as part of the Electrical TM.

2.5 Building Structural Elements

As noted herein, issues with the station's structure were identified as needing to be upgraded as part of a short term corrective action. A portion of the issues have already been repaired; however, the remainder of these repairs will be included as part of the short-term corrective action projects for the existing IPS.

Section 3

Conceptual Design Approach – Short Term Corrective Actions

Based on the Consent Decree schedule, Type 2 corrective actions must be completed within 24 months following EPA's approval of the Composite Correction Program (CCP).

3.1 Phased Upgrades Approach to IPS

To satisfy the Consent Decree requirements for the Type 2 remedial measures, implementation of phased rehabilitation of the existing IPS mechanical equipment is recommended. This approach would foster improved reliability of the existing station until the completion of the long-term upgrades to the IPS. Furthermore, regardless of which alternative is selected in the detailed design phase, these improvements will serve in supporting the long-term upgrades by providing a mode for continued operation during the construction of a new influent system; thus eliminating the need for a costly bypass pumping system.

The City has already initiated short-term corrective actions to the IPS by electing to move forward with certain structural improvements to the interior of the station's wetwell. During the last quarter of 2015, construction of the installation of a new top slab was completed. This repair partially addresses the "structural deterioration" item, which was listed as one of the Type 2 performance limiting factors within the CPE report.

The following paragraphs summarize the short-term corrective actions to the existing IPS. These proposed improvements are intended to extend the life of the station so that it may remain fully operational until the long-term improvements can be implemented, as well as satisfying the required remedial measures outlined in the CPE report.

3.1.1 Reliability of the Station Pumps

Corrective actions to eliminate the performance limiting factor of the reliability of the station pumps may include, but not necessarily be limited to, the following:

- Replacement of at least one of the 22,000 gpm raw wastewater pumps
- Repair/replacement of existing piping and piping appurtenances required to maintain functional pumping system

It has been confirmed that the station's existing pumps are still manufactured and commercially available to be purchased. Therefore, the replacement pumps can be matched to the existing pumps to expedite improvements to the pumping system.

3.1.2 Reliability of the Trash Racks

Corrective actions to eliminate the performance limiting factor of the reliability of the trash racks may include, but not necessarily be limited to, the following:

- Maintain functionality of the four existing screens so that they can remain in service until the completion of the long-term improvements.
    - Regular inspection of each of the four screens to determine their overall condition and functionality
    - Repair/replacement of any mechanical components associated with the effective operation of the screens
- Operation of the wetwell so that the water level remains below 10' above the bottom slab. By operating the wetwell below this 10' mark, it ensures that the flow passes through the screens prior to entering the suction inlets, thus protecting the pumps from debris that might cause damage/failure

3.1.3 Reliability of 84" Line to EQ Basins

Replacement of the 84" line to the EQ basins is the specific corrective action necessary to eliminate this performance limiting factor. To accommodate the 48 mgd flow demand, the new ductile iron replacement pipe would only be required to be 60-inch in diameter.

3.1.4 Structural Improvements to Maintain Building Integrity

As noted previously, the City has proactively begun to address structural deficiencies in the IPS. These deficiencies will continue to be addressed, and will be completed, as short-term corrective actions.

Section 4

Conceptual Design Approach – Long-Term Corrective Actions

As specified in the CPE report, an increase in IPS capacity is necessary to handle wet weather flows. These flows have been identified in the Design Flow TM as 30 mgd minimum flow, 60 mgd average daily flow, 138 mgd maximum flow to the treatment train, and 186 mgd total maximum flow (including 48 mgd to the storage ponds). The overall hydraulic design of the existing IPS structure, specifically the width of the influent channel, limits the potential for increasing the station's pumping capacity.

As indicated in Section 2, due to the condition and age of its mechanical equipment, the IPS can no longer be considered reliable to consistently convey influent flows. The pumps, screens, and most of the electrical components have far surpassed their operational lifecycle. Even if the station's mechanical equipment were replaced, the structure's design provides little flexibility in its operational capacity/function. The IPS represents, perhaps, the greatest liability to the City's ability to collect and treat wastewater while still meeting permit requirements.

In order to support the overall long-term, sustainable functionality of the plant, the required improvements should be designed and implemented to optimize system hydraulic performance and energy usage.

4.1 Alternatives for IPS Long-Term Corrective Actions

Recognizing the critical function of the IPS and the SSWWTP, the City performed an internal review of IPS improvements and determined that two alternatives are viable for the facility. Each of these are assessed in the following subsections. The improvement options were evaluated on the basis of the following criteria:

1. Requirements of MDEQ and the Consent Decree
2. Technical, Cost and Schedule feasibility
3. Station hydraulics
4. Requirement for maintaining operational IPS (i.e. need to forego bypass pumping during the rehabilitation/modifications)
5. Operational flexibility
6. Future O&M requirements
7. Potential for future expansion

The two alternatives considered for this study are as follows:

- Alternative 1: Construction of a new 186 MGD IPS (firm capacity) to handle anticipated peak flow;
- Alternative 2: Construction of a new IPS and rehabilitation of existing IPS for conveyance of 186 MGD total flow (firm capacity defined as one pump out of service at each station)

Rehabilitation of the existing IPS to handle future projected flows was determined to be infeasible due to the limitations of the station's configuration. Additionally, because there is no means of isolating the existing IPS, a temporary bypass pumping system would be required to service the entire influent flow for the duration of the station improvements. The City would incur significant costs associated with the installation and operation of this type of temporary bypass system, which ultimately would not provide any direct long-term benefit to the operation of the plant.

4.1.1 Alternative 1 - New Pump Station to Pump Peak Future Flow

Alternative 1, the design of the new station, would include the following components: two independent coated, enclosed wetwells; three automatic trash racks; eight submersible pumps with discharge check and isolation valves; discharge headers; a meter pit housing the three influent flow meters; a meter pit housing the meter to measure flow to the equalization basin; valve pit; electrical system, and a temperature-controlled electrical/operations building. The preliminary layout of the proposed station is shown in Figure 4-1 in Appendix A. The new screening facility will ensure an increased level of protection for the pumps from large debris. Also, since the screens would be automatic, the operator's daily tasks of manually cleaning the existing screens will be eliminated.

Concerning the new IPS pumps, the system would be an eight pump (18,500 gpm or 26.6 MGD each), submersible station design, meeting HI standards (9.8-2012 version), and would ensure the plant's ability to convey the peak design flow of 186 MGD. Because of the 186 MGD firm rated capacity of the station, physical model testing of the new IPS is recommended as part of the project budget. The construction of a physical model will provide confirmation that the design of the station reduces potential unforeseen hydraulic issues once the station becomes operational.

As part of this project**,** the existing IPS equipment would be repaired prior to the start of construction on the new station so as to maintain the plant's ability to convey influent flows during the entirety of the new pump station design and construction. This eliminates the need for construction of a new temporary bypass station.

This alternative is considered feasible as it would provide a new IPS for the plant that meets today's industry standards for large pump stations, reduces O&M cost as compared to the existing IPS, improves station operational flexibility, and is constructible with minimal disruption to plant operations.

4.1.2 Alternative 2 - Dual Pump Station – Build New and Rehabilitate Existing

Alternative 2 would consist of the construction of a new five pump 122 MGD total firm capacity IPS, and rehabilitation of existing IPS for conveyance of 64 MGD firm capacity total (capacity of both structures combined to equal the required firm capacity of 186 MGD with one of the existing

station pumps out of service; these pumps are larger than the new station pumps, so the "largest pump out of service" principle is fulfilled). The proposed configuration would have the two stations operating co-dependently. This alternative offers a level of flexibility that the current IPS is incapable of providing, while providing the plant with an influent system rated to handle the required peak design flow. This alternative was investigated as the most feasible method for salvaging the existing IPS structure while at the same time, improving the system's overall capacity rating.

If this project were selected, the most appropriate construction sequence would be to first construct the new facility, thereby allowing the existing station to continue as the influent pump station during this phase of construction. As such, the alternative would require the repair of the existing IPS as needed to maintain the IPS design capacity. Once the construction of the new pumping structure was completed, the influent flow would be transferred to the new station, thus allowing the existing IPS to be taken offline to complete the necessary rehabilitation. As part of the project, temporary bypass pumping of peak flows may be required during construction.

Each of the station structures would be furnished with new equipment and appurtenances including coated, enclosed wetwells; five trash racks (3 for the new station and 2 for the existing station); five 17,000 gpm submersible pumps in the new station; three 22,300 gpm dry pit submersible pumps in the existing station; discharge check and isolation valves (existing valves would be replaced); discharge header in the new station; two plant influent meters in a pit; equalization basin meter in a pit; electrical system; and a temperature controlled electrical/operations building. The preliminary layout of the proposed station is shown in Figure 4-2 in Appendix A. Hydraulic physical modeling is recommended to confirm the design of the improvements. The implementation of this project would include structural rehabilitation of the existing IPS wetwell's intermediate slabs and walls. As part of the project, rehabilitation of the existing dry pit building would also be necessary.

4.2 Comparison of the Two Alternatives

The principal similarity between these alternatives is that both increase the total influent capacity through the construction of a new influent station. On the basis of the tangible benefits to the City, both options offer the following:

- Significant improvement in overall reliability
- Improved level of protection of the influent pumps
- Increased level of operational flexibility
- Reduction in the necessary day to day O&M activities for operator

Long-term preservation of the existing IPS is the major differentiator of the two alternatives. If the decision is made to rehabilitate the existing IPS for long-term operation, it would ultimately be utilized as the wet-weather station, following the completion of the construction of the primary influent station. If the single station option is adopted, the current IPS would be abandoned after it completes its service as the "interim station" during the new station's

construction phase. The final decision as to whether a dual-station configuration will be implemented for the SSWWTP will be made as part of the detailed design phase.

Appendix A

Figures

Please see the following inserts.

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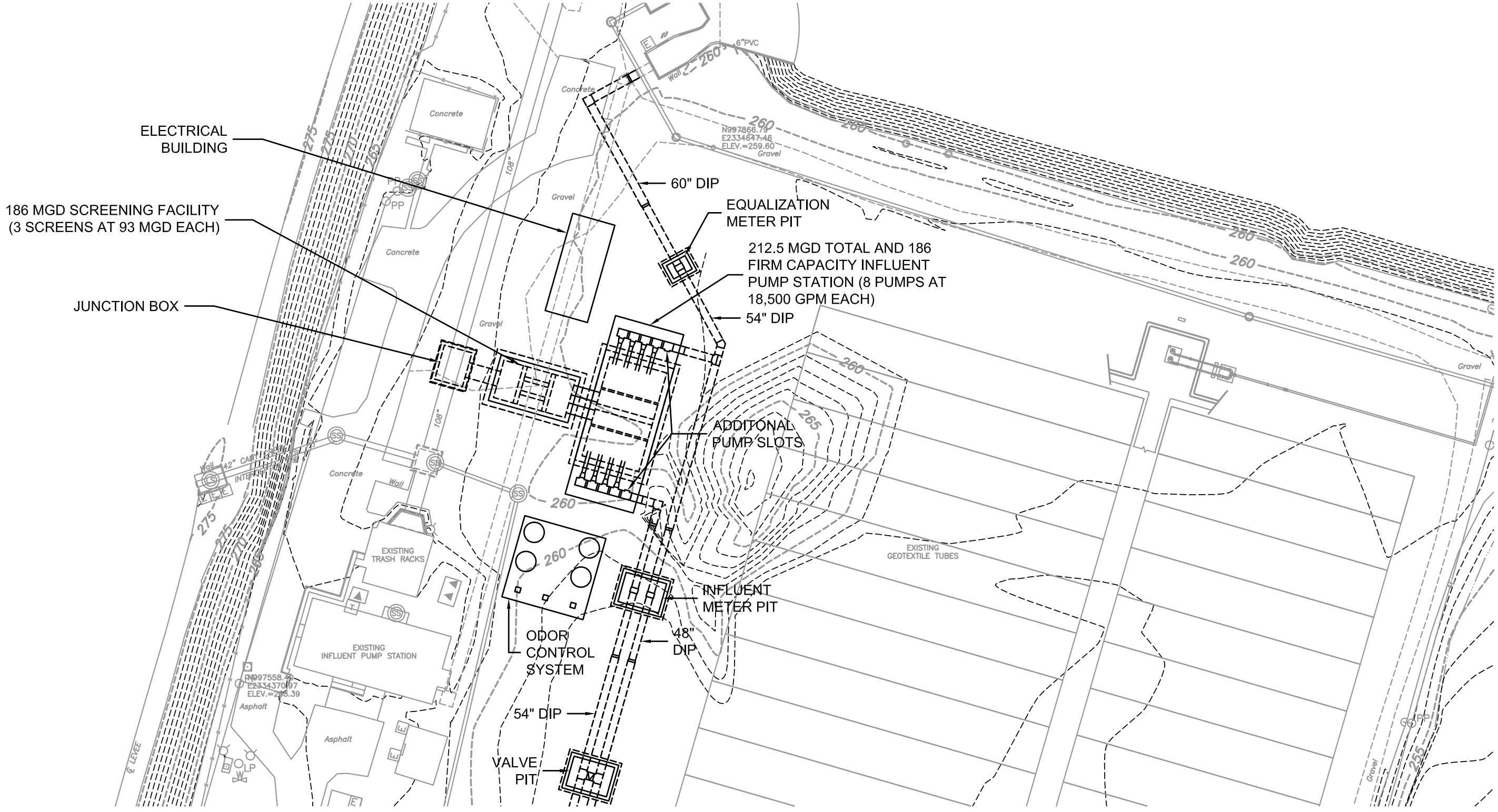

SITE PLAN

SCALE: 1" = 60'

GIBSON ENGINEERING

CDM Smith

SAVANNA STREET WWTP IPS
OPTION 1

DATE APRIL 2016

PROJECT NO. 109677

FIGURE NO. 4–1

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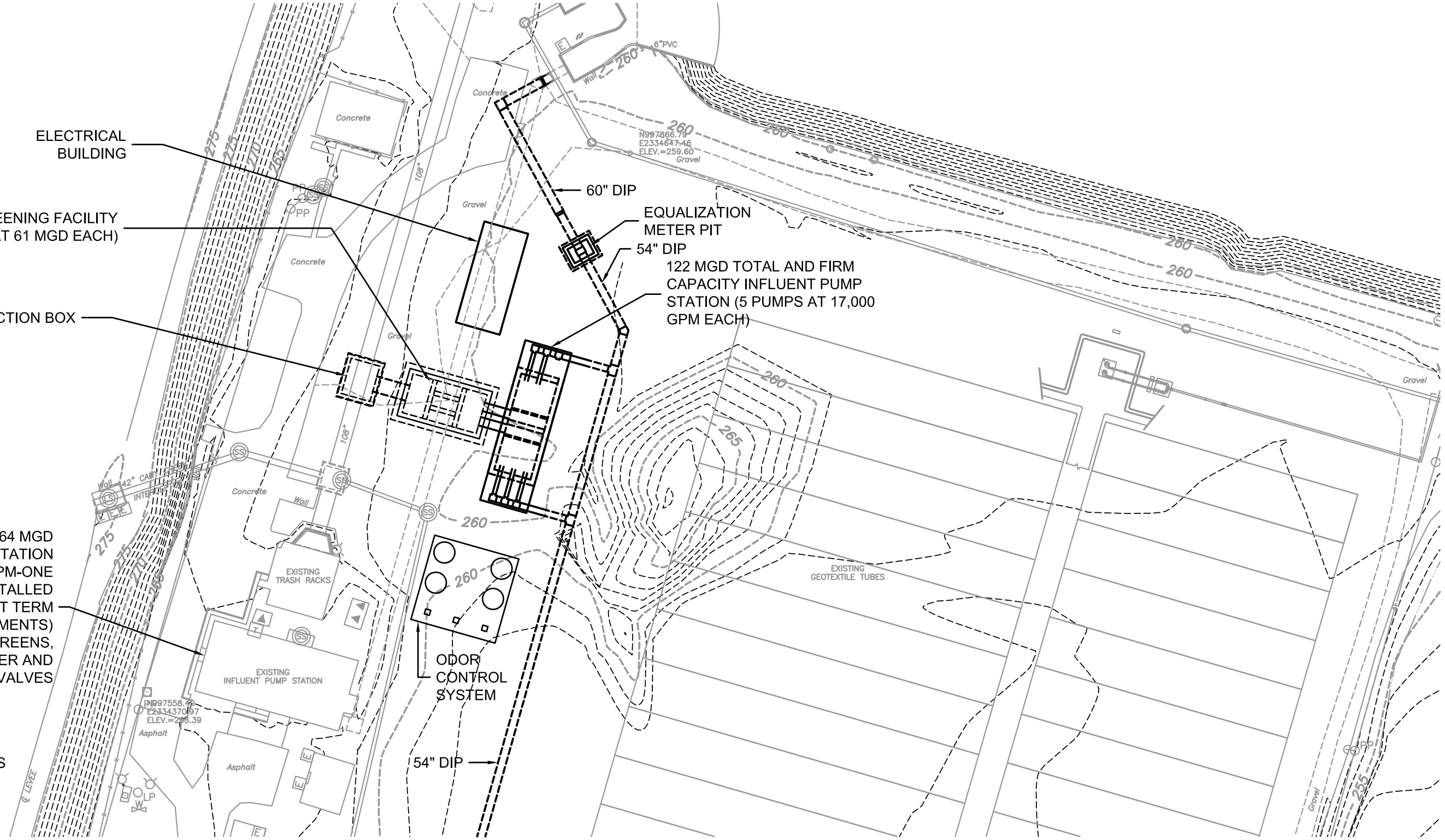

SITE PLAN

SCALE: 1" = 60'

GIBSON ENGINEERING

CDM Smith

SAVANNA STREET WWTP IPS
OPTION 2

DATE APRIL 2016

PROJECT NO. 109677

FIGURE NO. 4–2

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Appendix F

Headworks Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Preliminary Treatment Facility
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

1.1 Purpose

The purpose of this Technical Memorandum is to describe corrective actions proposed to resolve the CPE identified performance limiting factors of the Savanna Street Wastewater Treatment Plant's (WWTP) Preliminary Treatment Facility (PTF). The corrective actions will be short term (Type 2) and long term (Type 3).

1.2 CPE Summary Concerning Preliminary Treatment Facility

The CPE identified the following performance limiting factors:

No. 1. Overflowing of headworks basin of PTF (Type 2) is discussed in Section 3 of the CPE;

No. 2. Rehabilitation of mechanical bar screens (Type 2) is discussed in Section 5 of the CPE;

No. 3. Rehabilitation of grit removal systems (Type 2) is discussed in Section 5 of the CPE; and

No. 4. Anoxic basin effluent channel restriction (Type 2) is discussed in Section 3 of the CPE; and

No. 5. Redundant screen capacity and Structural expansion as needed to meet hydraulics of the peak design flow (Type 3) is discussed in Section 5 of the CPE. A new PTF will be required to remove performance limiting factor No. 5. The facilities are described in Section 3.

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Section 2

Existing System Description

The existing preliminary treatment facility (PTF) consists of a headworks structure with screening and grit removal equipment and anoxic zone basins that provide initial biological treatment prior to routing flow to the aeration basins. A brief description of the existing system is provided below.

2.1 Influent Basin

The existing PTF receives flow from the influent pump station and the flow is discharged into a receiving basin that distributes flow to the screen channels. The flow enters the basin vertically through a single feed pipe. During periods of high flow, the basin can experience splash overflow and full overflow, depending on the flow rate and the rate of solids accumulation on the screens. This basin has been identified as a facility that requires corrective action.

2.2 Screening Facility

The existing screening facility consists of two 50 MGD capacity climber screens with 3/8" openings. There is also a bypass screen channel, with manually cleaned bar screens of 1-1/2" clear openings. Each channel is provided with isolation sluice gates in the event the channel must be isolated. The current PTF screening facility has a total capacity of 100 MGD with both trains in service, but a firm mechanical capacity of only 50 MGD. The plant peak flow from Technical Memorandum – Design Flow is 138 MGD. The new required peak flow is 38 MGD above the existing capacity of the current PTF and 88 MGD above the firm mechanical capacity of the current PTF screens.

The existing bar screens are experiencing issues with rocks being lodged between the bars, which is leading to broken teeth on the rakes and eventual non engagement of the rake with the bar screen. Rocks are originating from the collection and transmission system and the influent pump station. The influent pump station has had some corrective measures taken which has minimized rocks from this source.

The hydraulic restrictions listed above prompted a Type 3 rating during the CPE report, with a conclusion that the existing headworks requires replacement.

2.3 Grit Removal Equipment

Flow from the screens passes through a channel into the vortex grit removal equipment. The hydraulic capacity of each grit chamber is similar to the screens – 50 mgd – for a total installed capacity of 100 mgd, but a firm mechanical capacity of 50 mgd. There is a bypass channel in the event that a grit chamber must be taken out of service.

The grit removal equipment includes a Pista-grit style vortex chamber, a vacuum primed grit pump, and a grit classifier. Each train has a screenings compactor that conveys the screenings to a dumpster while the grit classifier conveys the grit to the same dumpster.

2.4 Anoxic Basins

Effluent from the grit removal system is gathered in a flow distribution channel for distribution into one of 2 anoxic basins. These basins, when working properly, provide gentle mixing of the flow and prevent filamentous bacteria from growing, leading to better sludge settling in the clarifiers. The mechanical equipment includes aeration system piping and air dispersion fixtures. It has been observed that the aeration piping system is broken in at least one channel, as surface bubbling indicates that the basin is receiving significantly more air than is intended.

Flow exits the basins into a common discharge channel for routing to the aeration tanks. A Type 2 hydraulic restriction has been identified in this channel and will be repaired in the initial 24 month improvement period.

Section 3

Potential Corrective Actions

3.1 Conceptual Design Approach – Short Term Corrective Actions

Based on the Consent Decree schedule, Type 2 corrective actions must be completed within 24 months after EPA approval of the Composite Correction Program (CCP).

The following corrective actions will resolve performance limiting factor No. 1, overflow of PTF headbox:

- Remove handrail from around PTF headbox.
- Remove grating from PTF headbox.
- Construct 8" thick 42" high wall around PTF headbox at the location shown on Figure 1 in Appendix A. Use bentonite based water stop between existing deck and new wall.
- Move access stairway to the North if necessary.

The following corrective action will resolve performance limiting factor No. 2, rehabilitation of mechanical bar screens:

- Order and install all necessary parts required to keep bar screens operational.

The following corrective action will resolve performance limiting factor No. 3, rehabilitation of grit removal system:

- Purchase and install all necessary parts required to keep grit pumps and classifiers operational.
- If grit pump requires replacement, coordinate with design engineer to purchase basis of design grit pump being used to increase PTF capacity.
- If classifier requires replacement, coordinate with design engineer to purchase basis of design classifier being used to increase PTF capacity.

The following corrective action will remove performance limiting factor No. 4, Anoxic basin effluent channel restriction:

- Increase opening in anoxic basin from 4' wide by 6' tall to 4' wide by 15' tall as shown in Figure 2 in Appendix A. Structural analysis of basin with increased opening will be required.

3.2 Conceptual Design Approach – Long Term Corrective Action

Based on the Consent Decree schedule, Type 3 corrective actions must be completed within 60 months after EPA approval of the Composite Correction Program (CCP). Per the CPE, a new PTF will be required to remove performance limiting factor No. 5.

3.2.1 Preliminary Treatment Facility

The new PTF should consist of a Fine Screen Facility (FSF), a Grit Removal Facility (GRF), and a Preliminary Treatment Building (PTB). A potential location of the new PTF is shown in Figure 3 in Appendix A, but the final location of the PTF will be determined during detailed design. The proposed PTF should consist of three trains with each train having a peak flow of 69-MGD and a minimum flow of 15-MGD. The FSF should consist of drum screens, brush screen dewatering units, brush screen screw conveyors, screenings/grit collection and truck loading conveyors. The GRF should consist of vortex style grit removal chambers (type to be determined during detailed design), grit pumps, grit cyclones, and grit classifiers. The PTB should consist of truck loading facilities and an inside location for tractor trailer or bins for collection of screenings/grit.

The raw wastewater should be pumped from the Influent Pump Station (IPS) to the PTF. The conveyance piping is proposed as a multi-pipe system, using the existing pipes and adding pipes as necessary to handle the 138 mgd peak flow requirement. These raw wastewater lines should be isolated using sluice gates with remote manual electric actuators. All sluice gates should be fabricated of 316 stainless steel meeting AWWA C561. Final hydraulic design will occur during detailed design.

The total flow to the PTF should be measured with magnetic flow meters on the discharge pipelines from the IPS. The meters will be installed to be flooded at all times to prevent meter wet/dry cycles that would damage the meters.

The design of the new PTF must meet Mississippi Department of Environmental Quality (MDEQ) requirements and must obtain approval from MDEQ.

3.2.2 Fine Screen Facility

A common influent channel designed to Hydraulic Institute standards should receive flow from the IPS. To prevent grit accumulation within the common influent channel, two sets of pressurized non-potable water piping should be installed and should mix the bottom of the channels manually as desired by the plant operation staff. The operator should open a manual butterfly valve to initiate the washing process and close the butterfly valve at completion.

Three screening channels, each channel having influent and effluent isolation sluice gates equipped with remote manual electric actuators, should be provided. All three channels should contain a 5-mm circular opening double entry drum screen. Drum screen should be fabricated of Type 316 stainless steel with 9-mm thick polyurethane screening panels. The circular opening should taper from 5-mm to 5.5-mm for enhanced cleaning. The captured screenings should be removed from the screens using non-potable water, transported in troughs and dewatered. The

screen cover, ladder, and platform should be constructed of Type 316 stainless. Each screen channel should independently discharge to a common effluent channel.

It is noted that the drum screens are effective at removing rocks and construction debris of the type anticipated during construction of consent decree collection system improvements. The mechanism is designed to minimize clogging of the openings and to transport rocks and debris to the brush screen. This system has been proved at Baton Rouge under similar circumstances.

Each fine screen unit should be sized to handle a nominal peak flow of 69-MGD and a minimum flow of 15-MGD.

The screenings should be discharged from each screen's sluice trough into a corresponding dewatering brush screen. The screenings should be discharged out of the brush screen into an inclined pushed configuration shaftless screw conveyor that discharges via air actuated knife gate valve into one of two trains of screenings/grit collection shaftless screw conveyors. The screenings/grit collection conveyors discharge (each train has two conveyors in series) into one of two truck loading shaftless screw conveyors via air actuated knife gate valve. The screenings and grit are distributed into the bed of a tractor trailer or bin by using air actuated knife gate valves. Screenings/grit is removed from site and disposed of in the local landfill. All wetted parts in contact with the screenings/grit should be constructed of 316 stainless steel except for the shaftless screw which should be constructed of hardened carbon steel.

3.2.3 Grit Removal Facility

The screened raw wastewater should flow, by gravity, through the common effluent channel to the grit chamber influent channels. Each grit removal chamber should have an influent and effluent isolation sluice gate equipped with a remote manual electric actuator.

The GRF should consist of a concrete grit chamber with influent and effluent channels, a vortex grit removal system, a collection sump/storage hopper, and a flooded suction grit pump. The grit removal system shall remove 95% of grit down to 140 mesh (105 Microns).

Each grit removal unit should be sized to handle a nominal peak flow of 69-MGD and a minimum flow of 15-MGD.

Other components of the GRF are the grit concentrator/cyclone and grit classifier. The grit concentrator/cyclone receives the discharge from the grit pump and removes 93% to 94% of the water and sends the remaining 6% to 7% grit/water mixture to the grit classifier. The grit concentrator/cyclone should also separate 95% to 96% of the organic material from the grit/water mixture which is returned to the head of the plant. The grit classifier is used to receive the 6% to 7% grit/water mixture from the grit concentrator/cyclone and separate and remove the grit from the water (95% of 200 mesh material). The grit classifier should transport the grit to the inclined brush screen conveyor. The grit should be disposed of with the screenings.

The grit slurry from each grit unit should be pumped to one concentrator/cyclone and classifier. The grit pump should be a flooded suction arrangement so a positive head condition can be maintained. The grit pumps should be recessed cup-type impeller centrifugal grit pumps. The

pumps for this service should be equipped with Ni-Hard impeller and casing, stainless steel shafts, and mechanical seals.

The cyclone and classifiers should be located on the deck between the drum screens and vortex grit chambers next to the brush screens. Each of these units should be provided with covers and enclosures to reduce the potential for odor release. The cyclone and classifier overflow should return organics to the main influent flow stream via a return flow gravity pipeline connected to the common drum screen effluent channel. Interconnecting piping on the discharge of the grit pumps should allow another train's grit cyclone and classifier to be used. The cyclone should be a completely lined iron casting with heavy-sectioned natural or neoprene rubber for maximum abrasion resistance. The grit classifier should be constructed of 316 stainless steel.

The channels leading to and from the grit removal units should be covered. The covers should be vented to an odor control system. Air should be pulled from the structure interior as well as from the grit and screenings equipment enclosures by the fans of the odor control system.

The three grit effluent channels discharge into a common effluent channel. The effluent channel should be covered. This common effluent channel should provide flow distribution via weirs and piping to the Biological Treatment Facilities (BTF). Flow meters should be installed for each inlet pipe to each BTF basin. This will record flow to each basin and total influent flow will be totalized as a process control measure.

3.2.4 Plant Schematic

Figure 4 in Appendix A is an overall design concept for upgrading the Savanna Street WWTP that shows the yard piping and structures required to get flow from the new PTF to the BTF.

Appendix A

Figures

Please see the following inserts.

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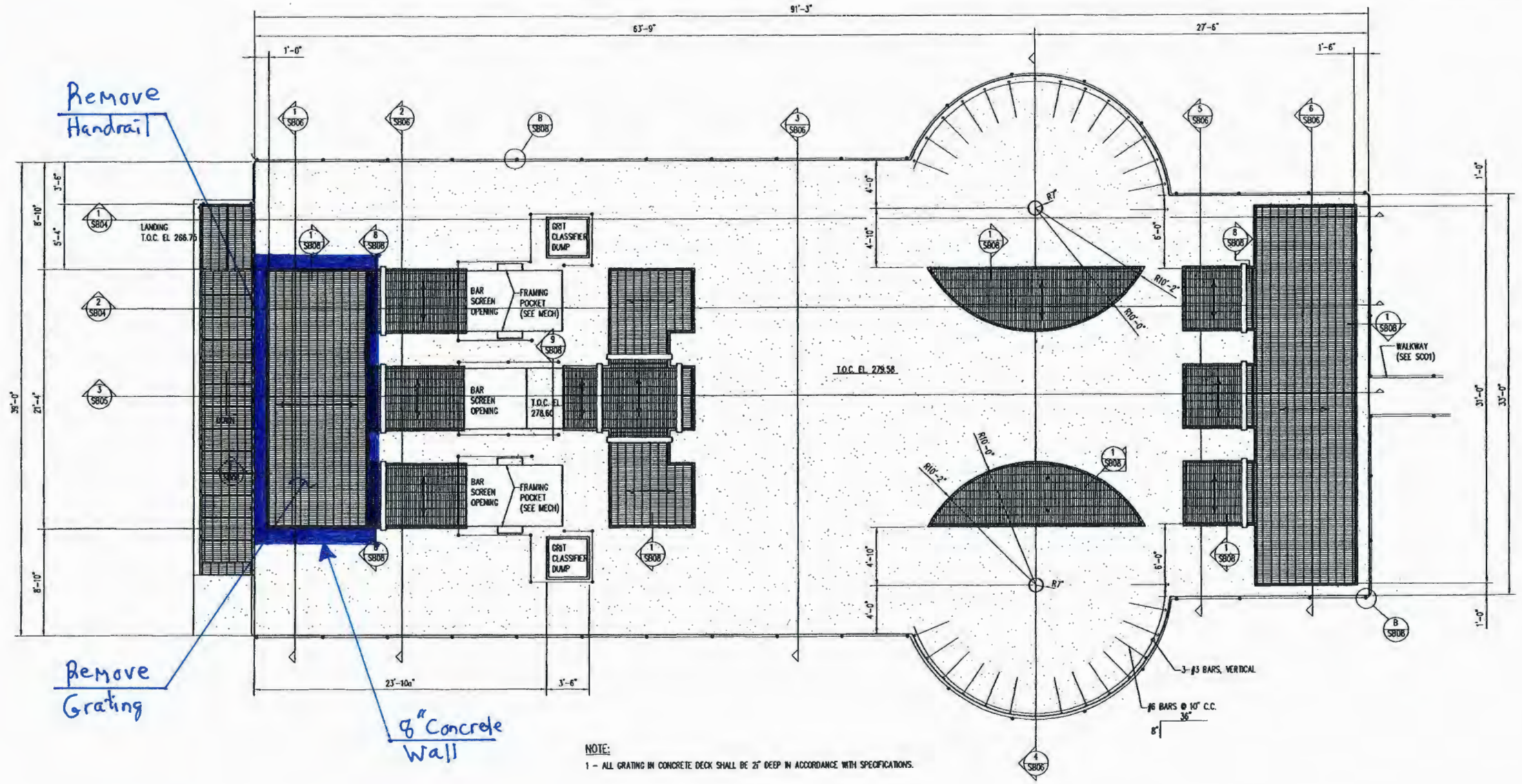
Remove Handrail

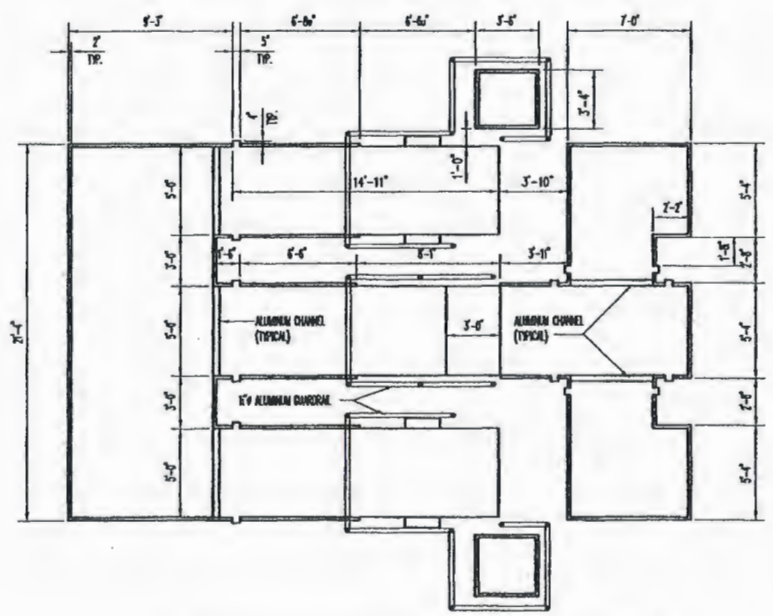
Remove Grating

8" Concrete Wall

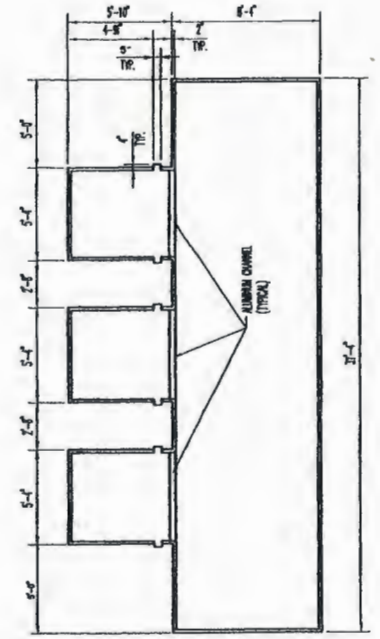


NOTE:
1 – ALL GRATING IN CONCRETE DECK SHALL BE 25" DEEP IN ACCORDANCE WITH SPECIFICATIONS.

UPPER LEVEL PLAN
1" = 1'-0"



SLAB AND GRATING CUT–OUT DETAIL
1" = 1'-0"



SLAB AND GRATING CUT–OUT DETAIL
1" = 1'-0"

RECORD DRAWINGS

THESE DRAWINGS HAVE BEEN PREPARED BY THE ENGINEER BASED ON INFORMATION FURNISHED BY THE CONTRACTOR IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONSTRUCTION CONTRACT.

REV. NO.	DATE	DRWN	CHKD	REMARKS
	01/02	DG	AF	RECORD DRAWINGS
1	5/99	DS	WK	ADDENDUM #1 (CONFORMS)

DESIGNED BY: WK
DRAWN BY: RB
SHEET CHK'D BY: WK
CROSS CHK'D BY: RDS
APPROVED BY: WK
DATE: APRIL 1999

CDM Camp Dresser & McKee Inc.
In association with:
CiViLTech, Inc.
Engineers & Project Managers

JACKSON, MISSISSIPPI
SAVANNA STREET WASTEWATER TREATMENT PLANT

NITRIFICATION AND OPTIMIZATION

HEADWORKS - UPPER LEVEL PLAN AND DETAILS

PROJECT NO. 19606-23701
FILE NAME: MHDPL801

SHEET NO.
SB03

Figure 1

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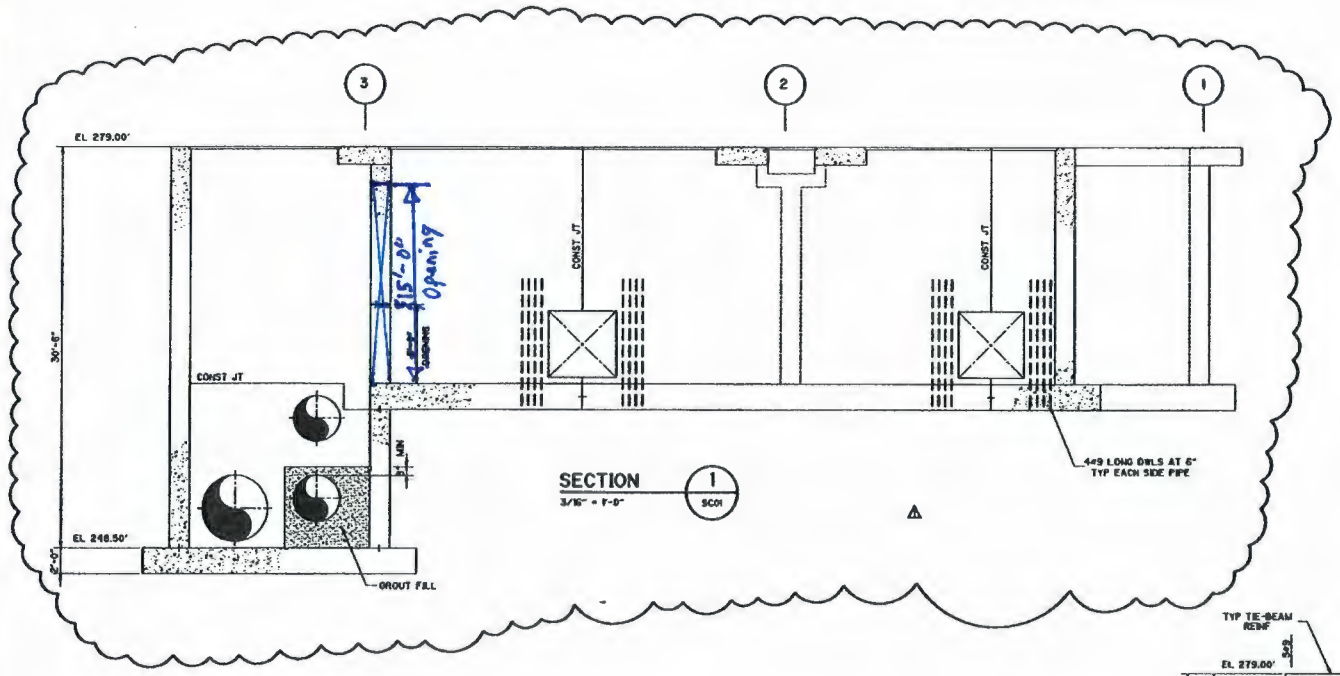

SECTION 1 / SC01
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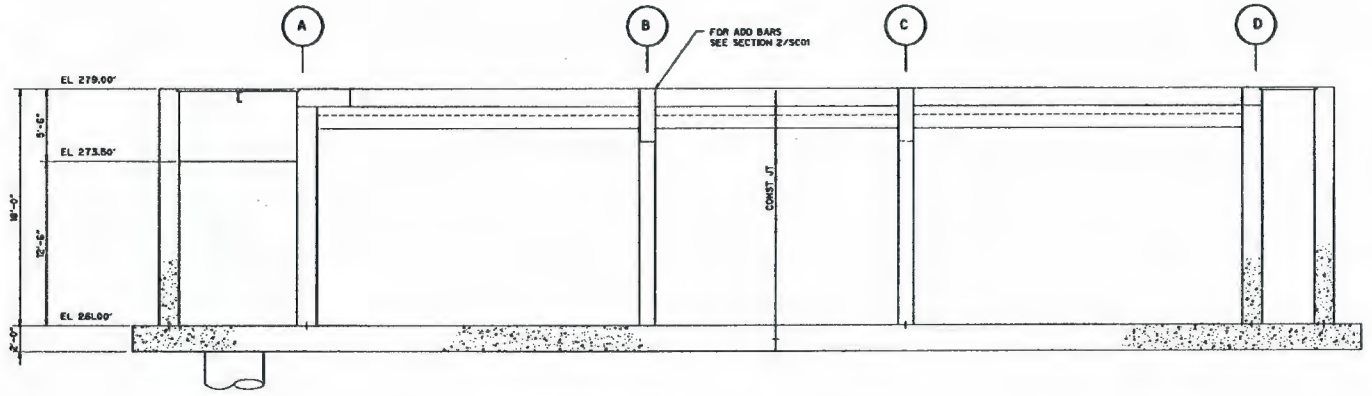

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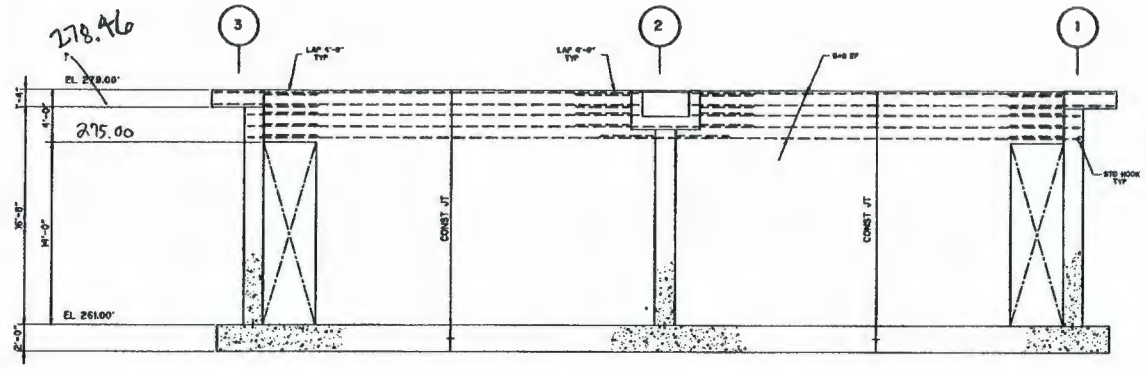

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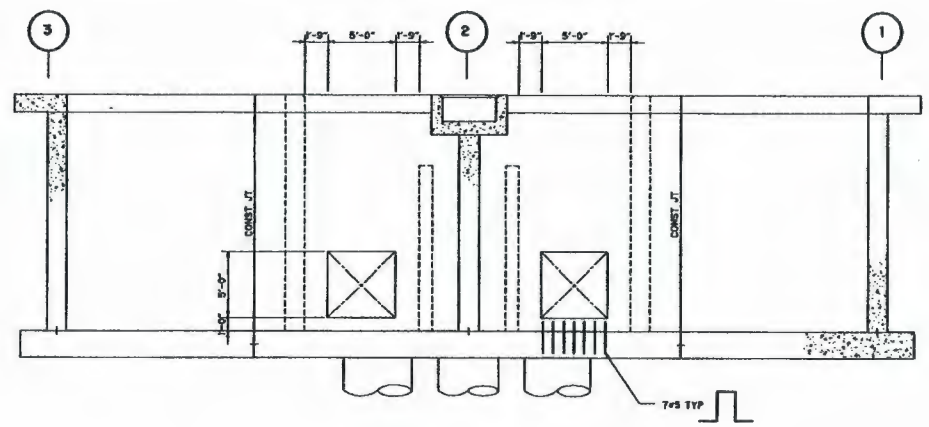

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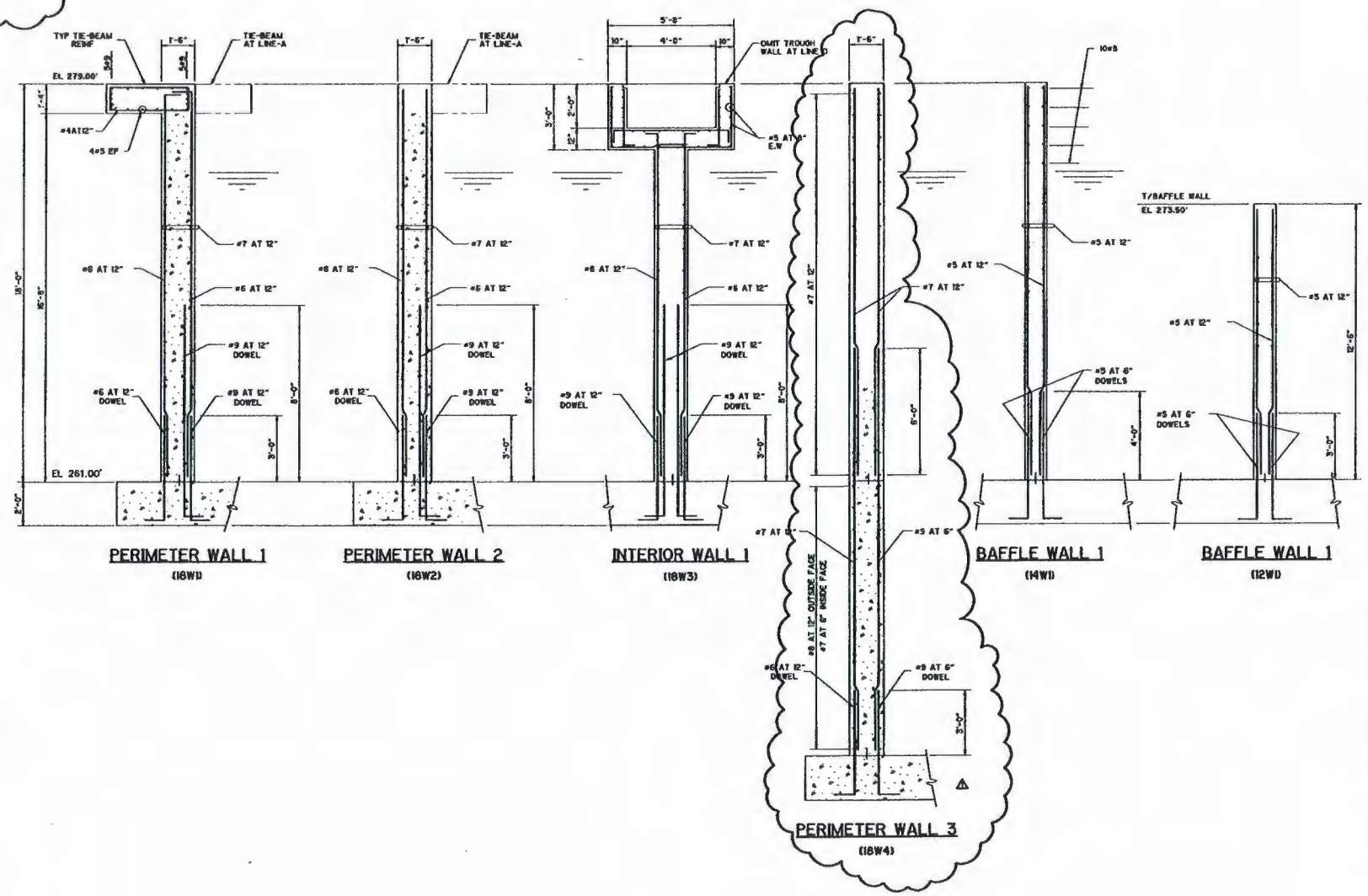

RECORD DRAWINGS

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	01/00	DG	AF	RECORD DRAWINGS
⚠	5/99	DAP	BE	REVISED AS PER CHANGE ORDER

DESIGNED BY: B.ERBL
DRAWN BY: M.S
SHEET CHK'D BY: B.ERBL
CROSS CHK'D BY:
APPROVED BY:
DATE: MARCH, 1999

CDM Camp Dresser & McKee Inc.
in association with:
CiViLTech, Inc.
Engineers & Project Managers

JACKSON, MISSISSIPPI
SAVANNA STREET WASTEWATER TREATMENT PLANT
NITRIFICATION AND OPTIMIZATION

ANOXIC ZONE SECTIONS

PROJECT NO. 10806-27301
FILE NAME: SABSC101
SHEET NO. SC03

Figure 2

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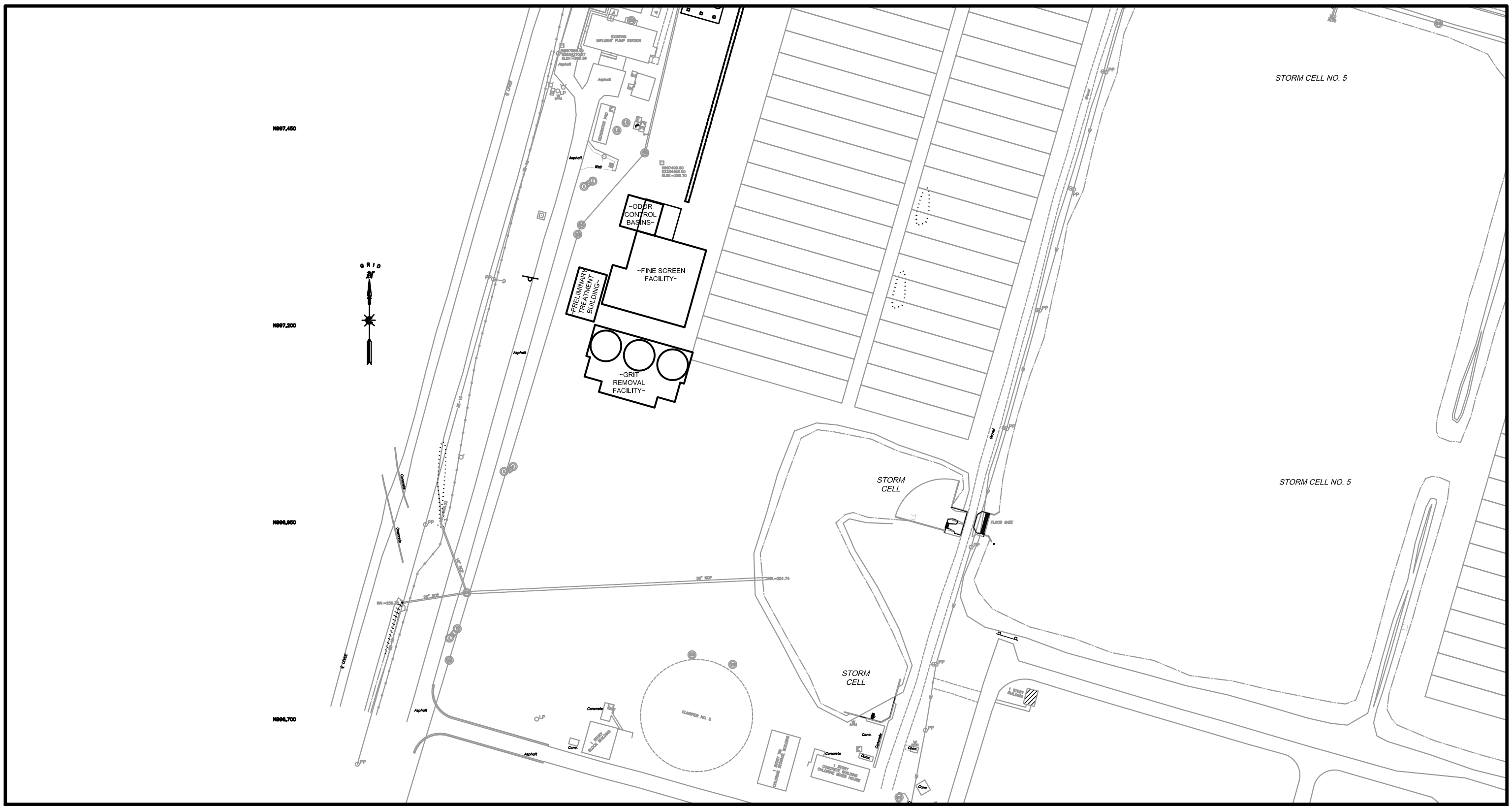

SITE PLAN

SCALE: NOT-TO-SCALE

CDM Smith

SAVANNA STREET WWTP
POTENTIAL LOCATION OF PTF

DATE APRIL 2016

PROJECT NO. 109677

FIGURE NO. 3

GIBSON ENGINEERING

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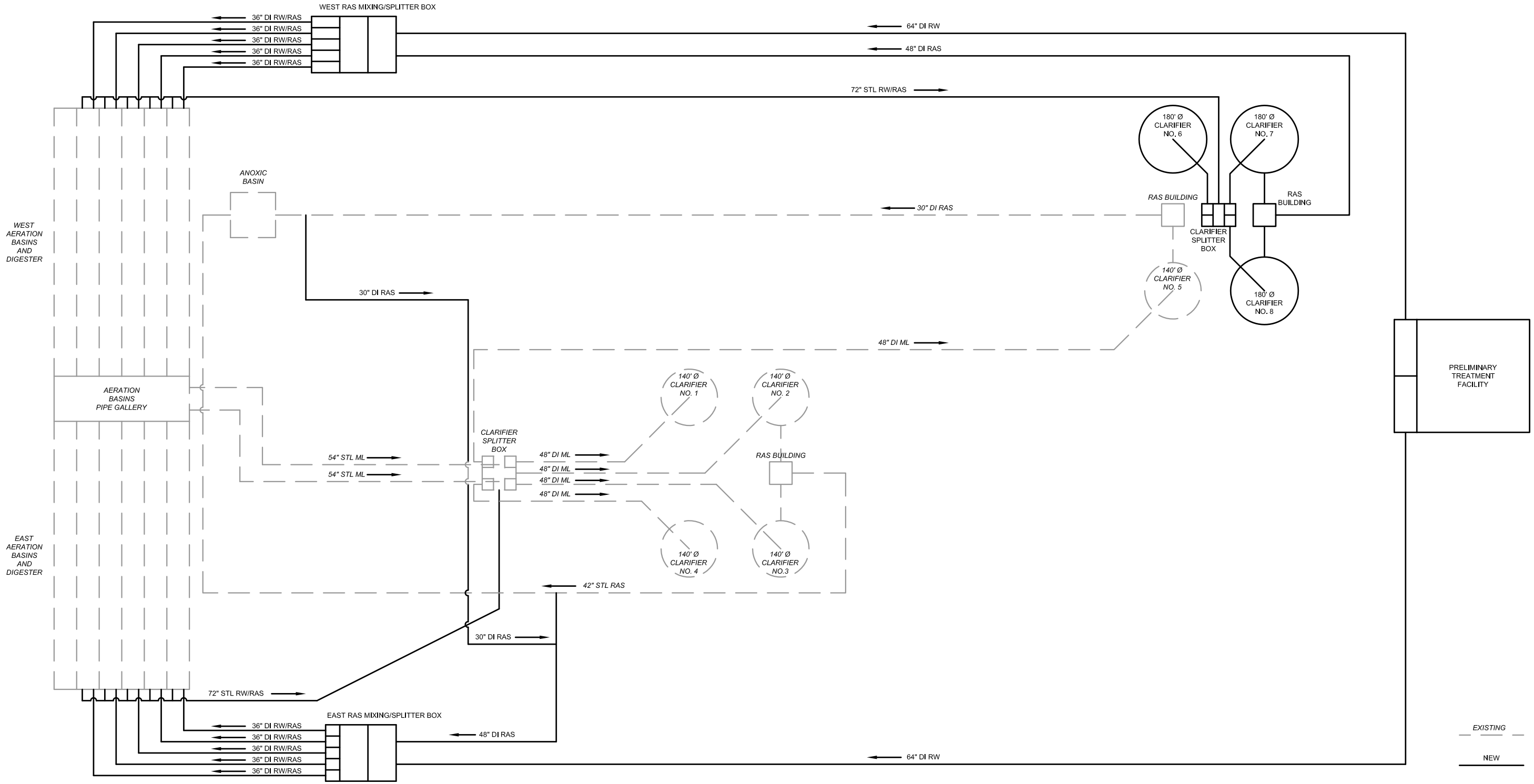

SCHEMATIC

SCALE: NOT-TO-SCALE

GIBSON ENGINEERING

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SAVANNA STREET WWTP
SCHEMATIC

DATE APRIL 2016

PROJECT NO. 109677

FIGURE NO. 4

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Appendix G

Biological Processes Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Biological Process
Technical Memorandum

April 2016

CDM Smith

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Appendices

Appendix A Figures

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Section 1
Performance Limiting Factors

1.1 Introduction

The purpose of this Technical Memorandum is to evaluate Savanna Street Wastewater Treatment Plant (SSWWTP) influent design loadings collected since issuance of the Comprehensive Performance Evaluation (CPE) report and after the installation of the three flow meters and samplers on the West Bank Interceptor, Caney Creek Interceptor, and West Rankin Force Main; compare this data against the CPE data; and update and refine, as necessary, the design parameters to be used for the upgrades at the SSWWTP. The three flow meters and samplers were required to sample the influent water upstream of the plant's recycle streams with final installation occurring in late 2014.

The analysis used to generate the findings herein consisted of a detailed evaluation of the plant's laboratory data between January 1, 2015 and December 31, 2015. The laboratory data for SSWWTP was provided by United Water Services Mississippi, LLC.

A second purpose of this Technical Memorandum is to investigate on a conceptual basis what biological treatment process configurations are feasible to allow the SSWWTP to treat an average flow of 60 mgd and peak flow of 138 mgd while maintaining compliance with NPDES permit limits. The most restrictive of these limits are the mass loading total nitrogen and phosphorus (nutrient) limits. The NPDES limits are summarized in Table 1-1. For this Technical Memorandum, the permit limits are the design criteria.

Table 1-1 NPDES Permit Limits

Parameter	Monthly Average	Weekly Average	Monthly Average*	Weekly Average*
Total Nitrogen	5221 lbs/d	7831 lbs/d	10.4 mg/L	15.6 mg/L
Total Phosphorus	1189 lbs/d	1770 lbs/d	2.4 mg/L	3.5 mg/L
Ammonia November – April	1652 lbs/d	2530 lbs/d	3.3 mg/l	5.0 mg/l
Ammonia May – October	768 lbs/d	1152 lbs/d	1.5 mg/l	2.2 mg/l
$CBOD_5$ November – April	10014 lbs/d	15021 lbs/d	20 mg/l	30 mg/l
$CBOD_5$ May – October	2687 lbs/d	4031lbs/d	5.4 mg/l	8.0 mg/l
TSS November – April	15021 lb/d	22532lbs/d	30 mg/l	45 mg/l
TSS May – October	11516 lbs/d	17274lbs/d	23.0 mg/l	34.5 mg/l
Chlorine			0.056 mg/l	0.096 mg/l
pH			6.0 minimum*	6.0 minimum*
Oxygen, dissolved			6.0 minimum*	9.0 maximum*

Note: *Concentration Based on Annual Average Flow of 60 mgd. pH and Oxygen dissolved levels at all times.

If/when the Trahon WWTP load sharing agreement is implemented, the treatment limits at SSWWTP will be reduced to lower than the current permit limits.

1.2 CPE Summary Concerning Biological Process

No influent design loadings were established as part of the CPE due to the plant's recycle flows and solids skewing the laboratory results.

Section 6 of the CPE identified the following performance limiting factors:

No. 1. Influent samplers and flow meters are needed on the West Bank Interceptor, Caney Creek Interceptor, and the West Rankin Force Main to remove the plant's recycle streams from the influent data. With this data, design loadings will be reevaluated as part of the CCP.

No. 2. Replace clarifiers 1, 2, and 3 mechanisms and walkways (Type 2);

No. 3. Clarifier Splitter Box – Correct hydraulic deficiencies (Type 2) is discussed in Section 3 and 6 of the CPE;

No. 4. Returned Sludge - Installation of new RAS pumps in RAS Building Number 1 and installation of flow meter on RAS Building Number 1 discharge line and RAS Building Number 2 discharge line for control of RAS pumps (Type 2).

No. 5. Basin process and flow configuration changes for biological removal of nitrogen and phosphorus including replacing diffusers (Type 3).

No. 6. Automation of influent valves to evenly distribute flow and maximize treatment efficiency (Type 3).

No. 7. Installation of dissolved oxygen meters, ORP meters, pH, and possibly ammonia meters for each basin to maximize treatment efficiency and control power consumption (Type 3).

No. 8. Installation of air flow meters for each basin to maximize treatment efficiency and control power consumption (Type 3).

No. 9. Replace two blowers and salvage parts to keep remaining existing two blowers operational (Type 3).

No. 10. Addition of clarifier 6 and third RAS pump in RAS Building Number 2 (Type 3).

No. 11. Make operational or replace aeration basin pipe gallery ventilation system (Type 3).

No. 12. Additional aeration basins if required to meet lower NPDES permit limits (Type 3).

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Section 2

Existing System Components and Performance

2.1 Existing Wastewater Loads and Peaking Factors

Knowledge of influent loading variations is important for assessing plant capacity and facility planning. Average annual daily pollutant concentrations (AADC) were determined using 2015 sampling data combined with the flow data to determine the annual average daily load (AADL). Table 2-1 through Table 2-6 shows the monthly average daily concentrations (MADC), monthly average daily load (MADL), and max month average daily concentration and load highlighted in yellow for TSS, $CBOD_5$, NH_3-N, TN, and TP.

Table 2-1 TSS Loads and Peaking Factors (January 1, 2015 to December 31, 2015)

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
January	191	84,560		94,266	
February	206	89,230		115,020	
March	145	80,628		109,992	
April	198	93,650		117,343	
May	330	142,933	1.535	151,624	
June	211	84,380		201,704	
July	190	67,104		84,130	
August	230	67,642		88,111	
September	191	57,752		78,248	
October	419	132,248		207,675	
November	289	122,379		255,061	2.739
December	217	94,795		190,399	
AADC	**235**				
AADL		**93,108**			

The annual average daily load (AADL) is based on AADF of 48.84 MGD.

Table 2-2 $CBOD_5$ Loads and Peaking Factors (January 1, 2015 to December 31, 2015)

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
January	119	50,681		56,456	
February	145	63,514	1.214	78,837	
March	88	48,069		70,862	
April	102	47,299		53,372	
May	199	83,558		99,275	
June	107	43,187		100,091	1.913
July	122	42,902		49,216	

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
August	144	41,378		57,323	
September	146	43,239		52,979	
October	200	60,590		66,538	
November	145	58,519		95,791	
December	99	44,584		56,572	
AADC	**135**				
AADL		**52,323**			

The annual average daily load (AADL) is based on AADF of 48.84 MGD.

Table 2-3 NH_3-N Loads and Peaking Factors (January 1, 2015 to December 31, 2015)

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
January	12.0	5,255		5,610	
February	11.6	4,547		5,599	
March	9.8	5,263		5,908	
April	2.4	5,704		6,024	
May	15.6	6,370	1.201	7,149	
June	14.3	5,800		6,827	
July	16.2	5,537		7,198	
August	19.0	5,602		7,262	1.369
September	17.0	5,106		5,976	
October	16.2	4,743		4,942	
November	11.5	4,527		5,634	
December	12.1	5,194		6,105	
AADC	**14.0**				
AADL		**5,304**			

The annual average daily load (AADL) is based on AADF of 48.84 MGD.

Table 2-4 TN Loads and Peaking Factors (January 1, 2015 to December 31, 2015)

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
January	19.4	8,620		8,909	
February	22.4	8,718		11,031	
March	16.0	8,419		10,547	
April	18.6	8,615		9,557	
May	25.2	10,155		10,795	
June	20.2	8,365		11,023	
July	22.9	8,067		8,714	
August	26.6	7,804		9,920	

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
September	30.6	9,186		10,091	
October	36.6	11,029	1.254	14,983	1.703
November	24.1	9,257		13,150	
December	16.9	7,336		9,069	
AADC	**23.3**				
AADL		**8,798**			

The annual average daily load (AADL) is based on AADF of 48.84 MGD.

Table 2-5 TP Loads and Peaking Factors (January 1, 2015 to December 31, 2015)

2015	MADC (mg/l)	MADL (lbs/day)	MMADL/ AADL	MWDL (lbs/day)	MWDL/ AADL
January	3.0	1,329		1,441	
February	3.9	1,467		2,485	
March	2.1	1,116		1,298	
April	2.4	1,123		1,277	
May	3.7	1,492		1,625	
June	2.9	1,218		1,834	
July	3.6	1,274		1,319	
August	4.2	1,233		1,586	
September	5.5	1,662		2,097	
October	5.8	1,746	1.323	2,536	1.921
November	3.1	1,222		1,781	
December	2.2	954		1,416	
AADC	**3.5**				
AADL		**1,320**			

The annual average daily load (AADL) is based on AADF of 48.84 MGD.

2.2 Existing Treatment Process

The existing process is not designed for nutrient removal. This typically requires incorporating anaerobic (no oxygen in any form) and anoxic (oxygen only in the form of nitrate) zones in the bioreactor. The existing process is equipped with a small anoxic selector but this is designed primarily for conditioning the biomass for enhanced settling in the secondary clarifiers. Despite not being designed for nutrient removal, the combination of a relatively dilute influent and an aging aeration system has resulted in an existing process that meets the nutrient removal limits for calendar year 2015 and most of the time in previous years. The limiting unit process in the existing process that is preventing treatment of high wet weather flows are the secondary clarifiers. At current annual average flow, the clarifier process is being operated at a solids loading rate (SLR) of 28 lbs/ft^2/day. Typically secondary clarifier processes are operated at a SLR of from 15-20 lbs/ft^2/day. The fact that the SSWWTP typically produces a low effluent total

suspended solids (TSS) is a testament to the effectiveness of the anoxic selector basin. However, to treat higher flows, additional secondary clarifier capacity is clearly required.

A BioWin™ process simulator was used to model the existing process. As can be seen in Table 2-6, exceptionally good calibration of the model was achieved based on the 2015 data. Only 2015 data was used because prior data had sidestreams comingled with the influent sample. The one exception is with effluent total phosphorus, with the simulator predicting a somewhat higher value than the data indicates. Typically calibration of the simulator requires checking solids production data but this data is not available. However, this level of calibration is adequate for the level of analysis required for this Technical Memorandum.

Table 2-6 Calibration of the Process Simulator

Parameter	2015 Average	Simulator Results
Flow	45 mgd	45 mgd
Influent Biochemical Oxygen Demand (BOD_5)	135 mg/L ($CBOD_5$)	154 mg/L*
Influent Total Suspended Solids (TSS)	235 mg/L	235 mg/L
Influent Total Nitrogen	23 mg/L	23 mg/L
Influent Total Phosphorus	3.5 mg/l	3.5 mg/L
Bioreactor Mixed Liquor Suspended Solids (MLSS)	3764 mg/L	3763 mg/L
Aerobic Solids Retention Time (SRT)	?	9.83 days
Effluent 5-day Carbonaceous BOD_5 ($CBOD_5$)	3.8 mg/L	3 mg/L
Effluent TSS	9.6 mg/L	11.7 mg/L
Effluent Ammonia	0.4 mg/L	0.4 mg/L
Effluent Nitrate + Nitrite	6.7 mg/L	6.5 mg/L
Effluent Total Nitrogen	9 mg/L	9 mg/L
Effluent Total Phosphorus	0.7 mg/L	1.6 mg/L

Note: *Adjusted upwards to account for the effects of the nitrification inhibitor in the raw sewage BOD test

In order to calibrate the simulator to match the effluent total nitrogen data, the dissolved oxygen (D.O.) concentration in the bioreactor had to be lowered to a relatively low concentration of 0.5 mg/L. This is an indication that the existing aeration system is not resulting in complete mixing and these unmixed zones are actually benefitting treatment by achieving denitrification in the aeration basins. This is a phenomenon referred to as simultaneous nitrification/denitrification (SND) and is one of the benefits of operating bioreactors at very low D.O. concentrations. SND will be discussed further in later sections in this Technical Memorandum.

Section 3

Potential Corrective Actions

3.1 Conceptual Design Approach – Short Term Corrective Actions

Based on the Consent Decree schedule, Type 2 corrective actions must be completed within 24 months after EPA approval of the Composite Correction Program (CCP).

The following corrective actions will remove performance limiting factor No. 1, install influent samplers and flow meters:

- This item has been corrected.

The following corrective actions will remove performance limiting factor No. 2, replace clarifier 1, 2 and 3 mechanisms and walkways:

- A design and construction project must be implemented and completed within 24 months of CCP approval.

The following corrective actions will remove performance limiting factor No. 3, correct splitter box hydraulic deficiencies.

- Raise the exterior walls of the clarifier splitter box by 3 feet.
- Extend the existing wall at the end of each aeration basin to form a 26 foot wide weir with 2 feet contractions on both sides to establish water level in the aeration basin. This allows for the splitter box weirs to be lowered to provide free board in clarifier splitter box influent chamber.
- Adjust clarifier splitter box weirs to lower water level in influent chamber of splitter box.

The following corrective actions will remove performance limiting factor No. 4, install new RAS pumps and RAS flow meters:

- A new RAS pump will be specified, procured, and installed in the RAS pump building.
- Magnetic flow meter in an underground concrete vault should be installed on the discharge line of both RAS pump stations.

3.2 Conceptual Design Approach – Long Term Corrective Actions

Based on the Consent Decree schedule, Type 3 corrective actions (Process Limiting Factors 5 thru 12) must be completed within 60 months after EPA approval of the Composite Correction Program (CCP).

3.2.1 Evaluated Treatment Process Modifications

Four different treatment process modifications were evaluated that would allow the SSWWTP to treat all wet weather flows while maintaining compliance with nutrient removal limits.

1. Maintaining the existing process with additional secondary clarification
2. Converting the existing process to a traditional biological nutrient removal (BNR) process by incorporating anaerobic and anoxic zones ahead of the aerated portion of the bioreactor (referred to as the A^2O process) and adding additional secondary clarification
3. Converting the existing process to a BNR oxidation ditch technology known as the VertiCel™ and adding additional secondary clarification
4. Adding primary clarifiers and anaerobic digestion to the A^2O process, eliminating the need for additional secondary clarification. This would require approval from the MDEQ to waive the requirement for an additional secondary clarifier for this option. It is likely the consent decree language did not consider the use of this option.

The below evaluations have not taken into account the additional nutrients to be removed when the Trahon Wastewater Treatment Plant's load sharing is added to the equation.

3.2.2 Option 1 – Existing Process with Additional Secondary Clarifiers

Because the existing facility has met the nutrient removal limits for calendar year 2015 and most of the time in previous years, the existing process is worthy of evaluation. If viable, this would be the least costly option for allowing the SSWWTP to treat all wet weather flows. The difficulty in recommending this option is the SND occurring in the existing bioreactors that is allowing the existing facility to meet permit limits is apparently incidental and not intended, being the result of inadequate mixing from an aging aeration diffuser system. It would not be appropriate to recommend the continued use of a diffuser system that is essentially in the process of failing. Therefore, this option would involve upgrading the aeration systems (both blowers and diffusers) and intentionally operating the aeration basins at low D.O. concentrations. This option is currently an area of considerable research and interest because of the low cost and energy efficiency advantages it provides. Traditionally, it has been thought that bioreactors must be operated with an excess of D.O. because this results in a more stable population of the sensitive nitrification bacteria. However, there is increasing evidence that operating bioreactors at low D.O. can result in other forms of nitrification bacteria, including a form of bacteria known as annamox that converts ammonia directly to nitrogen gas, that would allow the SSWWTP to forego the oxidation step to nitrate. These processes require precise control of the aeration system. This control can be accomplished by the use of on-line D.O. probes and more recently much attention is being directed to the use of on-line ammonia probes for this purpose. Use of ammonia probes for aeration control guarantees the least amount of oxygen is applied to the bioreactor, maximizing the potential for SND and annamox.

Figure 3-1 shows the preliminary simulator schematic for this option and Table 3-1 provides the process sizing and effluent quality results from the simulation. The process sizings reflect the existing process with three additional 180-foot diameter secondary clarifiers. The influent data

reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C. This simulation used a 0.5 mg/l dissolved oxygen concentration for the aeration volume.

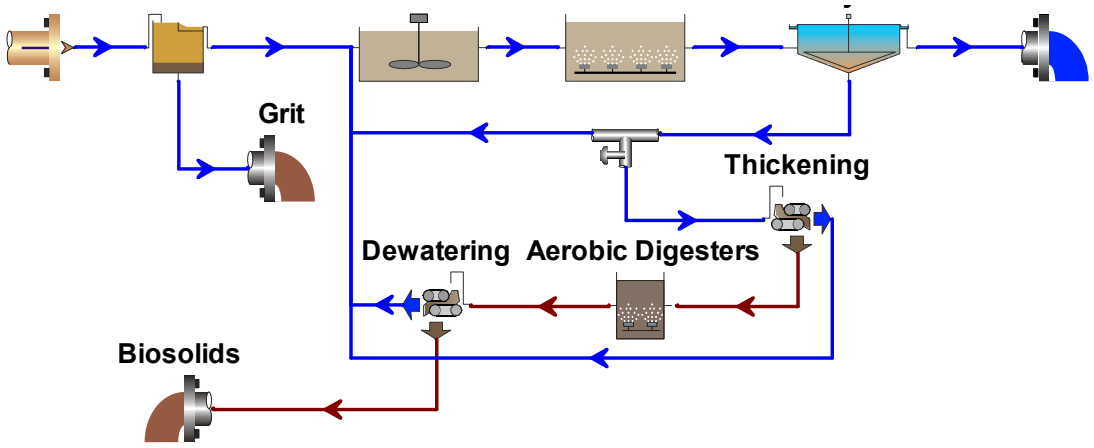

Figure 3-1
Existing Biological Process Simulator Schematic

Table 3-1 Process Sizing and Results of Existing Process Simulator

Element	Model Input/Results
Aerated Anoxic	0.47 MG
Aeration	22.88 MG
Secondary Clarifiers	153,300 ft2
Aerobic Digesters	4.58 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	3 mg/L
Effluent TSS	7 mg/L
Effluent Total Nitrogen	8.4 mg/L
Effluent Total Phosphorus	3.6 mg/L

As can be seen in Table 3-1, the addition of a coagulant chemical would be required to comply with effluent total phosphorus permit requirements but the process does meet the total nitrogen limit. As can be seen in Figure 3-1, return side streams from the solids processing operation are part of the preliminary model. Aerobic digesters were modeled as high solids digesters.

3.2.3 Option 2 – A2O Process with Additional Secondary Clarifiers

This process configuration represents a conversion from the existing process to a conventional nutrient removal process. Anaerobic zones are created from existing volume at the head end of the existing bioreactors for enhanced biological phosphorus removal (EBPR) and anoxic zones are created downstream of the anaerobic zones to accomplish total nitrogen removal. Internal

recycle pumps are installed in the bioreactor to recirculate around four times the influent flow back to the anoxic zones for denitrification.

Figure 3-2 shows the preliminary simulator schematic for this option and Table 3-2 provides the process sizing and effluent quality results from the simulation. The process sizings reflect incorporation of the BNR zones into the existing process volumes with an increased bioreactor water depth of 19 feet and three additional 180-foot diameter secondary clarifiers. The small existing aerated anoxic selector basin would be abandoned in this configuration and is not included in the model. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C.

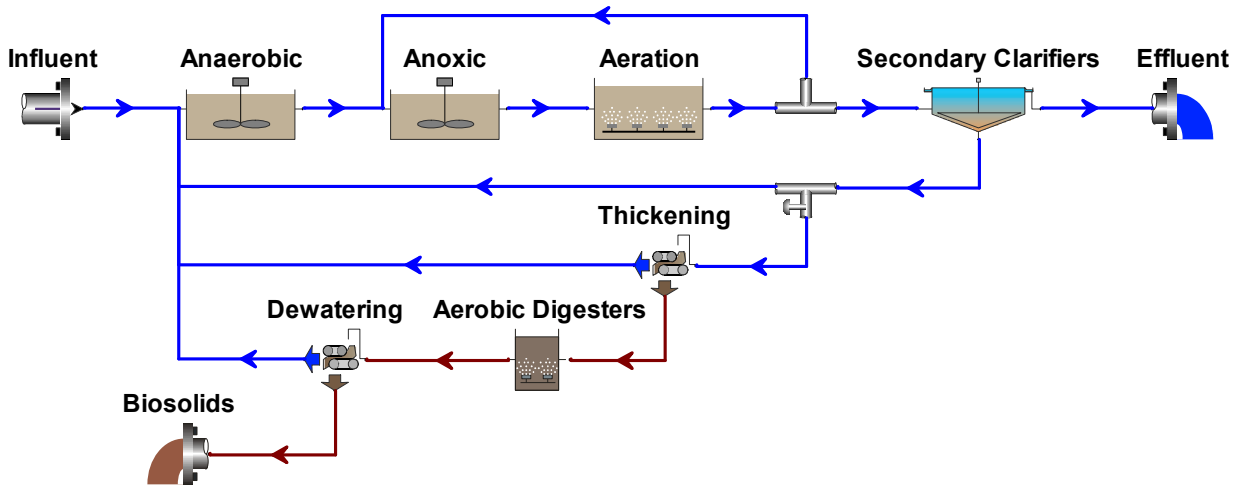

Figure 3-2
A2O Process Simulator Schematic

Table 3-2 Process Sizing and Results of A^2O Process Simulator

Element	Model Input/Results
Anaerobic	2 MG
Anoxic	4 MG
Aeration	19.48 MG
Secondary Clarifiers	153,300 ft2
Aerobic Digesters	4.58 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	3 mg/L
Effluent TSS	7 mg/L
Effluent Total Nitrogen	7.2 mg/L
Effluent Total Phosphorus	2 mg/L

As can be seen in Table 3-2, EBPR results in compliance with the effluent total phosphorus permit requirements without the need to add coagulant chemicals and the process results in a lower effluent total nitrogen that Option 1. As can be seen in Figure 3-2, return side streams from the solids processing operation are part of the preliminary model. Aerobic digesters were modeled as high solids digesters.

3.2.4 Option 3 – VertiCel™ Process with Additional Secondary Clarifiers

This process configuration represents a conversion from the existing process to a proprietary oxidation ditch technology marketed by Evoqua referred to as the VertiCel™ process. It would require construction of large horizontal slabs/dividers in the existing bioreactors to create the "over/under" recirculation flow pattern of the VertiCel™ process. This is a unique process operated at very low D.O. concentrations in the bioreactor and for that reason tends to push the limits of aerobic solids retention time (SRT) that is typically required for BNR processes. The process relies heavily on SND in the bioreactor for nitrogen removal. A bioreactor water depth of 17 feet was used in this simulation but could be increased to 19 feet as used in the A^{2}O process. A 19 feet simulation will be performed before decisions are made.

Figure 3-3 shows the preliminary simulator schematic for this option and Table 3-3 provides the process sizing and effluent quality results from the simulation. The process sizings reflect the incorporation of the VertiCel™ process into the existing bioreactor volume and three additional 180-foot diameter secondary clarifiers. The small existing aerated anoxic selector basin would be abandoned in this configuration and is not included in the model. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C.

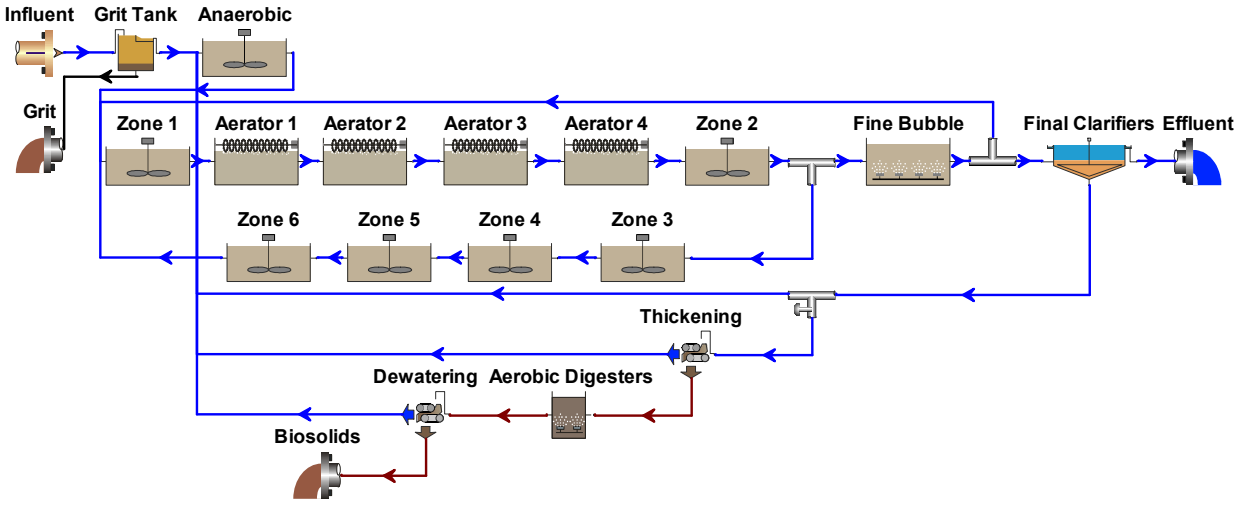

Figure 3-3
VertiCel™ Process Simulator Schematic

Table 3-3 Process Sizing and Results of VertiCel™ Process Simulator

Element	Model Input/Results
Anaerobic	1.95 MG
Zones 1 and 2 and Surface Aerator Zones 1-4	0.81 MG each
Zones 3-6	1.22 MG each
Fine Bubble Aeration Zone	11.4 MG
Secondary Clarifiers	153,300 ft2
Aerobic Digesters	4.58 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	4 mg/L
Effluent TSS	13 mg/L
Effluent Total Nitrogen	12 mg/L
Effluent Total Phosphorus	3.6 mg/L

As can be seen in Table 3-3, insufficient EBPR was achieved with this model indicating the need to add coagulant chemicals to meet the effluent total phosphorus limit and the process results in a higher effluent total nitrogen than Options 1 and 2 but is in compliance with permit limits. As can be seen in Figure 3-3, return side streams from the solids processing operation are part of the preliminary model. Aerobic digesters were modeled as high solids digesters.

3.2.5 Option 4 – A^2O Process, Primary Clarifiers and Anaerobic Digestion

This process configuration represents a conversion from the existing process to the conventional A^2O BNR process and the addition of primary clarifiers and anaerobic digestion. When primary clarifiers are added to a WWTP, it is necessary to also add anaerobic digestion. This is because when BOD is removed in the primary clarifiers it must be stabilized in an anaerobic process to take advantage of the energy savings of BOD removal in the primary clarifiers. Primary sludge should not be treated in an aerobic digester because the aerobic digestion process would require more energy that if the primary sludge BOD is treated in a mainstream process.

Figure 3-4 shows the preliminary simulator schematic for this option and Table 3-4 provides the process sizing and effluent quality results from the simulation. The process sizings reflect the addition of primary clarifiers, incorporation of the A^2O process into the existing bioreactor volume and the addition of anaerobic digesters. There would be no need for additional secondary clarifiers. The small existing aerated anoxic selector basin would be abandoned in this configuration and is not included in the model. The influent data reflects the maximum month load for 2015 that occurred in October and wastewater temperature of 26 C.

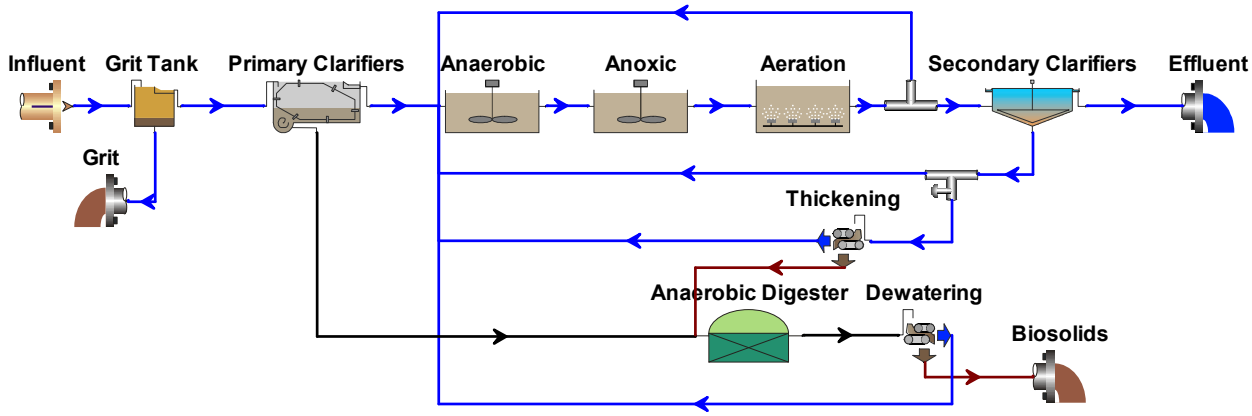

Figure 3-4
A2O with Primary Clarifiers Process Simulator Schematic

Table 3-4 Process Sizing and Results of A^2O with Primary Clarifiers Process Simulator

Element	Model Input/Results
Primary Clarifiers	55,000 ft2
Anaerobic	4 MG
Anoxic	6 MG
Aeration	15 MG
Secondary Clarifiers	77,000 ft2
Anaerobic Digesters	12 MG
Influent 5-day $CBOD_5$	220 mg/L
Influent TSS	420 mg/L
Influent Total Nitrogen	37 mg/L
Influent Total Phosphorus	6 mg/L
Effluent 5-day $CBOD_5$	6 mg/L
Effluent TSS	15 mg/L
Effluent Total Nitrogen	9 mg/L
Effluent Total Phosphorus	4 mg/L

As can be seen in Table 3-4, insufficient EPBR was achieved with this model indicating the need to add coagulant chemicals to meet the effluent total phosphorus limit and the process results in a higher effluent total nitrogen than Options 1 and 2 but is in compliance with permit limits. As can be seen in Figure 3-4, return side streams from the solids processing operation are part of the preliminary model. Standard anaerobic digesters were modeled.

3.2.6 Other Potential Process Alternatives (Proprietary Systems)

In addition to the above processes, other options that could be considered during detailed design are the proprietary Captivator™, BioMag™ and BioActiflo™ processes. These processes would reduce and possibly eliminate the need for additional secondary clarifiers. The Captivator system is a combination of proven unit processes that can be implemented within the existing bioreactor basins to achieve BNR treatment. The Captivator™ process is comprised of a modified contact

stabilization process followed by dissolved air flotation, to replace primary clarifiers, and a Vertical Loop Reactor®, to replace conventional aeration basins. The BioMag™ process includes the addition of a magnetite weighting agent to the bioreactor mixed liquor, greatly increasing the settleability of the mixed liquor, allowing design for higher solids loading rates on the secondary clarifiers. The BioActiflo™ process uses a microsand weighting agent in a sidestream process that is used only for wet weather flows. BioActiflo™ would be evaluated in a dynamic wet weather peak flow model to determine the impact of treating wet weather flows in the sidestream process and how much additional secondary clarifier capacity is needed in the mainstream process with this wet weather hydraulic load taken off the mainstream process.

3.2.7 Plant Schematic

Figure 3-5, located in Appendix A, provides an overall design concept for upgrading the Savanna Street WWTP that shows the yard piping and structures required to move flow from the new PTF to the BTF.

3.2.8 Conclusion

Treatment process modifications reviewed within this Technical Memorandum indicate that their equipment and need for treatment tankage volume fit within the footprint of the current biological process tanks and therefore appear to be a viable process modification. The design engineer will review these and, if the design engineer deems as a value added to the City, other viable alternatives that fit within said footprint, and determine the treatment alternative that meets or exceeds compliance objectives and best serves the City's interests. The design biological process must meet Mississippi Department of Environmental Quality (MDEQ) requirements and must obtain approval from MDEQ.

Appendix A

Figures

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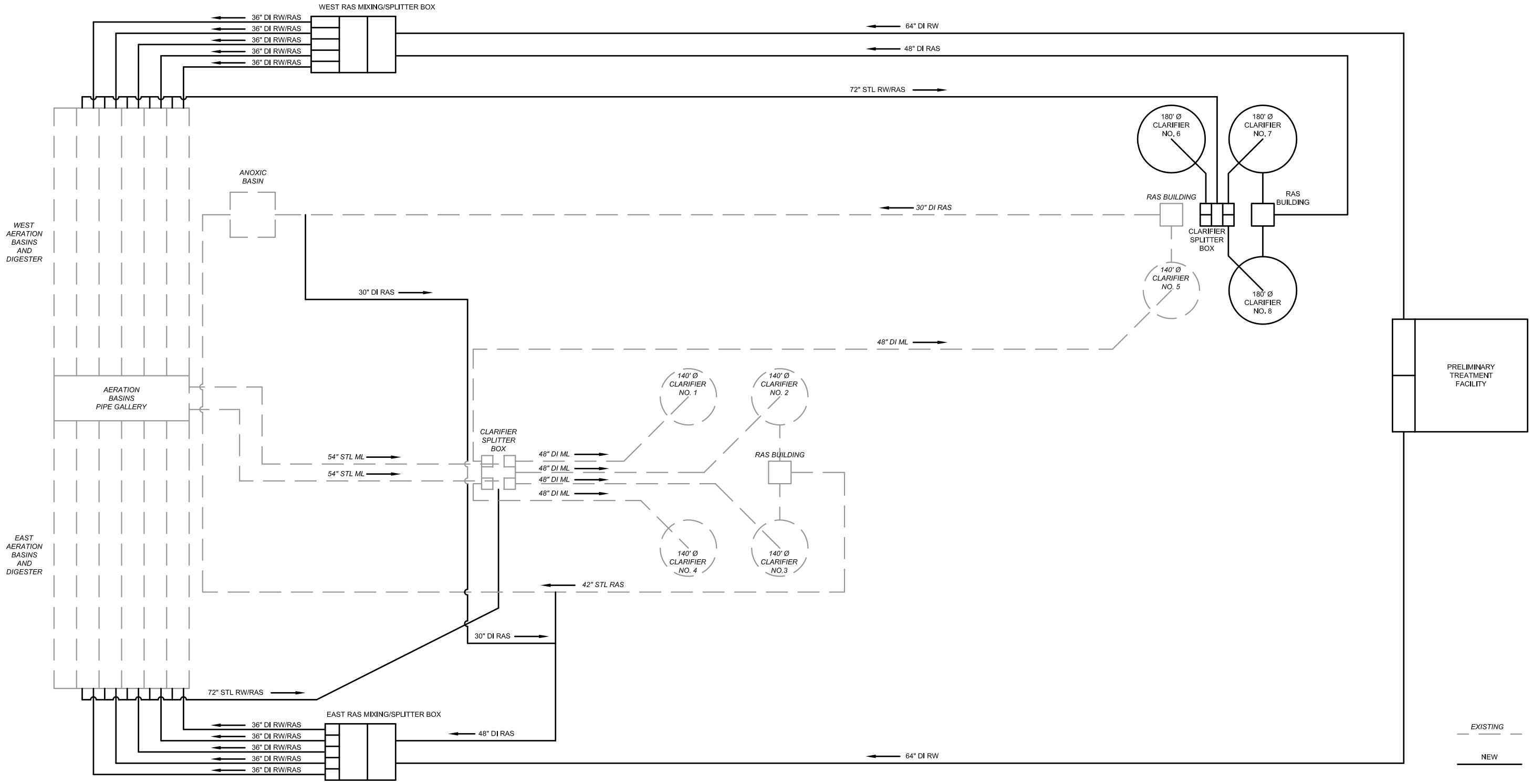

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GIBSON ENGINEERING

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SAVANNA STREET WWTP
SCHEMATIC

DATE APRIL 2016

PROJECT NO. 109677

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Appendix H

Disinfection System Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Disinfection Systems
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

1.1 Disinfection System History

Disinfection of the treated effluent is required in order to meet the effluent requirements of the Mississippi Department of Environmental Quality, Savanna Street WWTP NPDES Permit, issued May 4, 2012.

The disinfection process at the Savanna Street WWTP has primarily consisted of gas chlorine to disinfect the water along with a dechlorination step to remove excess free chlorine. UV disinfection was attempted in 1998-1999, but the process was unsuccessful. Details are provided below.

From initial disinfection system startup to the early 1990s, the Savanna Street WWTP received and fed chlorine gas directly from rail cars. In the early 1990s, for risk management and for safety reasons the facility converted to using one-ton cylinders of liquid chlorine. One-ton cylinders of sulfur dioxide were also used for dechlorination prior to effluent discharge.

In 1998 the plant converted to a UV disinfection system as part of a plant upgrade project. The UV system had a nominal capacity of 100-MGD at a specified wastewater transmittance of 65%. The system did not provide required performance and was taken out of service in late 1999. This UV disinfection system remains in place is not currently in use, and is reported to be non-functional. It has been reported that the operating company at that time performed little or no maintenance on the UV system while it was being operated.

The disinfection system using one-ton cylinders of liquid chlorine was put back into service in 2000 and continues to be used today.

1.2 Comprehensive Performance Evaluation (CPE) Summary and Conclusions

1.2.1 Summary

The disinfection system needs were characterized in the CPE in terms of the CPE / CCP scoring system. The performance limiting factors of the existing disinfection system are summarized in Table 1-1 below.

Table 1-1 Performance Limiting Factors for Savanna Street WWTP Disinfection System

Performance Limiting Factors	Performance Limiting Factor Rating	Remedial Measures
Cl2 Contact Time	A	Type 3
CL2 Feed Rate Control	A	Type 2
SO2 Feed Rate Control	A	Type 2
Contact Basin	A	Type 3
Disinfection Buildings	B	Type 2
One Ton Cylinder Storage	C	Type 2
Chemical Feed Equipment	A	Type 2

The Savanna Street WWTP disinfection systems has no needs that would be classified as Type 1.

1.2.2 Conclusions

The facility has several Type 2 remedial action measures, including:

- **Chemical Feed Rate Control** – The chemical feed rate is manually flow paced, requiring frequent adjustment and often causing excess or inadequate dosing of chemicals. More effective control of the chemical feed is needed.
- **Chemical Feed Equipment** – The current chemical feed equipment is over 16 years old. The equipment may not have reached the end of its useful life, but may be inadequate to allow automated flow, dose, and residual control to be super-imposed on it. The chemical feed system needs to be upgraded for automated control and to allow appropriate application of chemicals during extreme flow, loading and plant upset events.
- **Chemical Feed and Storage Buildings** – These structures do not meet current requirements for the safe storage and containment of chlorine or sulfur dioxide. These structures need to be replaced with appropriate structures to protect, contain and provide temperature control for the chemicals and well as provide proper ventilation and scrubbing in case of chemical leakage or spills.

These Type 2 short-term corrective actions must be completed within 24 months of CCP approval.

The facility additionally has needs requiring Type 3 remedial action measures, including:

- **Chlorine Contact Basin** – The contact time between the disinfectant chemical and the wastewater after mixing is inadequate at all normally experienced flows. The minimum contact time to be provided at all effluent flows up to the maximum flow rate of discharge is 15 minutes.

This Type 3 corrective action item must be completed within 60 months of CCP approval.

Note that the CPE additionally suggests that either the required contact time be provided as the Type 3 corrective action or that the existing UV disinfection system be replaced and upgraded.

Section 2

Current Disinfection System

2.1 Chlorination (Chlorine Gas)

The facility currently uses gaseous chlorine dissolved in water at a high concentration. The water with the high concentration of chlorine is subsequently injected into and mixed with the effluent through a chemical induction system in a small chamber in which the flow from all of the secondary clarifiers are collected and co-mingled. The system components are as follows:

- Chlorine gas cylinder storage building and chlorine equipment building (See Section 2.4)
- Gas cylinder storage area with provisions to store up to 24 tons of compressed chlorine gas as a liquid in the cylinders;
- Chlorine cylinder cradles;
- Scales for active or potentially active chlorine cylinders;
- Two overhead cranes;
- Chlorine gas detectors with local alarms (functionality not tested);
- Chlorine gas regulators;
- Vacuum chlorine transfer equipment and piping;
- Chlorine induction system equipment; and
- Chlorine solution injection and mixing equipment.

Chlorine residual concentration testing is performed manually; there is no chlorine analyzer.

As previously stated, the current disinfection system uses chorine gas stored in one-ton containers that is delivered to be mixed with plant water (recycled effluent) and then delivered to the point of use. The point of use is currently in the collection box for the secondary clarifiers' effluent. Flow through the box is turbulent. The chlorine solution is mixed with the effluent with the use of a chemical induction device within the mixing box.

The Savanna Street WWTP does not have the required contact time to comply with the regulations for the presently permitted flow rates. To compensate, the chlorine dosage is frequently higher than normal for a wastewater treatment plant producing secondary effluent. The dosage used at the Savanna Street facility is reported to be 5-mg/l, but may be higher depending on plant conditions. A dosage of approximately 3-mg/l is considered to be normal when appropriate contact time is provided, so there may be an opportunity to optimize chemical usage.

2.2 Dechlorination (Sulfur Dioxide)

Dechlorination is provided by feeding gaseous sulfur dioxide to the effluent immediately upstream of the plant discharge channel/effluent pump station. The sulfur dioxide (SO_2) is stored in one-ton cylinders containing liquefied sulfur dioxide under pressure. The feed of the gaseous sulfur dioxide is manually adjusted based on the anticipated effluent flow for the day. System components are as follows:

- Two wall mounted sulfonators - one 100 ppd capacity for normal flow and one 250 ppd capacity of wet weather bypass flow;
- Two vacuum induction units;
- Two – 4 ton cylinder headers with 500 ppd vacuum regulators and a one ton cylinder scale for each header;
- One wall mounted automatic switchover unit.

The point of application is within the effluent flow measurement structure. The structure is divided into normal flow and bypass flow channels. Each channel has a vacuum induction unit installed.

While the only SO_2 system component listed in the PLF table is the feed rate control, the CPE does note that the SO_2 feed equipment and SO_2 storage building should be monitored. This system will be reviewed during preliminary design to determine if improvements are required

2.3 UV Disinfection System

There is an existing UV disinfection channel with medium pressure UV lamps installed at the Savanna Street WWTP. The channel was installed in the late 1990s and used for a brief period of time. The system was not meeting performance requirements and was abandoned in 1999. The channel is in good shape, but the equipment cannot be reused.

2.4 Buildings

2.4.1 Chlorine Gas Cylinder Storage Building

The existing chlorine gas cylinder storage building is a metal building that is not an airtight/weatherproof structure. The materials of construction include a concrete floor, concrete columns, steel roof support beams, a corrugated metal exterior shell wall, an interior wall that appears to be panels of cured in place FRP, FRP translucent panels that allow for some natural light penetration, and a shingle roof. The single man door does not have a door or a door frame. The bay doors for chlorine gas cylinder access have gaps between the doors and at the door tops and bottoms. There is an exhaust fan in the building, but no scrubber apparatus to treat escaping gas if a cylinder leak occurs. The heaters in the building are disconnected. MDEQ Part 96.1 and 99A require that chlorine cylinders must be stored in a gas-tight structure. The current building is not gas-tight. Figures 2-1, 2-2 and 2-3 illustrate some of the issues with the existing chlorine gas storage facilities. Note that gaps between, below and above the access gates would allow for gas escape in case of a chlorine leak or spill and create a hazardous condition outside the storage

building. It should also be noted that the existing building can store 32-tons of chlorine gas in 1-ton cylinders.

Figure 2-1
Existing Chlorine Gas Cylinder Storage Building Interior

The 32-one ton cylinders provide sufficient chlorine for over one month at the current MMADF of 75-mgd and for over 50-days at the AADF of 48-mgd.

Figure 2-2 below shows the exterior of the chlorine storage building with the air gaps and open doors

Figure 2-2
Exterior of the Existing Chlorine Storage Building

In the above figure, please note that the open personnel door into the storage building does not even have a door frame, so a door currently cannot be installed in the door space. Adjacent to the opening is the safety shower and eyewash facility. This facility is not sheltered from the potential chlorine gas release nor is it provided with freeze protection.

Figure 2-3 below shows the back wall of the chlorine cylinder storage building with a ventilation fan opening that cannot be closed to prevent the escape of chlorine gas in case of a chlorine spill or leak.

Additionally the electrical fixtures inside the gas cylinder storage buildings should be gas-tight, submersible (IP-68) or explosion proof. IP-68 electrical equipment is likely to be the most practical. To limit the need to spend time inside the building for the replacement of lighting element, LED lighting fixtures are recommended.

Figure 2-3
Interior of Chlorine Gas Storage Building toward 'Back' Wall

2.4.2 Chlorination Equipment Building

The chlorination equipment building houses both chlorination equipment and the plant water pumps. The building exterior is a series of concrete fascia panels with CMU block and painted plaster interior walls. The roof is a concrete plank roof. The chlorination room has a false ceiling. The chlorination room contains only the chlorinators, plant water supply lines, and a supply cabinet. There is a ventilation system for the room.

2.4.3 Chlorination Feed and Control System

A schematic of the existing chlorine feed and control system is shown in Figure 2-4. The chlorine feed rate is totally based on manual operation. The operator reports that the chlorine feed rate is adjusted in proportion to the influent flow rate. No residual chlorine analyzers are used in the system. The existing chlorine regulators are shown in Figure 2-5 below.

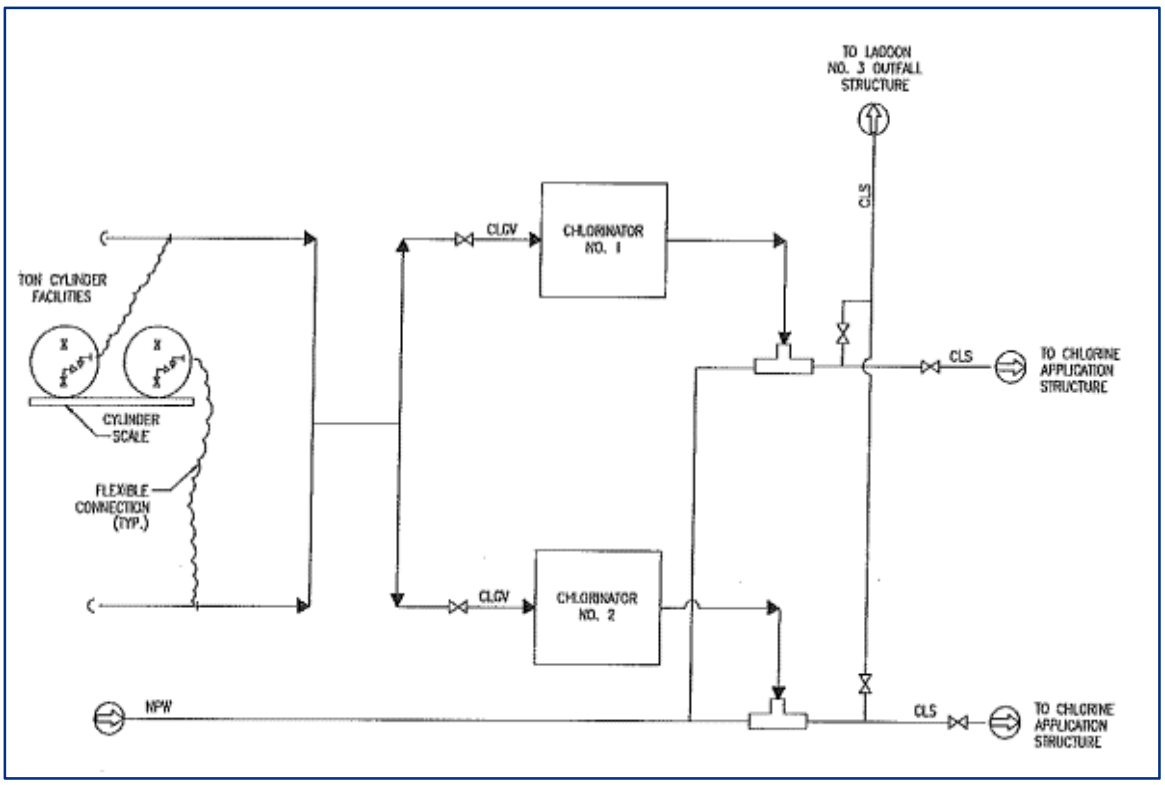

Figure 2-4
Chlorine Feed and Control System Schematic

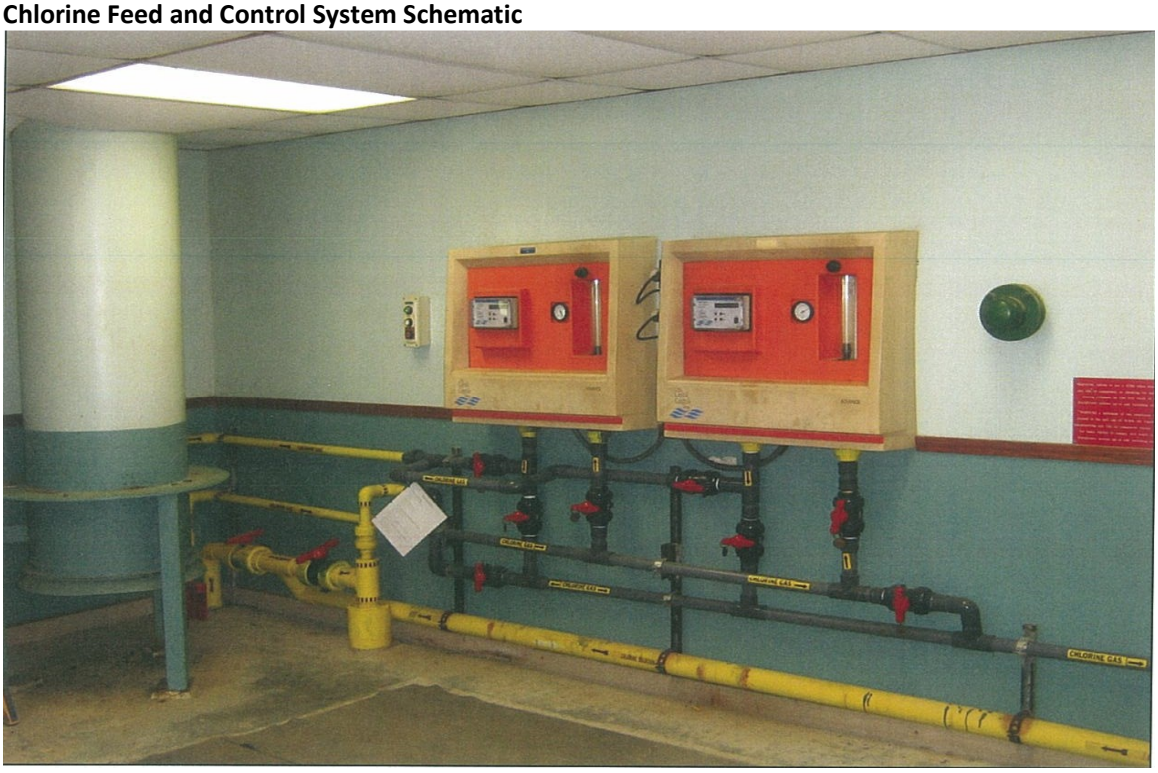

Figure 2-5
Chlorine feed and manual control system

2.4.4 Sulfur Dioxide Gas Building

The Sulfur Dioxide gas storage building is a metal building that is not an airtight/weatherproof structure. The materials of construction include a concrete floor, concrete columns, steel roof support beams (See Figure 2-6), a corrugated metal exterior shell wall, an interior wall that appears to be panels of cured in place FRP, and a shingle roof. The man door leads to the injector room; there is not a man door that leads directly to the outside (See Figure 2-7). There are space heaters in the room. The bay door for sulfur gas cylinder access has gaps between the doors and at the door tops and bottoms. There is an exhaust fan in the building, but no scrubber apparatus to treat escaping gas if a cylinder leak occurs.

The existing sulfur dioxide building suffers issues similar to those of the existing chlorine storage building. The building is not gas-tight, doors are propped open or without functional auto-closure mechanisms. The ventilation system has louvers that close so that outside air is not allowed to enter the building when the fan is off. In case of a sulfur dioxide leak the louvers would allow the gas to escape since the air/gas pressure inside the building would be greater than the ambient pressure outside the building.

Additionally the electrical fixtures inside the gas cylinder storage buildings should be gas-tight, submersible (IP-68) or explosion proof. IP-68 electrical equipment is likely to be the most practical. To limit the need to spend time inside the building for the replacement of lighting element, LED lighting fixtures are recommended.

Figure 2-6
Sulfur Dioxide Cylinder Storage Building Exterior

Figure 2-7
Sulfur Dioxide Storage Building interior

2.4.5 Sulfonator Room and Controls

The sulfonator room is attached to the sulfur dioxide gas storage building. The building is a CMU block building with man doors entering from the outside and from the gas storage building. Sulfonator equipment, recorders and a local water feed system are located here. The sulfur dioxide feed and control system is similar to the chlorine system shown in Figure 2-6 above. There is no automation of either system, which minimizes the opportunity for optimal chemical usage. Figure 2-8 shows existing feed equipment.

Figure 2-8
Sulfur Dioxide Feed, Control Equipment and Recording System

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Section 3

Corrective Actions

3.1 Short-Term Corrective Actions

3.1.1 Improve Chemical Feed Rate Control

To optimize chemical feed rates in the disinfection system, the chlorination and dechlorination feed rates should be set in accordance with the flow and chlorine demand and on the chlorine residual just prior to the dechlorination system feed/ mixing location. A compound loop system is capable of regulating the chlorine and sulfur dioxide feed rates to efficient levels that are not wasteful. The chlorination system sensors, feed rates, and feedback loops should all be adjustable through the use of set points in the WWTP SCADA. A general description of the improvements are provided below.

3.1.1.1 Chlorination Feed Rate Control

Chlorination feed rate control can be attained by use of a compound loop controller using flow and water quality data to control chlorine feed rate. This is also referred to as a cascade control strategy as shown in Figure 3-1 below. The water quality data of interest is the chlorine residual at the contact tank exit. With this data and the proper control program, chlorine usage can be optimized. The detailed design engineer will design the specifics of the system, but in general the system would consist of redundant chlorine analyzers to read chlorine residual at the contact tank exit and a flow meter to provide the initial chlorine dosage into the injection chamber. Data from the existing plant effluent flow meter should be sufficient for control purposes.

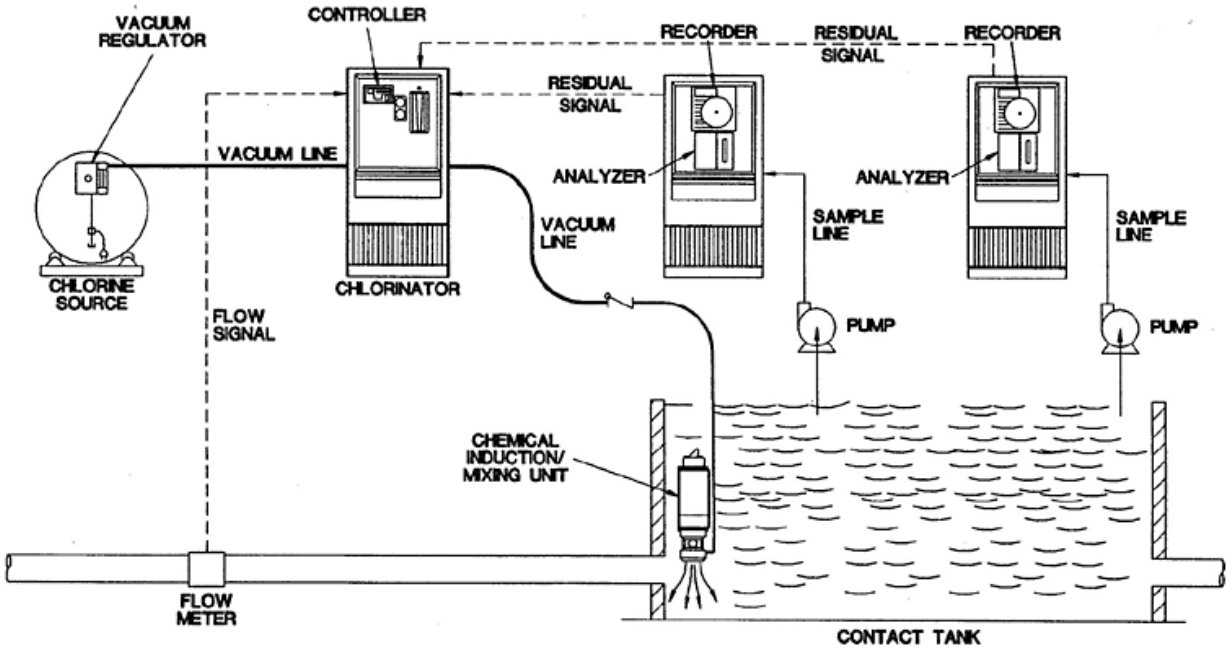

Figure 3-1
Chlorine feed and cascade control strategy

3.1.1.2 Sulfur Dioxide (Dechlorination) Feed Rate Control

Dechlorination feed rate control can be attained by use of a compound loop controller using flow and water quality data to control sulfur dioxide feed rate. The water quality data of interest is the chlorine residual the sulfur dioxide is being injected to neutralize. With this data and the proper control program, sulfur dioxide usage can be optimized. The detailed design engineer will design the specifics of the system, but in general the system would consist of redundant chlorine analyzers upstream of the sulfur dioxide injection point and a flow meter to provide the flow rate into the injection chamber. Data from the existing plant effluent flow meter and the chlorine analyzers at the contact tank exit should be sufficient for control purposes.

The cascade control system as shown in Figure 3-1 above as used for chlorination can also be used to help to optimize the dechlorination system,

3.1.2 Evaluate Chemical Feed Equipment during Detailed Design

The chlorine feed system equipment (regulators, injectors, hoses, etc.) is greater than 15 years old, but may be able to remain in service and should not automatically be earmarked for replacement. The equipment should be evaluated during detailed design for potential replacement keeping in mind that the equipment must be capable of meeting the design chlorine feed demands. The equipment must also be capable of reporting through and reacting to the compound loop system instruction as well as assimilate set point changes from SCADA and report pertinent data to SCADA. As the loop descriptions and control equipment will not be specified until detailed design, the evaluation of equipment is not applicable for this stage of the project.

3.1.3 Upgrade the Disinfection System Buildings

The disinfection system buildings require extensive upgrades or replacement to meet current codes. A description of improvements is provided below.

3.1.3.1 Chlorine Gas Storage Building and Sulfur Dioxide Gas Storage Building

The buildings require replacement with structures that can contain a gas leak and a scrubber system that can treat the leaking and contained gas. MDEQ requires that gas cylinders must be stored in air-tight rooms. Replacing the existing buildings to be gas tight will also require the addition of appropriate ventilation system linked to gas scrubbers in case of a gas leak inside the building. This will allow the gas produced from a spill or leak to be safely removed. Details of the building will be provided during detailed design.

3.1.3.2 Chlorine and Sulfur Dioxide Equipment Buildings

The chlorine and sulfur dioxide injection equipment buildings will be reviewed for Code violations and brought up to Code standards. The room structures are anticipated to be acceptable for continued use, based on the visual inspections performed, but the HVAC systems may require upgrade. Needs will be determined during detailed design.

3.2 Long-Term Corrective Actions

3.2.1 Add the Chlorine Contact Basin

The chlorine contact basin is needed to provide the required minimum chlorine contact time of 15-min at the peak flow rate of the WWTP (138 mgd). If this is to be provided in a well-designed

tank with appropriate baffling (efficiency equals the maximum allowed of 70%) the tank size needed is about 275,000 cubic feet. If full allowance for the potential time in the existing pipes is also to be used, then a credit of about 40,000 cubic feet can be taken. The approximate dimensions of this tank are about 280 feet long by 60 feet wide by 14 feet deep. Details of the tank will be provided during detailed design.

3.3 Alternative Disinfection Systems Investigation

The existing chlorination / dechlorination system is a viable alternative for future plant use. With the inherent danger of chlorine gas and potential future restrictions on the continued use of chlorine gas, it may be prudent to review alternate disinfection technologies during detailed design. The following alternatives could be viable:

- UV disinfection equipment, properly maintained, can be successful and would reduce the chemical inventory at the WWTP. Small amounts of chlorine (gas or hypo) may be needed on site for use as a part of the operational process control strategy.
- Liquid Sodium Hypochlorite is an alternative to gaseous chlorine. Sulfur Dioxide would still be required for dechlorination.
- Paracetic Acid can disinfect effluent wastewater without the need for sulfur dioxide. However, this option may still require the addition of a basin to provide adequate contact time.
- Sodium Bisulfite is an alternative dechlorination chemical. It works similar to sulfur dioxide but may be less expensive to use.

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Appendix I

Biosolids Processes Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Biosolids
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

The purpose of this Technical Memorandum is to discuss and/or evaluate sludge thickening, digestion, and dewatering processes for implementation at the Savanna St. Wastewater Treatment Plant (WWTP). This TM summarizes the design criteria for each process, discusses current technologies (or in the case of digestion, discuss the biological process alternatives), and presents advantages and disadvantages of each alternative.

1.1 Background

The Savanna Street WWTP was constructed in 1971. The sludge digestion and thickening processes were constructed at that time. Dewatering processes were added in the 1980s. A brief summary of each process is described below.

Sludge that is wasted from the aeration process is sent to the aerobic digestion tanks. There are two tanks, each 2.56 MG in size, located near the south end of the aeration basin tank farm. Each digester tank is a two-pass channel that is aerated using bottom channel air diffusers. The process has remained essentially unchanged since construction.

Effluent from each digester flows into a 30' x 30' gravity thickening tank. The tank is located within the aeration basin footprint, at the downstream end of the digester channel. The process has remained essentially unchanged since construction. The thickeners are undersized for their intended purpose, do not provide proper sludge thickening, and often have significant amounts of solids overflow in the tank effluent.

An independent contractor was operating and maintaining the biosolids dewatering system. Several years ago, the operator suddenly ceased management of the biosolids facility. The City added operation and maintenance of this system to the list of responsibilities of UWS-MS, and UWS-MS has been responsible for the biosolids dewatering system operation since that time.

In an effort to improve dewatering capability, Jackson moved three (3) 1.5 meter belt filter presses from the Trahon WWTP to the Jackson WWTP. The equipment has not performed as expected, and currently sits in the biosolids building as an emergency backup system. When it was determined that this system would not meet Jackson's objectives, a 2-meter belt filter press and a centrifuge were rented and brought to the biosolids building. The belt filter press has been the primary dewatering machine used since its arrival on-site. The centrifuge did not provide the level of reliable service that Jackson anticipated, so it sits on site as a backup system in the event the belt filter press fails.

Sludge is conveyed from the dewatering equipment via conveyor to the sludge storage area. When conditions allow for immediate land application of biosolids, the conveyor drops the biosolids directly into truck beds for immediate transport. During periods when land application is not allowed, the conveyor drops the biosolids onto the floor of the storage bay, and the

biosolids are moved around the site by a bucket loader truck as necessary to maximize storage capacity.

1.2 CPE Summary Concerning Biosolids Dewatering

The CPE identified the following performance limiting factors (all identified as Type 2 Improvements):

1. Thickening – more effective method required.
2. Sludge Dewatering – replacement of equipment required.
3. Dewatering Building – replacement required.
4. Dewatered Sludge Storage – covered sludge storage required.

While these are all listed as Type 2 improvements, it is recognized that new thickening and dewatering equipment is required and a new structure to house the dewatering system is also required. These items are more appropriately viewed as long-term corrective actions, in accordance with the EPA guidance documents and as described within. The dewatered sludge storage cover can be considered as a short term corrective action. A cover over the storage area can be designed and constructed independently of any other project, and an immediate positive benefit can be realized.

It is noted here, and reiterated below, that the biosolids improvements project can be designed, bid, and constructed independently of the "wet train" process improvements. In keeping with the CPE recognition that this is a high priority project, design will begin upon acceptance of the CCP report, but the project schedule is shown as 3 years in the project schedule in recognition of the fact that a cost premium would likely be paid by the City for compressing a project this complex into a 2 year time frame.

Section 2
Existing Facilities Description

The existing solids handling facilities consist of sludge digestion, thickening, pumping, storage (Frac tank), and dewatering processes. The specific components are:

- Two WAS pumps.
- Two aerobic digesters.
- Two gravity sludge thickeners.
- Two thickened sludge WAS pumps.
- Thickened sludge holding ("frac") tank.
- Belt press/centrifuge feed pumps.
- Three permanent 1.5 meter belt filter presses, one 2 meter rental belt filter press, and one rental centrifuge for sludge dewatering.

The aeration basin structure houses all equipment related to solids handling upstream of the frac tank. The upstream tanks of the structure provide the aeration process, while the downstream provide digestion. A 30 foot square gravity thickener is located at the end of each digester tank. The sludge from the gravity thickeners is pumped to the frac tank by the WAS pumps, which are housed in the aeration basin pipe gallery.

The plant produces sludge that, after introduction into the soil, meets Class B pathogen reduction criteria. After dewatering, sludge cake is hauled by a private contractor to agricultural land application sites owned by the City. A schematic of the plant solids handling facilities is shown in Figure 2-1 and Figure 2-2.

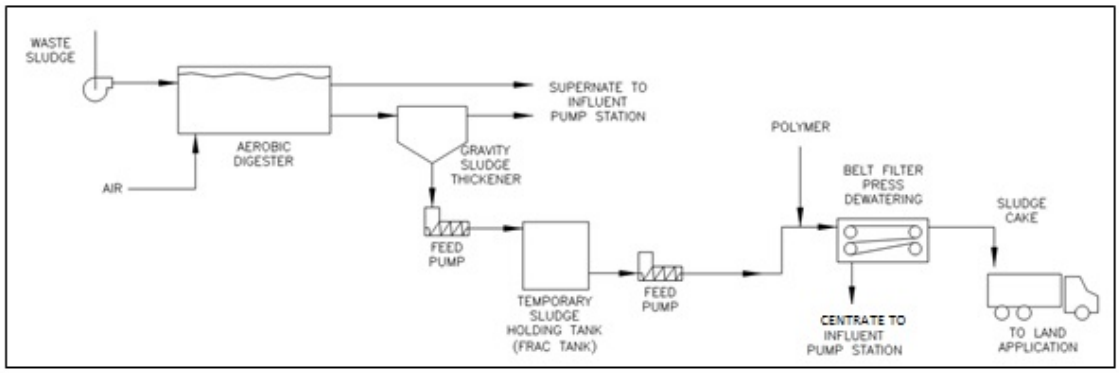

Figure 2-1
Savanna Street WWTP Solids Handling Facilities, Belt Filter Press Train

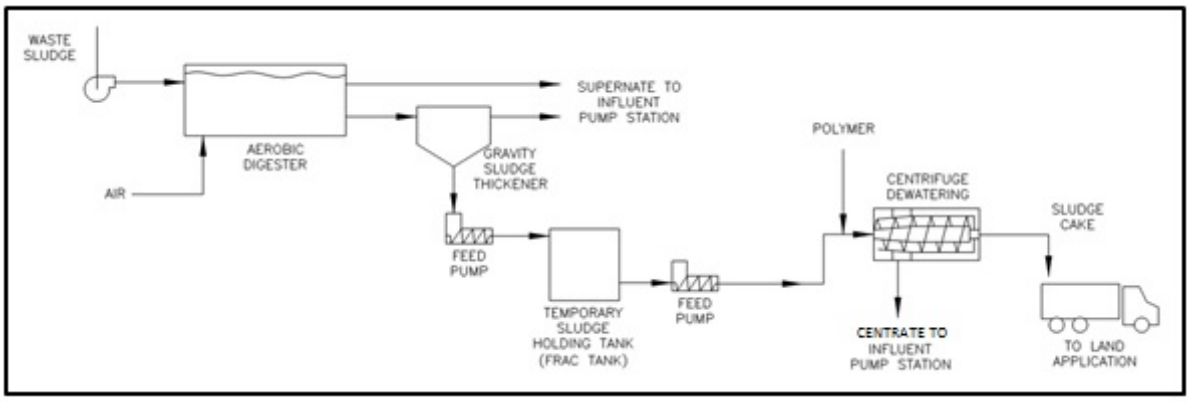

Figure 2-2
Savanna Street WWTP Solids Handling Facilities, Centrifuge Train

2.1 Aerobic Digestion

The plant has two aerobic digesters, each with a capacity of 2.56 MG. They are aerated using fine bubble flexible membrane tube diffusers manufactured by Environmental Dynamics, Inc. Aeration air is supplied by the main process air system for the plant which consists of four Roots single-stage blowers.

A summary of the current aerobic digester operation is shown on Table 2-1. A photo of one of the digesters is included as Figure 2-3, illustrating the two longitudinal cells in series that comprise each tank.

Table 2-1 Aerobic Digester Performance at Savanna Street WWTP

Parameter	Units	Value	Remarks
Aerobic digesters	ea	2	
Digester volume, ea	gal	2,560,000	
Total digester volume	gal	5,120,000	
Digester detention time	days	6.4	
Digested sludge solids	lb/day	91,600	To thickening
Digested sludge volume	gpd	550,000	
Thickened sludge concentration	%	2.0%	
Volatile solids reduction	%	5.1%	

Figure 2-3
Savanna Street WWTP Aerobic Digester

As indicated in Table 2-1, the digester detention time is relatively short, since typically 20 days or more are provided for aerobic digestion. Despite the short detention time, the digested sludge is achieving Class B pathogen standards according to plant lab tests. It does not achieve the required vector attraction reduction criteria of 38 percent volatile solids reduction. However, in Mississippi, MDEQ regulations require that all land applied sludge be incorporated into the subsoil (plowed in), which in itself is an acceptable vector attraction reduction option.

2.2 Gravity Thickening

Each aerobic digester tank contains an integral, 30-foot square gravity thickener. Digested sludge discharges over a weir into the gravity thickener. As seen in Figure 2-4 below, solids overflow is a common occurrence. This is evident in plant operating data by the low solids capture rate of the thickeners. A properly sized gravity thickener should produce a dilute supernatant containing relatively little solids.

The solids carryover and recycling of excess solids within the plant requires correction. In order for normal plant operations to be maintained, additional thickening capacity and/or other improvements should be provided to avoid the continuous recycle of excess solids.

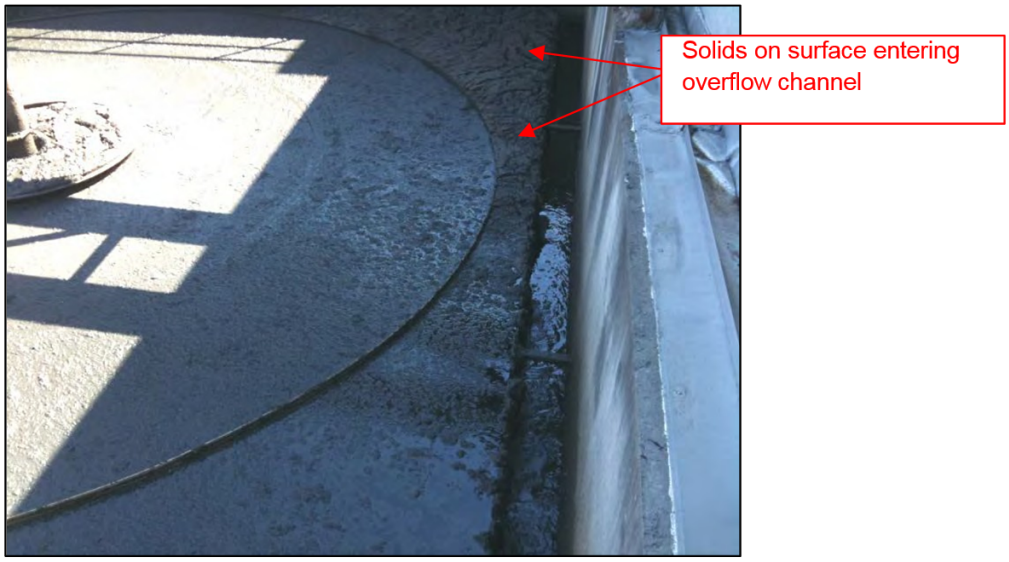

Figure 2-4
Savanna Street WWTP Gravity Thickener

2.3 Sludge Holding Tank

As shown in Figure 2-5, the portable 20,000 gallon "frac" tank used as a temporary holding tank for thickened sludge serves the purpose of partially disconnecting the sludge thickening and sludge dewatering operations. The tank contains an air distribution system fed by two blowers housed in a building adjacent to the frac tank. This system, which is used to mix the contents of the tank, does not appear to be functional at this time.

The tank has two discharge ports. One port routes sludge to the rental belt filter press. The other routes sludge to the rental centrifuge. Pumps located at each piece of equipment draw sludge from the frac tank to the dewatering equipment.

Figure 2-5
Sludge Holding (Frac) Tank

2.4 Sludge Dewatering Equipment

In an effort to improve the sludge dewatering process, the three existing BFPs at the Trahon WWTP were relocated to the Savanna Street WWTP. These three existing 1.5 meter belt filter presses, shown in Figure 2-6, are in excess of twenty years old and have been difficult to maintain. Although two of the presses were refurbished in 2011 by the manufacturer, frequent breakdowns continue to occur; current estimates by plant staff place availability of the three machines at 50%. Due to the unreliability of these presses, the City is renting a 2-meter portable belt filter press, shown in Figure 2-7, and a 26-in diameter portable centrifuge.

Figure 2-6
1.5 Meter Belt Filter Presses

Figure 2-7
Rented 2.0 Meter Belt Filter Press with Chemical Feed Tote (right side of picture)

Current operational practice is to use the rented 2-meter belt filter press whenever it is working. The remaining equipment is only used when the 2-meter press is unavailable for use. It has been reported that the backup equipment is not always available when needed, so at times the plant must stop dewatering functions. When in service, the 1.5 meter presses are supported by the polymer feed units and sludge feed pumps shown in Figure 2-8.

Figure 2-8
Polymer Feed Units (foreground) and Sludge Feed Pumps (background) for 1.5m presses

2.5 Dewatering Building

The dewatering equipment is housed in a 34 year old steel-framed building, shown in Figure 2-9, that is in very poor condition. The roof and wall panels have numerous holes and continue to deteriorate to the point that operators have installed netting under the roof trusses to trap falling debris. There is also damage to the framing and concrete foundation wall from past vehicle impacts. Per the inspection and assessment, the existing dewatering building is in need of complete replacement.

Figure 2-9
Sludge Dewatering Building, Damaged (left), and Debris Net (right)

2.6 Sludge Disposal

The plant generates approximately 43 dry tons per day of sludge. With a dewatered cake at 20 percent solids, this equates to 215 wet tons per day or about 11 truckloads per day. During wet weather conditions, when access to the land application sites is not possible, the dewatered sludge cake must be temporarily stored on-site in the uncovered storage space. While in this storage area, cake is exposed to the weather (including rain events) and is susceptible to re-growth of pathogens.

Dewatered sludge cake is transferred from the dewatering equipment using a belt conveyor. The conveyor delivers the sludge to one of two locations: (1) to truck beds for delivery to land application sites; and (2) when land application is not possible due to environmental conditions or when there is excess sludge for current land application needs, directly to the sludge storage area. A bucket truck is used to move the stored sludge within the storage area or to delivery trucks when deliveries can be made. This storage site is shown in Figure 2-10. When options 1 and 2 are not available, the sludge may be applied to the nearby City-owned Byram Landfill Farm or, in the worst case, disposed of in a commercial landfill.

Figure 2-10
Dewatered Sludge Storage

The plant has obtained permits to dispose of sludge on 18 land application sites totaling 4,036 acres. With the application acreages currently permitted, the plant has sufficient land application capability to dispose of the sludge produced.

For additional background on Savanna Street's historical sludge protection, please see Exhibit A, Savanna Street Wastewater Treatment Plant Sludge Management Plan.

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Section 3
Short-Term Corrective Action

The existing sludge storage bay is 100' x 140', with a concrete wall around the perimeter. The wall has a 20 foot break on the northern wall (See Figure 2-10), where biosolids are loaded onto a truck. It is recommended that the storage area be covered.

An architectural fabric covering is a cost-effective solution. Such structures can be designed to provide room for machinery to operate inside and can be of material capable of withstanding caustic fumes associated with biosolid storage (typically a polyurethane coated membrane). The covering can accommodate HVAC or lighting if desired/warranted. Many companies lease their coverings, with an option to credit towards a full purchase if desired by the customer. The substructure supporting the fabric is typically aluminum, and may be mounted directly on the existing wall. Examples of such fabric covered facilities are shown in Figure 3-1.

Figure 3-1
Architectural Fabric Structure Examples
(Images Courtesy of Sprung Instant Structures Ltd.)

According to the Mississippi Department of Environmental Quality, the cake storage area should be capable of holding three months of projected cake production. The storage facility size should be verified in detailed design.

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Section 4

Long-Term Corrective Action Alternative Review

4.1 Sludge Thickening

Sludge thickening is required to reduce volumetric loading on the aerobic digestion process, produce a relatively solids-free supernatant, and increase the efficiency of subsequent solids processing steps. The digested feed sludge, waste activated sludge (WAS), will need to be thickened from 1% to 5% prior to entering the digesters. The "5% solids concentration goal" is desired to increase volatile solids destruction and to optimize aerobic digestion performance. A comparison of the three sludge thickening technologies considered for this application is shown in Table 4.1.

Table 4-1 Technology Options for Thickening WAS

Technology	Description	Typical Thickened Solids, %	Justification
Gravity Belt Thickening (GBT)	Water is drained from flocculated solids on a fabric mesh belt; belt wash cleans belt before return to the influent end of equipment.	4% to 6%	Proven equipment with successful operating history. Long successful track record.
Rotary Drum Thickening (RDT)	Rotating drum conveys flocculated feed through basket; basket allows drainage of water with flocculated solids being retained.	4% to 6%	Enclosed process with operating history of similarly sized equipment.
Screw Thickening	Rotating screw conveys flocculated feed through inclined basket; mesh on basket allows drainage of water with flocculated solids being retained.	4% to 5%	No known U.S. installations for municipal WAS thickening in the size required.

Sludge thickening at the SSWWTP is being relocated upstream of the digesters to improve digester performance. The feed sludge (primary, WAS, or primary/WAS blend) will be thickened to a target percent solids of 5% prior to entering the digesters.

4.1.1 Alternative 1: Gravity Belt Thickener (GBT)

GBTs operate on the principle of coagulation and flocculation of solids in dilute sludge. The sludge is conditioned with polymer to coagulate and concentrate the solids. The conditioned sludge is then fed to a distribution box, which evenly applies it to a slow-moving, porous fabric belt. Separation of sludge solids from the liquid is by gravity drainage and capillary suction forces imparted by the fabric's interstitial voids. As the conditioned sludge is conveyed along the belt, plow blades create furrows that allow water to pass through the belt. Free water released from the solids drains through the belt while the solids remain on top. The drained water is typically

returned to the headworks of the plant. The thickened sludge is discharged to a hopper, and the belt passes through a wash cycle to remove any solids trapped in the fabric mesh. The GBTs are driven by a variable-speed drive unit. GBTs are often manufactured in standard equipment sizes where the capacity is a function of the belt width. As shown in Figure 4.1, multiple GBTs are often required for capacity and reliability, and they can be installed in a side-by-side or end-to-end configuration.

Figure 4-1
Multiple GBTs Arranged in Parallel

GBTs are particularly suitable for thickening WAS as a volume reduction method prior to digestion. GBTs can be furnished with enclosures integral to the frame to contain odors and exhaust them to an odor control system. The enclosures provide access to the gravity table through hinged access panels, while the side panels are typically bolted. A conceptual layout of a GBT facility is shown in Figure 4-2.

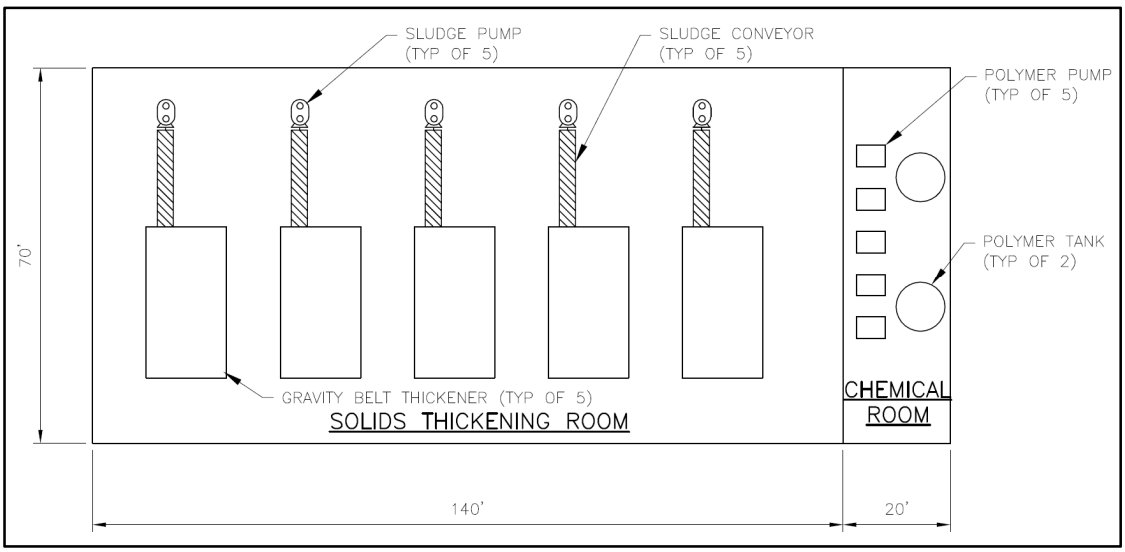

Figure 4-2
GBT Thickening Facility Conceptual Layout

4.1.2 Alternative 2: Rotary Drum Thickener (RDT)

A RDT functions similar to a GBT unit, achieving solid-liquid separation by coagulation and flocculation of solids and drainage of free water through rotating porous media. The porous media typically consists of a drum with cloth filter, wedge wires, perforations, or stainless steel mesh screens.

The thickener consists of a floc tank followed by an internally fed rotary drum with internal flights that are used to transport the thickened sludge to the end of the drum. The drum rotates on trunnion wheels and is driven by a variable speed drive. Sludge is polymer conditioned and mixed in a flocculation tank prior to thickening. A photo of one manufacturer's arrangement for the flocculation tank and drum thickener is shown in Figure 4.3. The conditioned sludge is fed directly to the interior of the drum via piping to one end of the drum. As the drum rotates, free water passes through the drum perforations into a collection trough, leaving thickened sludge inside the drum that is discharged by the internal flights at the opposite end into a hopper. A continuous fixed spray bar extends along the entire length of the drum to clean and prevent blinding of the screen.

Figure 4-3
RDT with Flocculation Tank

Similar to the GBT, rotary drum thickening is a relatively low-energy process. Power is required for polymer addition, sludge mixing, and drum rotation. Similar to GBTs, the RDT process can be operated continuously with minimal operator attention. A conceptual layout of a RDT facility is shown in Figure 4-4.

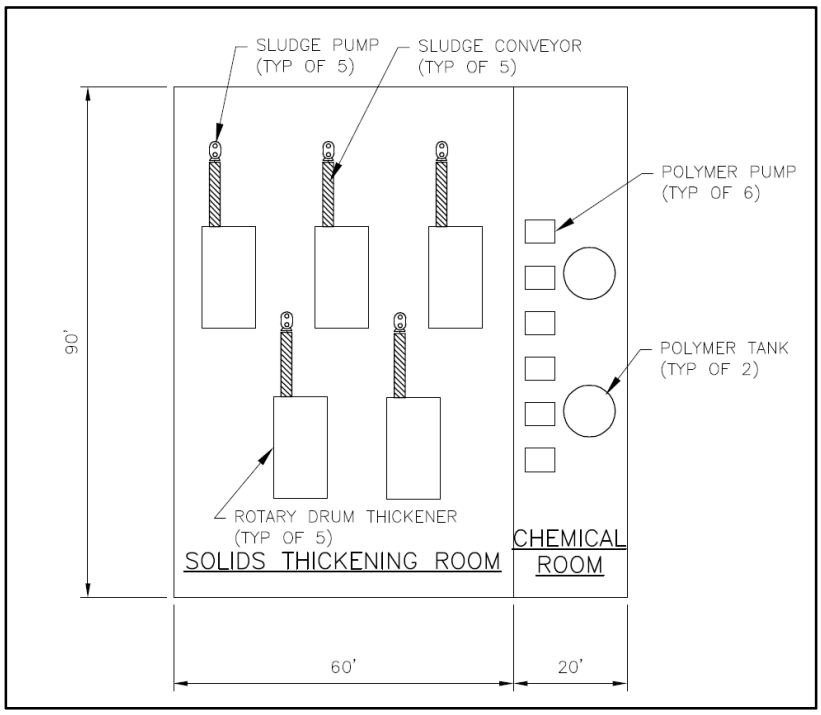

Figure 4-4
RDT Thickening Facility Conceptual Layout

4.1.3 Alternative 3: Screw Thickening

Similar to RDTs, screw thickeners achieve solid-water separation by coagulation and flocculation of solids, and drainage of free water through porous media at the perimeter of the tank. The sludge is preconditioned with polymer in a separate tank prior to introduction to the screw thickener. Once in the screw thickening tank, conditioned sludge is conveyed from the bottom of the tank to the top using a variable speed screw conveyor. Water separates from the coagulated solids through the perforated basket at the perimeter of the screw conveyor. Thickened sludge exits the thickener through the top of the tank into a hopper. Filtrate exits the tank through the bottom of the tank. The complete screw thickener assembly, with conditioning tank and thickened sludge hopper, is shown in Figure 4-5.

Figure 4-5
Screw Thickening Assembly

Similar to GBTs and RDTs, screw thickening is a relatively low-energy process. Power is required for polymer addition, sludge mixing, and screw rotation. Screw conveyors can be operated continuously with little operator attention. However, unlike GBTs and RDTs there are few domestic screw thickener installations for municipal WAS thickening. A conceptual layout of a screw thickening facility is shown in Figure 4-6.

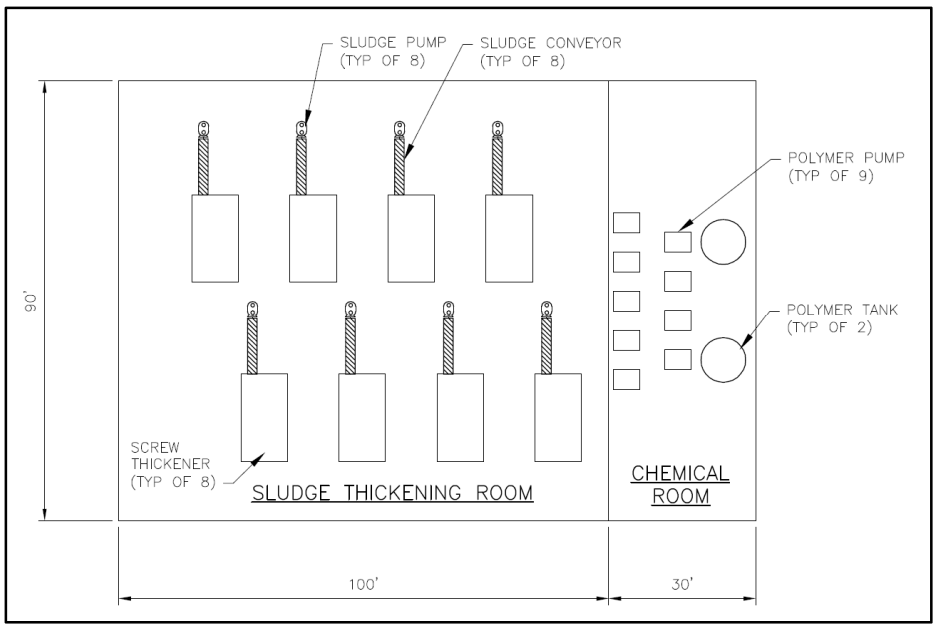

Figure 4-6
Screw Thickening Facility Conceptual Layout

4.1.4 Thickened Sludge Pumping

New pumps will be required to convey mechanically thickened sludge to the dewatering equipment. Positive displacement pumps are preferred for high-solids applications, for their ability to convey low flow at high pressure, and capability to pump gas entrained, variable viscosity sludge. Progressive cavity and rotary lobe pumps may both be considered for this use.

4.1.5 Thickened Sludge Building

The cost of the sludge thickening building is a significant consideration. The building will need to house the thickening equipment as well as supporting equipment including sludge feed pumps, the polymer feed system (polymer storage tanks, pumps, and piping, with tanks and pumps in a separate room from the dewatering equipment), conveyors, control panels, and a ventilation system. GBTs will have the largest footprint and the equipment/building should be constructed to provide odor control in the event it is needed in the future. While rotary drum thickeners and screw thickeners have similar footprints for an individual piece of equipment, the room footprint of rotary drum thickeners is smaller because a rotary drum thickener has higher throughput than a screw thickener and, therefore, requires fewer units.

4.1.6 Summary of Alternative Review

A review of the alternatives noted above indicate that GBTs and RDTs are viable alternatives and should be reviewed further during detailed design. It also indicates that, due to their lack of installation history in facilities of this size and high capital cost due to the high number of units required, that screw thickeners are not a viable alternative and should not be evaluated further.

4.2 Sludge Digestion

Aerobic digestion is a biological sludge treatment process that stabilizes the sludge by aerobic bacterial breakdown of the volatile and biodegradable organic constituents (e.g., proteins, carbohydrates, fats, and grease) of sludge in the presence of free oxygen. Aerobic digestion is based on the principle that, in the absence of an adequate external food source, microorganisms will consume their own cellular mass to obtain energy which in turn reduces the sludge volume. This biological process is commonly referred to as endogenous respiration.

The aerobic digestion process requires blowers, coarse bubble diffusers, mixers, feed pumps, valves and piping. In general, thickened sludge solids are aerated and mixed in a tank for a period of 18-22 days, depending on the temperature of the sludge contents, to ensure the solids are thoroughly treated and stabilized. A continuous operation system will be employed. During the continuous operation, the digested solids are removed from the tank for dewatering and ultimate disposal. The most critical operating parameters are oxygenation and mixing. Maintaining sufficient oxygen levels allows the biological process to occur and helps control nuisance odors. In addition, proper system operation requires adequate, homogeneous mixing of the digester tank contents to ensure proper contact of oxygen, cellular material, and organic matter.

This process already exists at the SSWWTP, and will be maintained. To approach the industry-standard retention time frame, the thickening process will be relocated to upstream of the digesters and the existing thickening tank will be converted to add storage volume to the existing digester tanks. Preliminary calculations indicate that retention time can be obtained in the existing tankage, but this should be confirmed during detailed design. Blower capacity for the digesters will be reviewed, and the fine bubble diffusers in the digester tanks will be replaced with coarse bubble diffusers. It is noted that preliminary analysis of air requirements in the plant, as compared to the existing blower capacity, indicate that existing blower capacity is sufficient for future plant process needs.

4.3 Sludge Dewatering

Sludge dewatering is the process of mechanically separating water from the sludge solids. As mechanical forces are applied during dewatering (typically via compression, centrifugation, or filtration), a percentage of the interstitial water is released from the sludge and separated from the bulk solids to produce a sludge "cake." The resultant cake dryness depends primarily on the type of mechanical force applied and the characteristics of the sludge, although the conditioning process also has significant impacts on the limits of dewatering.

The CPE identified that sludge dewatering processes at Savanna Street required replacement. As part of the CCP, the decision was made to evaluate the dewatering processes and determine viable alternatives for the City of Jackson. A summary description of alternatives reviewed is provided in Table 4-2.

Table 4-2 Technology Options for Dewatering Digested WAS

Technology	Description	Typical Dewatered Solids, %	Justification
Belt Filter Presses (BFP)	Water is drained from flocculated solids on a fabric mesh belt; belt wash cleans belt before return to the influent end of equipment.	16% to 18%	Proven equipment with successful operating history. Requires a moderate level of operator attention.
Centrifuges	Rotational force separates solids from liquid. Liquid collects along bowl walls and drains from the influent end, solids are pushed out of a conical section on the opposite end.	18% to 20%	Proven equipment with successful operating history. Requires a minimal level of operator attention. Enclosed process.
Screw Presses	A rotating screw pushes sludge along a perforated basket or screen, allowing liquid to separate onto the pan below.	15% to 17%	Comparatively limited operating history in municipal wastewater, but multiple installations are in the US and a track record has bene established. Requires a minimal level of operator attention. Enclosed process.

4.3.1 Design Criteria

The design criteria for the dewatering evaluation is contingent on the approach to digestion, which is discussed in detail in the Biological Process TM. While the equipment selection will need to be confirmed as the optimal option once a digestion strategy is selected, the criteria listed in Table 4-3 offer a reasonable baseline for comparison of dewatering techniques.

Table 4-3 Dewatering Equipment Design Parameters

Parameter	Value
Design Average Plant Flow (mgd)	60
Digested Sludge Production (dppd) Design Max Month Design Avg. Month	 72,500 61,000
Digested Sludge Volume (gpd) Design Max Month Design Avg. Month	 288,000 238,000
Desired Weekly Operating Period (hrs)	80

4.3.2 Alternative 1: Belt Filter Press (BFP)

A BFP separates water from solids through a combination of gravity drainage, pressure, and shear. This can be accomplished using a 2-belt or 3-belt BFP design. For thin sludge (<2 percent total solids (TS)), the 3-belt configuration may be more advantageous than the 2-belt configuration. The 3-belt configuration provides an independent belt for the gravity deck (with two belts for the pressure zone), allowing operators to optimize gravity belt speed to handle high

hydraulic loads without sacrificing pressure zone belt speed, typically used for low TS concentration sludges. As sludge fed to the unit is anticipated to be greater than 2%, a 2-belt configuration is assumed.

Advantages of the BFP include its simplicity and low power requirements. In addition, BFPs typically have lower polymer consumption than centrifuges and provide good capture efficiencies of 95 percent or greater.

Disadvantages of the BFP include more frequent operator attention, the relatively large footprint required for the system, difficulty of odor containment, lower cake TS concentration in comparison to centrifuges, and the significant amount of washwater at high pressure required to maintain the belts' porosity. The washwater requirement, which can range from 50 to 100 percent of the sludge feed rate to the press, can be met with non-potable water. This washwater would be mixed with the filtrate and sent back to the Influent Pump Station. Figure 4-7 shows different configurations for BFPs.

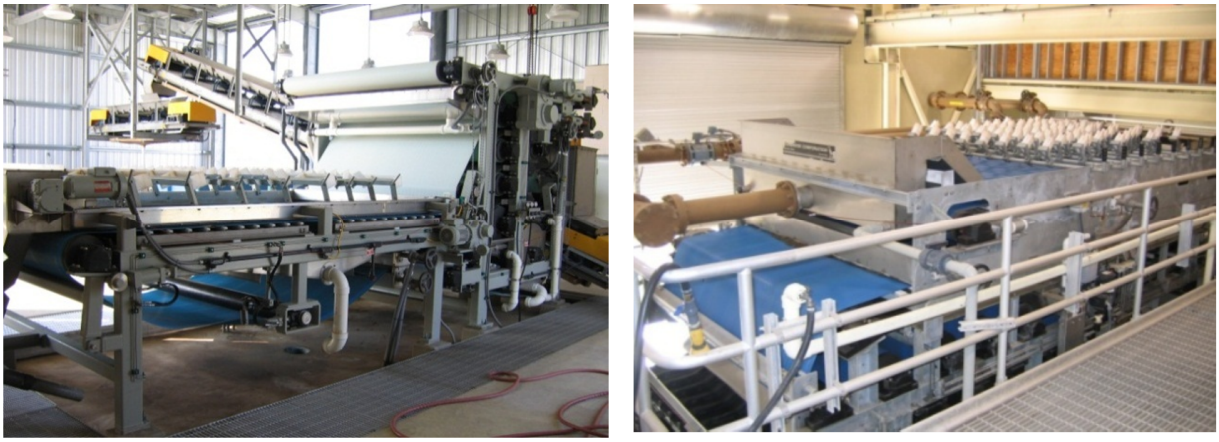

Figure 4-7
Vertical and Horizontal Belt Filter Press Configurations

BFP Manufacturers and Experience

Belt filter presses are the most commonly used dewatering process in the municipal wastewater industry. The most common belt filter press manufacturers are Andritz, Alfa Laval, Ashbrook Simon-Hartley, Komline-Sanderson, and BDP. Each of the manufacturers has units with sufficient capacity for the Savanna St. WWTP and numerous installations of similar-sized equipment. The municipal BFP supply market is very competitive, and these manufacturers' units could be competitively bid against one another. A conceptual layout of a BFP facility is shown in Figure 4-8.

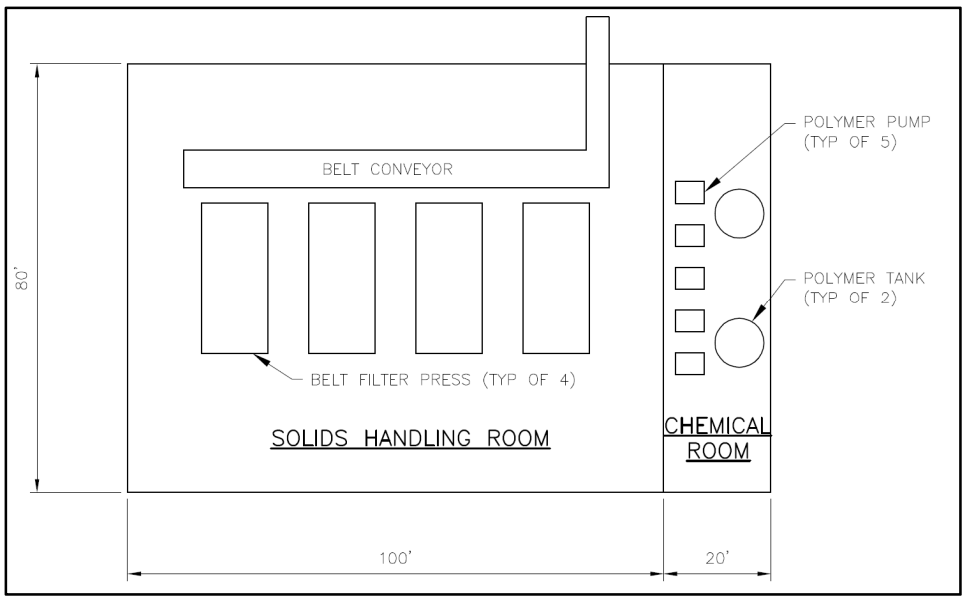

Figure 4-8
BFP Dewatering Facility Conceptual Layout

4.3.3 Alternative 2: Centrifuge

Centrifuge dewatering is a process that uses the force developed by the rotational movement of a bowl to separate the sludge solids from the liquid. Sludge is pumped through a central pipe into a bowl rotating at speeds of approximately 3,000 revolutions per minute (rpm). Centrifuges rotate at a high speed to apply a centrifugal force to the sludge slurry, forcing the heavier sludge to separate from the water fraction and collect along the bowl wall. The liquid overflows centrate discharge weirs located at one end of the unit. A screw conveyor (scroll) inside the centrifuge moves the sludge cake from the bowl up the conical section (the "beach") where the cake is discharged at the other end of the unit. Figure 4-9 is a cross sectional drawing of a dewatering centrifuge.

Advantages of centrifuges include high throughput capacity, suitability for unattended operation, good containment for odor control, and good performance with capture efficiencies of 95 percent or better and TS concentrations of 18 to 20 percent for aerobically digested WAS solids (with even higher concentrations sometimes possible). In addition, centrifuges do not require continuous machine washing; only a small amount of washwater is needed when the unit is shut down.

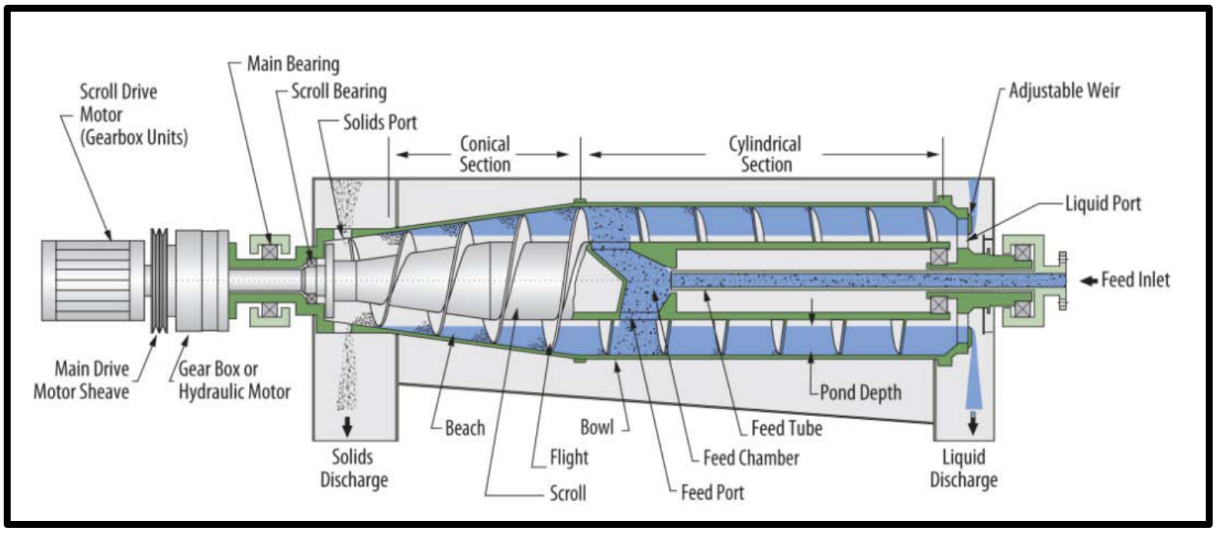

Figure 4-9
Cross-Section of a Typical Decanter Centrifuge

Primary disadvantages of centrifuges for dewatering include high energy requirements and high polymer requirements (20-30 lb active polymer / DT solids). Centrifuge maintenance is also typically more expensive due to the heavy-duty mechanical components and wear on the scroll assembly. Major equipment maintenance is typically performed by the manufacturer (a maintenance contract is suggested for the Savanna Street WWTP).

Centrifuge Manufacturers and Experience

Centrifuges are widely used in the municipal wastewater industry, dating back over 30 years, particularly at facilities with treatment capacities of 10 MGD or larger. The most common centrifuge manufacturers are Alfa-Laval, Andritz, Centrisys, Westfalia, and Flottweg. Each of these manufacturers offer similar mid-feed, counter-current designs using AC variable frequency drives (VFDs) for the main drive motors. Solids conveyor (scroll) gearbox / speed reducer input shafts are driven by VFD-controlled AC motors as well, with the exception of Centrisys, which uses a radial piston hydraulic motor, with a VFD-driven hydraulic oil pump.

Each of the manufacturers has units with sufficient capacity for the Savanna St. WWTP and numerous installations of similar sized equipment. The municipal centrifuge supply market is very competitive, and these manufacturers' units could be competitively bid against one another. A conceptual layout of a centrifuge facility is shown in Figure 4-10.

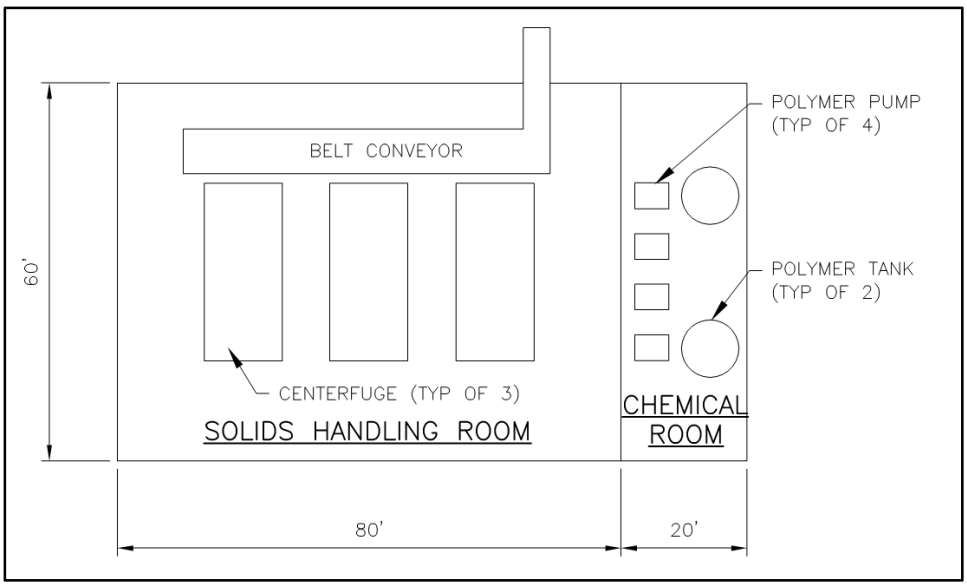

Figure 4-10
Centrifuge Dewatering Facility Conceptual Layout

4.3.4 Alternative 3: Screw Press

Screw presses are a fairly new addition to the municipal dewatering market, but have been in use for many years in industrial applications, especially the pulp and paper industry. Polymer conditioned sludge is fed to the inlet of the screw press, which is comprised of an inclined wedge wire screen or perforated plate screen / basket. A slowly rotating screw moves the sludge up through the basket or screen, allowing the water from the sludge to filter through into a drainage pan. The screw pushes the solids to the end of the basket with higher pressure, where it is further dewatered. A pneumatic or actuated cone on the outlet of the screw provides the back pressure in the dewatering zone. The key design aspect of a screw press is the interface between the static basket or screen and the rotating screw. Some manufacturers use brushes on the tips of the screw that clean the screen of accumulated solids with each screw revolution. The screw presses rely on a periodic internal spray system to backflush the solids using non-potable water. The flushing of the screw press is automated and based on the measured pressure in the feed chamber. Screw presses typically dewater WAS to approximately 15 to 17 percent TS. Figure 4-11 shows examples of screw press equipment.

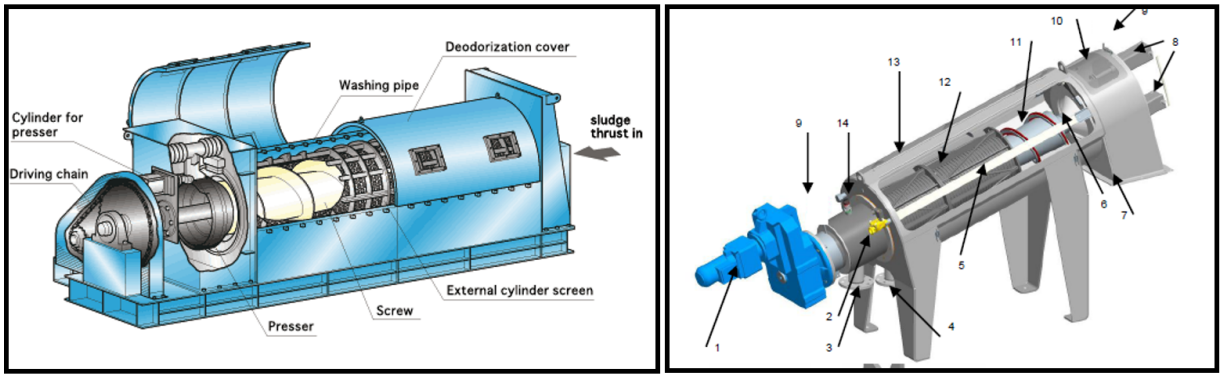

Figure 4-11
Examples of Screw Press Equipment
(FKC Screw Press on the left, Huber Screw Press on the right)

Screw Press Manufacturers and Experience

As noted above, the screw press is a relatively new technology in the US employed in the municipal dewatering market, particularly for larger facilities. As such, this alternative is scrutinized in greater detail.

There are four screw press manufacturers that may be suitable for the Savanna St. WWTP: FKC, Huber Technology, Schwing Bioset, and BDP Industries. Each of these manufacturers' units has considerable differences and experiences, which are described below in more detail.

FKC Co. Ltd. stands for Fukoku Kogyo Company, which was established in 1959 in Tokyo. FKC has been operating a US based subsidiary in Washington State since 1998, which manufactures units and maintains spare parts for North America customers. FKC originally was developed for industrial applications including pulp and paper production, with the oldest municipal screw press installed in 1997 in North America. The FKC units are the largest screw press units of the four manufacturers, are fed by gravity from the sludge thickening unit, and spins with the slowest revolutions (>0.5 rpm).

Huber Technology Inc. is the North American subsidiary of the parent company, Huber SE, in Berching, Germany, which has been owned by the Huber family for over 175 years. The Huber system has brushes on the external tips of the screw, which is a wear item that requires occasional replacement. The Huber units are characterized by an inclined arrangement, which is unique among screw press suppliers.

Schwing Bioset has licensed their screw press technology from an Austrian manufacturer of screw presses (FDM Maschinen & Verfahrenstechnik GmbH). FDM has approximately 60 installations in central Europe dating back to 2001, many of which are in Austria. There are currently two installations in the U.S.: one unit in Florida and one unit in Indiana.

BDP Industries' screw press differs from the other manufacturers in that a pre-thickening rotary drum thickener is provided directly above the unit. Dirty filtrate from the screw press is recycled back through the rotary drum thickener to improve solids capture. BDP also offers an optional filtrate re-use system for dilute sludge, utilizing clean filtrate from the RDT to wash both the RDT drum and screw press basket. These differentiators offer advantages over other screw press

manufacturers in certain applications, but typically add cost to the equipment. A conceptual layout of a screw press facility is shown in Figure 4-12.

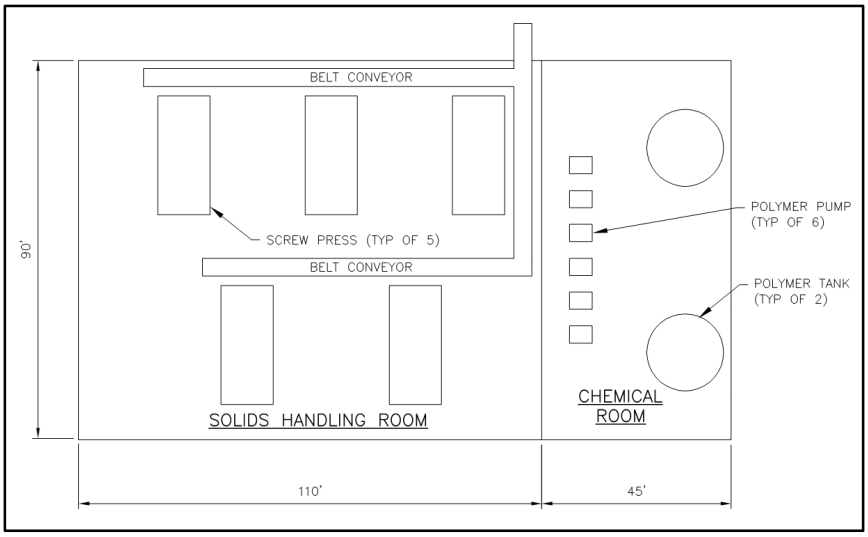

Figure 4-12
Centrifuge Dewatering Facility Conceptual Layout

4.3.5 Comparison of Alternatives

The dewatering equipment alternatives are evaluated based on the number of installations currently in operation and equipment requirements. A summary of each alternative's advantages and disadvantages is shown in Table 4-4.

Table 4-4 Dewatering Technology Advantages and Disadvantages

Alternative	Advantages	Disadvantages
Alternative 1: Belt Filter Press	▪ Startup and shutdown relatively quick ▪ Less noise than other alternatives ▪ Relatively low power and polymer consumption	▪ Open source of odor; OC may be required, but determine if required once ops begin ▪ Relatively large footprint ▪ More operator attention than other alternatives ▪ More labor-intensive cleanup operations ▪ Significant washwater requirements
Alternative 2: Centrifuge	▪ Lower capital cost than other alternatives ▪ Small footprint with high throughput ▪ Low staffing requirements, well-suited for unattended operation ▪ Small, contained odor source, so external odor	▪ High power consumption ▪ Relatively noisy, higher vibration ▪ Slightly higher polymer use ▪ Expensive spare parts ▪ Major repair work performed by manufacturer

Alternative	Advantages	Disadvantages
	control typically not required ▪ Relatively easy to clean ▪ Highest cake TS concentrations of alternatives ▪ Easy startup and shutdown	
Alternative 3: Screw Press	▪ Low staffing requirements, well-suited for unattended operation ▪ Low odor and noise levels ▪ Low power consumption ▪ Easy startup and shutdown ▪ Compact footprint ▪ Requires minimal operator attention ▪ Enclosed process	▪ Relatively new, performance history not as well documented as more established technologies ▪ Slightly lower cake solids ▪ Lower throughput capacity requires more units and longer operation hours

4.3.6 Dewatering Equipment Building

As mentioned above, the dewatering building is in very poor condition and will need to be replaced. The cost of the building is a significant consideration. The building will need to house the equipment itself, as well as supporting equipment including sludge feed pumps, the polymer feed system (polymer storage tanks, pumps, and piping, with tanks and pumps in a separate room from the dewatering equipment), conveyors, control panels, and a ventilation system. BFPs will have the largest footprint and the equipment/building should be constructed to provide odor control in the event it is needed in the future. While centrifuges and screw presses have similar footprints for an individual piece of equipment, the room footprint of centrifuges is smaller because a centrifuge has higher throughput than a screw press and, therefore, requires fewer units.

4.3.7 Summary of Alternative Review

A review of the alternatives noted above indicate that BFPs, centrifuges and screw presses are all viable alternatives and should be reviewed further during detailed design.

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Appendix J

Electrical System Technical Memorandum

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Electrical
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

1.1 Electrical System History

The electrical distribution system at the City's Savannah Street Waste Water Treatment Plant (SSWWTP) was originally constructed to support a lagoon treatment system that consisted of three stabilization ponds and three smaller polishing ponds. The electrical system was upgraded in the early 1970's after the construction of the mechanical treatment plant. The electrical system, in general has had little or no major upgrades since the 1970's upgrade.

The plant currently is served via an onsite 115 kV Entergy Mississippi Power & Light (MP&L) owned and maintained substation. The service voltage to the plant is 4.16 kV provided from the MP&L substation and is routed via a radial system. The electrical system consists of outdoor transformers (4.16 kV/480V) and secondary gear (480V) located near major process loads.

The plant has a single working generator that supplies limited standby power to the Influent pump station, Administration building, disinfection system and effluent pump station.

1.2 CPE Summary and Conclusion

The City entered into a Consent Decree with the United States Environmental Protection Agency (EPA) and the Mississippi Department of Environmental Quality (MDEQ) in 2012. As required by the Consent Decree the City developed, completed, and, in March 2014, submitted a Comprehensive Performance Evaluation (CPE) for the SSWWTP.

1.2.1 Summary

The basis of the CPE's electrical system analysis was the expected long term power requirements and the reliability of the existing electrical system. The CPE identified unit process within the electrical distribution system that affects performance or does not have sufficient capacity to support major unit processes. The performance limiting factors of the electrical distribution system are:

- Type 2 Remedial Measures
  - Repair or replace existing generators and automatic transfer switches
- Type 3 Remedial Measures
  - Repair or replace paralleling equipment
  - Replace plant switchgear and motor control center equipment

1.2.2 Conclusions

The majority of the existing electrical system is 1970s era equipment that functions, but has reached or is well beyond its useful life. Availability of spare parts is an issue and is compounded

due to the radial system (i.e. no redundancy) and fails to meet standard EPA reliability design criteria. The electrical system is a critical component at the SSWWTP and improving safety, reliability and maintainability is much needed at this facility.

1.3 CCP Approach

The Composite Correction Plan (CCP) provides recommendations for improvements for the performance limiting factors identified in the CPE report. The correction plan is broken into two phases:

1. Operational Changes and minor capital improvements completed within 24 months of CCP approval.

2. Major capital improvements completed within 60 months of CCP approval.

While, in essence, the electrical system generally falls into "major capital improvements" category, CDM Smith will review the criticality of system components to determine if variations from these schedules is warranted. The review in this CCP has been a general overview of the electrical system and not meant to be a detailed electrical analysis. The issues noted in this CCP are examples noticed during an initial site tour and not meant to be a complete list of deficiencies that may be present at the SSWWTP plant. An in-depth electrical report prepared as part of a full "Basis of Design (BOD) Report" is recommended to further delve into the details and specifics of the electrical system in order to provide a more accurate and encompassing analysis.

Section 2

Current System

2.1 Overview

2.1.1 Reliability Assessment

The *Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability* (EPA-430-99-74-001) is the recognized criteria which establishes minimum reliability and redundancy requirements for wastewater treatment facilities. This design criteria is required to be followed when Federal financial assistance is provided under PL 92-500.

This design criteria addresses power distribution external to the works and power distribution internal to the works. The design criteria for power external to the works requires two separate and independent sources of electric power from either two separate utility substations or from a single substation and a works based generator. If a generator is provided it must be sufficient to operate all vital components during peak wastewater flow conditions, along with critical lighting and ventilation.

The design criteria for internal power distribution requires that components of the same type serving the same function to be divided as equally as practicable among motor control centers or other distribution so that a single power outage will not result in disruption to plant processes.

The existing electrical distribution equipment (switchgear, panelboards, motor control centers (MCC), etc.) at the Savanna Street WWTP does not follow this criteria. The electrical distribution equipment at this facility is a radial system. A radial system has a single circuit breaker or switch with only a single source of power and single points of failure which does not meet the EPA design criteria. Limited reliability is provided by a single standby power generator; however, the generator connection points suffer from the same single point of failure issue.

In addition, all equipment in process areas are typically connected to single source equipment. For example, all blowers are served from a single fed medium voltage MCC located in the blower building. A loss to this MCC or its power source would result in complete loss of all blowers. In addition, this MCC serves as the service entrance for the entire facility and a loss of power or failure at this MCC would result in the loss of the entire plant's treatment processes. The existing distribution system is not currently following the EPA reliability design criteria and therefore reliability and single point failure risks are elevated at SSWWTP.

2.1.2 NFPA 820 Assessment

NFPA 820, "Standard for Fire Protection in Wastewater Treatment and Collection Facilities" was originally published in 1990 as a recommended practice and subsequently became a standard in 1995. This standard identifies fire hazards associated with wastewater systems. Sewer and sludge gases are flammable, and explosive conditions can result around influent collection, influent screening and degritting, odor control, primary clarification, anaerobic digestion, and sludge handling areas of the plant. National Electrical Code (NEC) Article 500 describes three

different classes of hazardous areas: Class I being flammable and combustible gases, Class II being combustible dust, and Class III being ignitable fiber/flyings. Article 501 describes the wiring requirement associated with Class I areas.

As the original construction of the plant pre-dates NFPA 820 and the standard is not retroactive, the installation of equipment and wiring practices of the original construction are not required to be upgraded to the current standard unless they present a serious hazard. However any new work performed or equipment installed in areas governed by NFPA 820 must conform to the Standard. In addition, any new process areas or structures must comply with the NFPA 820 Standard.

Proper area classification and documentation of each of the process areas is required prior to any modifications and new work in areas falling under the NFPA 820 standard. A comprehensive review of the plant hazardous areas was not performed for this CCP. A comprehensive evaluation of all areas should be performed during preliminary design of any and all plant upgrade design projects.

If new work is performed in existing areas, the following are some concerns with respects to NFPA 820 and NEC compliance that may or may not need to be addressed:

- In many process areas, electrical devices, panels, equipment, motors, lighting, etc. were not originally rated for the hazardous areas defined by NFPA-820.
- In multiple instances, it was observed that conduit seals were not installed on conduits entering or leaving classified locations.
- Most process areas and buildings do not appear to have adequate ventilation. Ventilation is a mitigation technique permitted by NFPA 820 for downgrading some areas. A complete analysis would need to be performed for each specific area prior to any modifications.

2.1.3 Electrical Code Assessment

NFPA 70E - Standard for Electrical Safety in the Workplace is a national consensus standard that addresses safety of employees whose job responsibilities require interacting with energized electrical equipment or circuits. The standard addresses electrical safety related work practices, safety-related maintenance requirements, and other administrative controls necessary to protect employees from hazards during activities such as the installation, inspection, operation, maintenance, and demolition of electric equipment. It also includes safe work practices for employees performing work activities such as troubleshooting, testing and repairing that can expose them to electrical hazards as well as installation of conductors and equipment that connect to the supply of electricity.

The current standard seeks to provide practical safe working areas for employees related to the hazards arising from the exposure to electricity. Electrical equipment likely to require examination, adjustment, servicing, operating or maintenance while energized to be field or factory marked to warn qualified persons of *potential electric arc flash hazards*. The arc flash labeling requirement applies to equipment such as switchboards, switchgear, panelboards, industrial control panels, meter socket enclosures, motor control centers, etc.

A complete and thorough NEC code analysis was not performed as part of this CCP. However, some potential issues were noticed during the site tour. Below are examples of possible NEC and potential safety concerns at SWWTP. This list is not comprehensive and should be expanded based on a thorough site investigation performed as part of the BOD:

- Electrical equipment has not been properly labeled to identify electrical hazards as required in the NEC and NFPA 70E.
- Electrical equipment is in poor condition due to age, inadequate climate control and ventilation, and some installations appear to not be suitable for their current location or environment
- Inaccurate as built drawings, including single line diagrams
- Inadequate site and structure lighting for maintenance, troubleshooting, repair, etc.
- Inadequate workspace around equipment
- Aged cabling systems

2.1.4 Condition Assessment Summary

In general, most major electrical equipment has a technical service life of 20-25 years. Older equipment is usually more maintenance intensive and often harder to keep operational due to the lack of available spare parts. In this Section an assessment of "good" is defined as being in good condition and capable of serving its intended use for over ten years with proper maintenance. "Fair" indicates the equipment is in a condition that requires attention to maintain reliable operation, and it should be scheduled for replacement within 5 years. "Poor" is defined as being in a condition that needs to be replaced. Equipment defined as "Poor" is at the highest risk for failure and should be replaced within 2-3 years.

The majority of the existing distribution equipment at SSWWTP is well past its design life and is in poor condition that should be scheduled for replacement. The reliability of this equipment is questionable and higher maintenance costs are expected. The age of equipment contributes to the difficulty in obtaining repair parts, and when these parts can be found, they typically come at a premium cost. The cost of maintenance will typically increase as equipment ages due to normal mean-time failures, but these costs can increase dramatically due to a major component, insulation, or equipment failure. These types of catastrophic failures result in operations downtime and higher repair costs. As more components fail, the need for replacement parts will continue to rise and the parts themselves will be difficult to find. In addition, long delivery times for critical components are common and, depending on critical nature of the equipment, jeopardize its usability for plant operations. A system-by-system overview is provided in subsequent paragraphs of this CCP report.

2.2 Incoming Power Supply

There are two separate utility circuits at SWWTP; a 115/4.16 kV substation serving the main plant and a small 480V pole mount transformer serving the Bio-solids facility. These sources do not provide power to the same processes.

The first and only source of utility power at SWWTP is a dedicated substation, owned by Entergy Mississippi Power & Light (MPL). The substation provides 4160VAC, three phase power and is located at the south end of the plant (See Figure 2-1). This circuit is configured as a radial system. For this application, the circuit feeds through an underground channel to a medium voltage MCC located in the Blower Building. Overhead transmission lines, shown leaving the substation, are installed down the east side of the plant towards the northeast area of the property; this line previously serviced surface aeration equipment (lagoon aerators) which have been removed. This line currently serves geotube sump pumps & gates.

There are no redundant utility feeds to this facility. Under normal operating conditions, the entire plant (with exception to the biosolids facility) is served through the single incoming supply circuit to the blower building MCC (4.16 kV) which is fed from the MP&L substation. A fault in the supply circuit, at the substation, Blower Building MCC, or any of these respective cabling systems will cause an interruption of service to essentially the entire facility until power is restored. The only standby power system at the facility is located at the Influent Pump Station.

115kV-4160V to Blower Building MCC

4160V Overhead to GeoTube pumps

Figure 2-1
Incoming Service

The second circuit provides power for the Biosolids process area. This small service provides 3 phase 480V power to the Biosolids treatment area through pole mounted utility transformers. The overhead services follow the property line on the west side of the plant to the north end of the property and ends. It does not appear to be connected to any other equipment or process area. This process area does not have a redundant feed or standby system.

Based on discussions with the plant staff, power outages do occur periodically at SSWWTP. The outages are due to different factors such as storms, utility side outage/faults, etc. While the utility

accounts for one type of outage, internal plant faults (i.e. ground faults) have occurred that have resulted in extended outages at the plant. Some of the internal plant faults have resulted in outages up to eight hours or longer. The internal plant faults, such as a ground fault, have in the past not been properly localized by the protective relaying system and have activated MP&L substation protective devices which created outages for the entire plant. These types of plant wide outages due to a ground fault well down in the system can be preventable with proper protection coordination.

CDM Smith is unaware of any short circuit, coordination or arc flash analysis being performed at this plant. These analysis are directly related to the safe and proper operation of an electrical system. For instance, a coordination study will provide selectivity of the protective devices to limit an outage to the device closest to the actual fault versus activating upstream devices (i.e. at MP&L substation). Short circuit, Arc Flash analysis along with proper coordination settings are critical for personnel safety.

2.3 Major Equipment

2.3.1 Blower Building

The Blower Building medium voltage MCC is the main distribution and service entrance point for the facility. It is located in the Blower Building which is not climate controlled (See Figures 2-2 and 2-3). The MCC is radial fed and has no built in redundancy.

Figure 2-2
Blower Building MCC Main Circuit Breaker Compartment

The MCC feeds power to the major processes such as the aerators, Influent Pump Station MCC, Blower Building Distribution Panel, Return Sludge Building MCC, and Effluent Pump Station. Loss of utility power at the Blower Building MCC will cause a plant wide loss of power. Major equipment failure such as a service cable fault, MCC bus fault, etc. to the Blower Building MCC can cripple the plant indefinitely. The blower MCC does not currently have any means for standby power operation.

Figure 2-3
Blower Building MCC

The Blower Building is connected to the Pipe Gallery which is a classified hazardous location; however, the installation between the areas does not meet the minimum separation requirements of NFA 820 or NEC Article 500. The building appears to have poor ventilation and the equipment is exposed to conditions such as moisture, hydrogen sulfide, dust, etc.

The equipment in the Blower Building is in poor condition due to age and harsh environment. Fire damage is evident on Blower No 4 cubicle due to an electrical fault in this section of the switchgear (See Figure 2-4). Even though the section has been repaired the entire MCC may have been compromised because smoke remnants from the fire could have easily spread to other compartments. As the equipment continues to age and deteriorate the risk of additional failures is expected to rise.

Figure 2-4
Blower Building MCC Cubicle No 4 Fire Damage

Rust and corrosion are visible in multiple locations on the equipment and hardware. In addition, equipment covers are missing and hardware securing covers have severe corrosion.

The workspace required between the side of Blower No 4 Control Panel and the 480V distribution panel to its right is 27 inches (See Figure 2-5). Per NEC Table 110.26(A) the minimum depth of clear working space about 600VAC equipment is 42 inches.

4160V Blower Control Panel and 480V Distribution Panel

Measured Distance

Figure 2-5
4160V Blower Control Panel and 480V Distribution Panel

2.3.2 Influent Pump Station

The Influent Pump Station (IPS) MCC is located in the IPS building on the northwest end of the property. The building is adjacent to the influent wet well, which is a classified location. The influent wet well is a Class I, Division I Hazardous Location. The electrical installation in this area does not meet the current requirements of NFPA 820 or NEC Article 500.

The building has a climate controlled room that houses the Generator Control Panel and Generator Circuit Breaker Panel (See Figure 2-6); however, the remaining equipment, IPS MCC, variable frequency drives (VFD), 4160V-480V transformers, and 480V distribution panels are installed inside the IPS Building equipment area, which is not climate controlled (See Figure 2-7).

The electrical equipment in this building is in poor condition due to age and harsh environment.

Figure 2-6
Influent Pump Station Generator Circuit Breaker Control Panel

The IPS MCC is rated for 4160V and has two fused load break switches, one for normal power and one for standby power; however, it does not have a main-tie-main configuration. The normal power is supplied from the Blower Building MCC. The standby power is provided by one 1500kW generator. Reference Section 2.5 for detailed information about the standby system. The MCC is in poor condition due to age and harsh environment. Rust spots are visible on equipment enclosure. See Figure 2-8.

Figure 2-7
Influent Pump Station *Raw Sewage MCC*

The front and rear access panels for the Generator Circuit Breaker Control Panel are secured using a handle as shown in Figure 2-8 and not securely fastened with bolts, which is a safety concern.

Front Access

Handles

Figure 2-8
Generator Circuit Breaker Control Panel

The IPS 400HP VFDs have been replaced recently. The new VFD enclosures are equipped with individual air conditioning units. Dirt and dust build up is evident on the equipment and the AC filters/vents (See Figure 2-9). The AC unit sizing appears to be questionable given the 400HP sizing. A complete analysis should be performed to verify proper cooling requirements for these VFD's.

The workspace around the generator switchgear/control equipment does not meet the minimum working space requirements as specified in NEC Article 110.34, as shown in Figure 2-10.

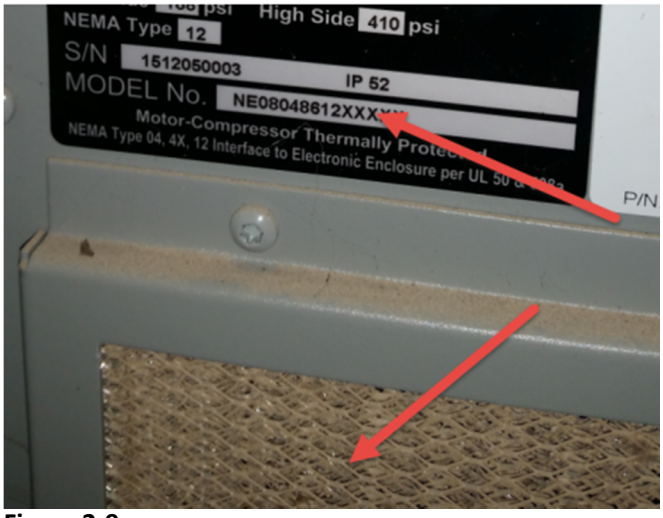

Figure 2-9
Influent Pump Station *New VFD Enclosure*

Rear Access

Measured Distance (35")

Figure 2-10
Generator Circuit Breaker Control Panel

There are three (3) 500kVA, pad mounted transformers outside the IPS near the raw sewage wet well. One transformer provides 120/208V power for the Administration Building. One provides 480V power for the Chlorination Building. The final transformer provides 480V power for the IPS. Rusting and corrosion is visible on the enclosures due to the harsh environment, as shown in Figures, 2-11, 2-12, and 2-13.

Figure 2-11
Influent Pump Station Transformer

The 480V Hoist Room Distribution Panel is in poor condition due to age and environment. In addition, the location of this panel is a safety concern due to the access path and lack of handrails around the existing floor openings (See Figure 2-14).

480V Transformer with Distribution Panel
Figure 2-12
Raw Sewage Pump Building

480V Transformer with Distribution Panel
Figure 2-13
Raw Sewage Pump Building

Figure 2-14
Hoist Room Distribution Panel

2.3.3 Headworks

The Headworks is an outside structure that is a classified hazardous location, but the installation between the areas does not meet the current requirements of NFA 820 or NEC Article 500. There is no power distribution equipment installed at the location, only support equipment such as control panels and instrumentation.

Rust spots are visible on equipment, support and hardware. Conduit seals have not been installed on conduit runs in the classified locations or at locations required by the NEC. Unused openings in conduit bodies were visible (See Figures 2-15, 2-16, and 2-17).

NEC requires outlets installed in classified locations to have a label warning against unplugging under load. The outlet shown in Figure 2-18 is installed on the Headworks platform which has not been labeled accordingly. Additionally, the weather-proof cover is broken off. Further evaluations should be performed in this area, in particular if new work is expected.

Figure 2-15
Missing Cover

Figure 2-16
Rusting Cover

Figure 2-17
Rusting Bolts

Weatherproof While In Use
Figure 2-18
Cover Missing

2.3.4 Aeration Basin, Digester, and Pipe Gallery:

The Aeration Basin, Digester, and Pipe Gallery are classified hazardous locations under the current NFPA 820 criteria. The current electrical installation in this area does not currently follow the requirements of NFPA 820 or NEC Article 500. Conduit seals have not been installed in these areas on conduit runs in the classified locations or at locations required by the NEC.

Rust spots are visible on equipment, support and hardware (See Figure 2-19). The outlet shown in Figure 2-20 is installed on the Aeration Basin platform. It has not been labeled as required. Additionally, the conduit and enclosure are severely corroded. A 480V disconnect in the Pipe Gallery is in poor condition due to age and harsh environment.

Conduit is not securely supported. Per NEC 344.30(A), RMC shall be securely fastened within 3 ft of each outlet box, junction box, cabinet, conduit body or other conduit termination. Figure 2-21 shows one instance where the installation is not in compliance with this requirement.

Figure 2-19
Rusting Disconnect Switch

Figure 2-20
Weatherproof While In Use

Figure 2-21
Conduit not supported

2.3.5 Return Activated Sludge (RAS) Pumping Station (No 1-4)

The Return Activated Sludge MCC (See Figure 2-22) and control panels for pumps 1-4 are located in the Return Sludge Building, which is not climate controlled. The MCC feeds equipment in a classified hazardous location, but the electrical installation does not meet the current requirements of NFPA 820 or NEC Article 500.

The equipment in the building is in fair condition; however, the Model 4 Square D MCC and Robicon drives are obsolete. The pad mounted transformer and distribution equipment appear to be in fair condition.

Replacement parts for the VFD's may no longer be in production and may be difficult to find. The lower panel cover for RSP No 2 VFD is missing (See Figure 2-23). Ventilation and climate control systems should be reviewed for operability, capacity and suitability for cooling the VFD equipment (See Figure 2-24).

Figure 2-22
RAS MCC

Figure 2-23
Robicon Drives (Missing Panel

Figure 2-24
Current Ventilation

2.3.6 Return Activated Sludge (RAS) Pumping Station (No 5 & 6)

RAS pumping station for pumps 5 & 6 electrical equipment appears to be in good condition, however the Robicon drives are obsolete (See Figure 2-25) and replacement parts may no longer be in production and may be difficult to find.

The existing lighting panel does not have the NEC required minimum working clearances with respect to width in front. The panel currently has 28" width; NEC requires a minimum of 30 inches. The air handling units (AHU) Alarm Panel enclosure does not have minimum working clearances per NEC. This panel contains 120V which requires a minimum 36 inch working clearance, current distance is only 28 inches, as shown in Figure 2-26.

The RAS area pad mounted transformer and distribution equipment appear to be in fair condition; however, bolts to secure the covers are missing at this equipment, as shown in Figure 2-27.

Figure 2-25
Robicon Drives Obsolete

Figure 2-26
NEC Clearance

Figure 2-27
Transformer Missing Bolts

2.3.7 Clarifiers 1-5

The Clarifier area is a classified hazardous location, but the electrical installation in this area does not meet the current requirements of NFPA 820 or NEC Article 500. For instance, conduits entering enclosures and entering/leaving classified location require conduit seals, however no conduit seals were noticed. Also, equipment installed in a classified location is required to be selected to mitigate corrosion problem, but corrosion is visible on equipment in classified locations, likely due to the age of the equipment.

2.3.8 Biosolids Area

Figure 2-28
Biosolids Building

The Biosolids building is a prefab-style metal building consisting of a steel beam and truss support structure and metal siding. The building has visible signs of corrosion and holes in the walls and roof near the electrical equipment. Electrical equipment is housed in the process area and does not have climate control. Supports and hardware for the service head mounted to the metal building are rusting. The electrical equipment is in poor condition due to age and harsh environment. Rust is visible throughout the area; on equipment, building supports, metal siding, and equipment stands (See Figure 2-28). A temporary cable exits the bottom of the main distribution panel to serve loads in the Biosolids building (See Figure 2-29). This cable is not secured properly and is a trip hazard.

The Biosolids Area is a classified hazardous location, but the electrical installation in this area does not meet the current requirements of NFPA 820 or NEC Article 500. The overhead service drop is shown in Figure 2-30.

Figure 2-29
Electrical Equipment Condition

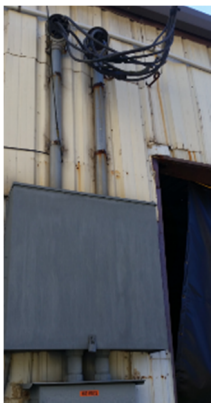

Figure 2-30
Overhead Service Drop

2.3.9 Ultraviolet (UV) Building

The UV process appears to be abandoned. The 1600A main breaker is off and equipment throughout the area and in the building is de-energized (See Figure 2-31).

The pad mounted 1000kVA transformer appears to be leaking (See Figure 2-32). Sampling and mitigation of leaking should be done along with any soil contamination mitigation at this transformer. Electrical equipment is in poor condition and corrosion is visible inside the electrical room. There is an opening at the bottom of the main panelboard with exposed wiring (See Figure 2-33).

Figure 2-31
Transformer Possible Leaking

Figure 2-32
Distribution Panel De energized

Figure 2-33
Exposed Wiring

2.3.10 Chlorination Building

The Chlorine Building MCC is located in a climate controlled room (See Figure 2-34), but ventilation appears to be inadequate due to the apparent corrosion of the equipment. The equipment in the building is in poor condition with corrosion visible on the equipment (See Figure 2-35). Screws for securing covers are rusting and not secured in multiple locations. The Model 4 Square D MCC is obsolete. Replacement parts may no longer in production and may be difficult to find.

The pad mounted 500kVA transformer and distribution equipment are in good condition; however, the conduit for the 480V which is galvanized rigid steel does not appear to have been protected against contact with the soil and some corrosion is evident as shown in Figure 2-36.

Figure 2-34
Chlorine Equipment MCC

Figure 2-35
Chlorine Equipment MCC Rust

Figure 2-36
Transformer Conduit Installation

2.3.11 Effluent Pump Station

The Effluent Pump MCC is located in the Effluent Pump Station building, which is not climate controlled (See Figure 2-37). There is a single radial feed to this area but includes a transfer switch for interconnection with the trailer mounted generator located at the influent pump station that provides limited standby power to the effluent pump station (See Figure 2-38) (only one pump is currently supported based on discussions with plant staff). The equipment is in poor condition due to age and the environment. The pad mounted 500kVA transformer that serves 480V building loads appears to be in good condition.

Figure 2-37
Effluent Pump Station MCC

Figure 2-38
Automatic Transfer Switch

2.3.12 Old Effluent Building

The building is a prefab-style metal building consisting of steel beams for support and metal siding. This building is not climate controlled. The entrance opening of the building is covered by a large plastic canvas type arrangement that provides minimal weather protection (See Figure 2-39). The equipment is in poor condition due to age and harsh environment with visible rust on the equipment. An effluent pump is shown in Figure 2-40.

The workspace required around the equipment does not meet the minimum working space requirements required NEC Article 110.34. This equipment is required to have a minimum of 48 inch clearance; presently it only has 36 inches & 47 inches respectively (See Figure 2-41).

Figure 2-39
Old Effluent Building

Figure 2-40
Old Effluent Pump

Figure 2-41
NEC Clearance

2.3.13 Administration Building

The electrical equipment for the administration building is housed in an outdoor switchgear assembly. The equipment appears to be in fair condition (See Figure 2-42). The interior of the Administration Building was not reviewed.

Figure 2-42
Transformer Conduit Installation

2.4 Conduit and Wire

Cable manufacturers specify their cables to have a life span from 30 -40 years of continuous operation in an optimal environment and operating conditions. Many of the power cables operating in WWTP applications can be exposed to a variety of environmental and operational conditions, including elevated temperature, high UV radiation, high humidity, water submersion, and exposure to dust, dirt, and corrosive contaminants that can shorten this lifespan.

Electromechanical forces from short circuit current and fires can potentially damage cable jackets, insulation material and cable conductors. Additionally, high-voltage stress from lightning strikes or power system transients can also degrade the dielectric strength of cable insulation. Over time, these conditions, alone or in unison, can cause aging and areas of insulation stress points that will result in a gradual degradation of the cable insulation and jacket materials. The cabling system was not accessible during the site visit in order perform a visual assessment. As it is understood that much of the cable and conduit are original equipment, it is recommended that cable testing and inspection should be a part of the preliminary design of any improvement project at this plant. Where new electrical distribution systems are provided, replacement of cables is strongly recommended.

2.5 Backup Power System

There are four diesel powered standby generators on site, located at the influent pump station; one (1) 1250kW, two (2) 900kW units and one (1) trailer mounted 1500kW unit with step up transformer (1500kW shown in Figure 2-43). The 1250kW and 900kW units have been abandoned in place and no longer have the ability to serve any plant loads. The abandoned generator voltages are 4.16 kV; the 1500 kW unit is 480V and powers a step up transformer to the 4.16 kV plant distribution voltage level. The only remaining viable standby power is the 1500 kW trailer mounted unit. The 1500 kW trailer mounted unit does not have the capacity to support the plant processes currently connected. The 1500 kW unit has the ability to serve the Influent Pump Station, Administration Building, Chlorination Building, and Effluent Pump Station. However, due to the size limitation, the 1500 kW unit cannot adequately serve the minimum process requirements for these process areas. Based on discussions with plant staff, only 2 raw water pumps and a single effluent pump are capable of operation on this unit. The 1500 kW generator is in fair condition. In addition, the generator does not appear to be capable of automatic starting as it currently has been tagged to require fuel before starting (See Figure 2-44).

Figure 2-43
Generator Enclosure

The CPE identified that the automatic transfer switches are not functioning correctly in automatic. One transfer switch operates in manual and the programmable logic controllers (PLC) for paralleling the generators are no longer functional.

Figure 2-44
1500 kW Generator – Fuel Tag

Section 3

Alternative Analysis

3.1 Incoming Power Supply

3.1.1 Do nothing; Equipment is Adequate for all Loads

This option should not be considered as the current system offers no redundancy or meets any basic reliability criteria. A loss of power at either the substation or main service level will result in an overall plant outage, potentially for extended periods.

3.1.2 Maintain Existing Power Supply, but add Equipment to Account for New Loads

In order to comply with reliability criteria, the existing radial system would need to be upgraded to provide redundancy which is not recommended given the current conditions. New processes and equipment require redundancy not possible with the existing system/equipment; therefore a secondary selective design as described below (Paragraph 3.2.4) along with suitable standby power is recommended.

3.1.3 Replace Entire Incoming Power Supply

The incoming power supply should include considerations for reliability, maintainability, and safety. To provide for reliable distribution, the system should have two independent sources of power and protection from common mode failures. The existing radial system design could be improved from a reliability/redundancy standpoint if a second independent power source were to be provided. However, given the condition and locations of the existing equipment, utilizing it is not recommended. A new secondary selective design (M-T-M) that complies with reliability criteria is recommended for this facility.

The secondary source of power can be a second utility service from MP&L or an adequately sized standby power system.

3.2 Major Equipment

3.2.1 Do nothing; Major Equipment Being Reviewed is Acceptable as Is

This option is not recommended due to the age and current poor condition of the majority of equipment and inherent safety concerns. During preliminary design of any improvement, a more detailed review should be performed to determine if individual pieces of equipment noted ass good could potentially remain.

3.2.2 Rehabilitate Existing Equipment Pieces that are Economically Sound to Rehabilitate and add New Equipment to Account for New Loads

This option is not recommended due to the age and current poor condition of the majority of equipment and inherent safety concerns. During preliminary design of any improvement, a more

detailed review should be performed to determine if individual pieces of equipment can be rehabilitated to help keep costs down.

3.2.3 Replace Existing Equipment Pieces that Require Replacement and add New Equipment to Account for New Loads

This option is not recommended due to the age and current poor condition of the majority of equipment and inherent safety concerns. During preliminary design of any improvement, a more detailed review should be performed to determine if individual pieces of equipment can be replaced without overhauling the entire system to help keep costs down.

3.2.4 Replace all Existing Electrical Equipment (Design Plant for all-new System)

This alternative is recommended and corroborates the initial findings of the CPE report. The electrical distribution system should provide maximum flexibility to operate under a range of demand and treatment conditions. Electrical distribution should be designed to facilitate installation of future loads without replacement of the switchgear or other major electrical components. Following the EPA design criteria requirements is recommended for the plant electrical distribution system and all treatment processes.

The electrical distribution design criteria should include considerations for reliability, maintainability, and safety. To provide for reliable distribution, the system should have two independent sources of power and protection from common mode failures at all plant distribution voltage levels from the 4.16 kV system down to 480V and in some cases critical 120/208V panels.

Providing for electrical distribution that is maintainable requires provisions that enable a portion of the system to be taken out of service for routine maintenance (i.e., cable testing, bus testing, circuit breaker inspection/testing, etc.). The considerations for safety are directly related to maintainability. If plant maintenance personnel can safely maintain the equipment and provide preventative maintenance, the possibility of failures, temporary connections, and equipment damage will be reduced. To achieve this, a dual-ended secondary selective distribution system (M-T-M) is the preferred system to comply with EPA reliability criteria.

A secondary selective distribution system is divided into two parallel systems that have interconnecting tie breakers or switches. In the normal mode of operation, each system or main feeder provides power for roughly one half of all the plant electrical loads. However, all plant loads required for operation could be carried by a single feeder, if required to do so. This arrangement allows for system maintenance with minimal interruption of plant operations or processes. The secondary selective distribution system provides high reliability, flexibility, and safe maintainability, while minimizing system downtime.

The power distribution system is in poor condition due to age and harsh environments. Design should also include erecting climate controlled building for electrical equipment. The building should be sized to accommodate all electrical equipment in the area with space for additional loads. Erecting new buildings will help facilitate the installation of new power system minimizing

downtime and installing a system that will meet the minimum requirements of NFPA 70, NFPA 820, and NFPA 70E.

3.3 Conduit and Wire

3.3.1 Do nothing; Conduit and Wire Acceptable as Is

This option could not be validated due to lack of cable system information. However, based on the age and condition of the equipment it appears that the cabling systems are from the same vintage. With that assumption, replacement of the existing cables where practical is recommended during any plant upgrade.

3.3.2 Replace Conduit and Wire only as Necessary, and add New Conduit and Wire to Account for New Loads

This option could not be validated due to lack of cable system information. However, based on the age and condition of the equipment it appears that the cabling systems are from the same vintage. With that assumption, replacement of the existing cables where practical is recommended during any plant upgrade.

3.3.3 Replace all Existing Wire and Conduit (Design Plant for all-new System)

The power cable system requires a visual assessment at termination points and at any point where the cable is visible such as in manholes. The cable system requires testing such as DC and AC hi pot testing to assess the overall insulation of the cable as well as to determine the condition of the existing system. It should be noted that DC testing on medium voltage cables can be destructive or increase the deterioration of any cable found to be compromised. Based on the age and condition of the equipment it appears that the cabling systems are from the same vintage. With that in mind, the installed cables are more than likely in need of replacement.

Due to the age of the existing cable infrastructure design criteria should include replacing existing cable system to the extent possible.

3.4 Backup Power System

3.4.1 Determine Amount of Backup Power Required and if Plant Currently has that Power Installed

Preliminary calculations suggest that the 1,500kW generators do not have enough capacity to support connected processes. Additionally, due to age of equipment and condition due to harsh environment the existing system is considered unreliable.

3.4.2 Rehabilitate Existing Generator / ATS Systems

This option is not recommended due to the age and condition of the equipment.

3.4.3 Provide New Diesel Generator / ATS Systems

Due to the age and condition of the existing system a new standby system should be installed for the overall plant. Design consideration should include an assessment of running loads versus connected loads and critical equipment required during an outage. The new system should be

design to support the entire facility with a parallel scheme that includes load shedding based on system needs and requirements.

New generators and associated switchgear should be located in one central area with the design capable of serving the entire facility versus locating individual generation at existing process locations.

3.4.4 Secondary Independent System Feed

The single MP&L service to this plant could be supplemented with a second feed. This second feed would provide reliability to the facility provided that it is completely independent of the existing 115 kV system (i.e. a source completely separate from the existing MP&L 115 kV source). However, second utility feeds can suffer from a common loss of power if the utility grid system experiences a wide area outage.

3.4.5 Secondary Independent System Feed / Generator Combination

The addition of suitable standby power in conjunction with a second utility source is optimal. This provides the best overall reliability due to having the ability at the plant to power the processes regardless of utility feeds.

Regardless of whether or not a second utility feed is provided, the internal plant electrical distribution system should be designed to accommodate dual utility and generator standby power (i.e. secondary selective).

Section 4

Corrective Actions

4.1 Short-Term Corrective Actions

4.1.1 Repair or Replace Existing Generators and ATSs

The field review of the existing generators and ATS devices confirmed that the need for repair or replacement still exists. However, based on the limited capacity of this generator and its condition repair or refurbishment is not recommended. A new standby generation facility adequately sized for ultimate plant loadings is recommended. The overall generator system sizing should be such that it is adequate to operate the plant under worst case process scenarios. Specific sizing would need to be determined during detailed design based on existing and new process loading and operational needs.

4.1.2 New Electrical Distribution System

The existing electrical service is inadequate from a reliability standpoint as well as being in poor condition and well past its design life. It is recommended that the existing electrical distribution system and all associated equipment, cabling, etc. be replaced with a dual-ended medium voltage switchgear/system. The dual ended system would include full redundancy with a main-tie-main arrangement and suitable interlocking and utility voltage monitoring for signaling automatic generator start in case of a utility loss. The new electrical distribution system should meet all EPA reliability design criteria.

The electrical distribution system should be a high priority for replacement as a stand-alone project. This replacement should fully encompass new secondary selective service entrance switchgear; generator paralleling switchgear; secondary selective distribution systems and all associated support systems to all processes and a suitably sized standby generation system.

Prior to a replacement project, a detailed evaluation of the entire electrical system is recommended. This analysis should be comprehensive and provide an in-depth review of the existing systems, equipment and produce an overall updated and accurate distribution single line.

4.1.3 Electrical Improvements as part of Type 2 Mechanical System Improvements

For any mechanical process system improvements that are included under the Short-Term Corrective Actions activity, the electrical system upgrades required for the system will be included. Examples of this include the Clarifier 1, 2 and 3 mechanism upgrades, new clarifier 6, and electrical upgrades required for the disinfection system improvements. These electrical improvements should be done utilizing the secondary selective design philosophy.

4.1.4 New Blower Generator

To accommodate standby power for the blowers, the recommended plant wide generator system would include the blowers and associated facilities. The blowers are a critical part of the

treatment process and also represent the largest electrical load at the WWTP. The generator facility would need to be designed to accommodate quantity of blowers needing to be operated during peak operations.

4.2 Long-Term Corrective Actions

4.2.1 New Switchgear, MCCs and Paralleling Equipment

Where existing switchgear, MCCs and paralleling equipment are not improved as part of any mechanical process system improvement, replace the equipment under this task. One example is the equipment at the effluent pump station.

4.2.2 Electrical Improvements as part of Type 3 Mechanical System Improvements

For any mechanical process system improvements that are included under the Long-Term Corrective Actions activity, the electrical system upgrades required for the system will be included. Examples of this include the biological process upgrades and electrical upgrades required for the influent pump station.

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Appendix K

Administrative, Operations and Maintenance TM

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Department of
Public Works

Savanna Street
Wastewater Treatment Plant

Composite Correction Program

Administrative
Operations and Maintenance
Technical Memorandum

April 2016

CDM Smith

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Section 1
Introduction

1.1 CPE Summary and Conclusions

1.1.1 CPE Summary

As part of the CPE Report, an analysis of SSWWTP Administration, Operations and Maintenance functions was performed. The analysis included a review of Plant Administration, Plant Staff, Maintenance, Operations and the Existing Operating Contract. A summary of these analyses is provided below.

Plant Administration. United Water Services, Mississippi LLC (UWS-MS) administers plant operations. It was noted that a plant O&M Manual exists, as well as written Standard Operating Procedures (SOPs) for certain pieces of equipment. The SOPs are maintained separately from the O&M Manual.

Dry weather operation was not discussed. In wet weather situations, plant staff monitor video of certain pumps, but have to operate the systems manually and the written procedure is to conduct a visual inspection at the pump stations every 1-2 hours, based on rainfall intensity. Plant staff have the authority to turn pumps on and off.

Plant Staff. UWS-MS's contract calls for a maximum of 48 full-time plant employees for 24/7/365 plant operation. As of May 2014, UWS-MS employed 44 people in full-time positions (including 12 licensed WWTP operators) and had working relationships with local colleges for internships. UWS-MS has a contract with a local company to provide emergency pumping. The staff appear to receive appropriate and ongoing training and can be cross-trained to gain skill sets in multiple areas of the plant.

Financial. UWS-MS's contract is for operations and maintenance only; capital funding is not a part of the contract and must be provided by the City. In recent years, capital project funding has been applied for by UWS-MS but not approved by the City, due to the lack of money. It was noted that major equipment failure prompts the City to seek outside contractors to perform the work; this leaves the damaged equipment unrepaired for long periods of time.

Maintenance. eRPortal is an asset management system used to manage preventive and corrective maintenance activity. UWS-MS uses this system for Jackson's three WWTPs and 98 lift stations.

Operations. The plant has an onsite laboratory for compliance sampling and logs the data in the Wastewater Information Management System (WIMS). Independent laboratories are also used when needed. Flow monitoring is provided daily, with process adjustment made when flow patterns change (dry to wet weather and back, for example).

Existing Operations Contract. The contract's main requirement is to not violate the plant NPDES permit. There are few operational milestones beyond this, and there is nothing in the contract to allow UWS-MS to perform capital repair work without permission from the City.

1.1.2 CPE Conclusions

Plant Administration. Pump control, which is now primarily a manual control function, should be changed to automatic control based on flow rate and/or wetwell level.

Plant Staff. The plant appears to be right-sized for effective operation, but is not properly sized for emergency operation. Contracts with local companies are in place for emergency operation.

Financial. Capital improvement funding is generally not available, but is necessary. The majority of the plant mechanical systems are past their anticipated useful life.

Maintenance. Maintenance appears to be executed at a level that keeps the plant running. Preventive maintenance is helping to extend the life of the equipment and corrective maintenance is tracked to help determine when equipment needs to be replaced. UW-MS is performing this work on an "as necessary" basis, but the program is not a "comprehensive" program due to budget limitations on the capital side of the contract that prevents UW-MS from buying larger dollar value equipment and supplies.

Operations. Flow and compliance sampling are executed in-house, but some lab sampling is performed offsite. Plant operation is changed based on flow changes, but is performed manually.

Existing Operations Contract. The existing operations contract is inadequate to address proper maintenance and capital improvement for the WWTP and requires renegotiation or reprocurement by the City.

1.2 CCP Approach

The CCP approach used for the Administration, Operations and Maintenance functions of the Savanna Street WWTP is to address the Process Limiting factors identified in the CPE report. These are listed below.

- The ability to control pumps remotely should be implemented to improve control of the IPS and prevent manual (and potentially dangerous) operation during wet weather conditions.
- Addressing capital improvements in a timely fashion at the plant has been a recurring issue. Capital budget planning (a facility plan, as noted earlier, is being pursued on a parallel path to this TM) needs to occur to properly establish annual repair or replacement budgets for major equipment to assure proper maintenance.
- The existing O&M contract with UWS-MS has not obtained the results the City had hoped to achieve. Alternatives will be offered that may be able to improve the results of future agreements, including the currently-advertised O&M contract RFP.

Section 2

Current State of Process Limiting Factors

2.1 Pump Operation

The CPE notes that while cameras provide a visual assessment of pumps (the CPE does not specifically indicate which pumps, but the pumps in question are the influent pump station pumps), the operation of changing the pump sequencing is a manual function that requires an operator to be physically at the pump to change the lead-lag sequence of pump operation. There is an ultrasonic level sensor for on/off control via wetwell level, but there is currently no remote pump control via radio or SCADA system; that's why the requirement for an operator to be present is reported. This current level of process functionality is labor intensive, does not allow plant staff to have instant response to varying flow situations or emergency situations unless someone is dedicated to the IPS 24/7/365, and is not a level of control typically installed at facilities of this size and importance. Control upgrades are required.

2.2 Capital Improvements

The CPE notes that money has not been available to make necessary capital improvements to the WWTP. This situation has not improved. UWS-MS submits capital budget requests to the City of Jackson, and these requests, in large part, have not been able to be granted. In essence, the plant systems are running until they break, then being fixed only if they are plant-critical. Equipment and systems that have extended beyond their useful life but are still working are not being replaced. If this practice continues, operation that consistently meets NPDES effluent permit limits cannot be guaranteed.

2.3 Operations Contract

The CPE notes that the current operations contact is for operation and basic maintenance of the plant. UWS-MS can request funding for major maintenance or capital upgrades, but the money has to be approved and provided by the City of Jackson.

The contract has few performance parameters that the City can hold UWS-MS to. Meeting NPDES permit requirements is the primary performance indicator. Internal plant performance requirements, lagoon performance and operation requirements, and even routine maintenance requirements are not specified.

In summary, the contract has not been executed and administered to achieve best results at the WWTP. The contract is, in essence, an operator rental agreement for plant operation, with the City being responsible for providing capital funding for plant improvements or high cost repair and maintenance items. A lack of available funding (often due to budgeted capital funding having to be used for emergency repairs) has made this contract model difficult to execute.

Concerning contract status, the contract expired at 12:01 AM on November 1, 2015. The City and UWS-MS extended the term of the contract by one year to 12:01 AM on November 1, 2016.

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Section 3
Alternative Analysis

3.1 IPS Pump Operation

As noted above, the IPS pumps are operated automatically by an ultrasonic level sensor; there is no other automatic or remote control. The following discussion provides an alternative analysis of potential improvements to the IPS pumps.

3.1.1 Retain Current Pump Control Procedure (Do Nothing Alternative)

The IPS Pumps are currently manually controlled by plant operators. An ultrasonic level sensor monitors the wetwell level and plant staff turn pumps on and off. This control is local to the station; there currently is no SCADA or radio signal that is sent to a central control station for control of these pumps. There is a camera-based wet well level and pump monitoring system with a monitoring screen in the operations office; the screen provides a visual status of the IPS. The procedure during wet weather is to station an operator at the IPS to monitor flow conditions and make changes to pump operation to react to changes in wetwell level.

This procedure is only in place because there is no remote control of the IPS pumps. While the procedure does not cost more from a labor perspective – UW-MS is using employees already on site – it does take the employee away from other functions they would be performing, so labor efficiency is impacted. This procedure also exposes the employees to potentially hazardous conditions, such as operating electrical controls in a humid or wet environment and having to walk in and out of the pump station in potentially adverse weather conditions to physically review trash screen status.

The current standard of operation for pump stations in 2015 is to have instrumentation and controls in place that provide remote control of the station. Continuing to operate using manual labor to change pump operation is inefficient and potentially dangerous to plant staff and is not recommended.

3.1.2 Provide Additional Automatic Pump Control

Providing additional pump controls is a viable alternative at the Savanna Street WWTP. "Additional" is defined as adding the least amount of control infrastructure needed to remotely control and monitor the critical equipment at the IPS. The "critical equipment" is defined as the pumps, the trash screens, and the power supply.

Instrumentation required to meet this alternative include (1) a high level float switch upstream of the trash screens to indicate that the screens are overloaded and the screens need to be cleaned; (2) an ultrasonic level sensor to control pump operation based on wetwell level; (3) instrumentation for each pump to indicate the pump status (on/off) and if the pump has failed; (4) instrumentation to allow for remote start/stop operation of the pump; (5) instruments to monitor the power supply to verify that power is being fed to the screens and the pumps; (6) instruments to monitor that the backup power generators are working or have failed (generator

upgrade and replacement is discussed in the Electrical System TM). The MCC would have to be reviewed to determine if modifications are required to accommodate these improvements. A small PLC would be required to collect signals from the instruments and send them to a panel in the control room. This panel would have status lights to indicate if the trash screen channel water level is too high, which pumps are running, if a pump has failed, if main power or generator power is supplying the station, and if a generator has failed.

This level of instrumentation will allow the operator to remotely monitor station operations (pumps are operating as intended under all flow conditions, for example) and will inform the operator if there is mechanical failure within the IPS infrastructure. Pump or power supply failure causes will not be identified; the operator will have to go to the local control panel in the IPS or at the generator to determine the failure cause.

This alternative will not provide the information necessary to optimize station operation (motor data, VFD data, power supply data, automatic control of lead-lag sequence, water levels, etc.).

3.1.3 Provide Full Spectrum of Pump Control

This alternative provides a SCADA system to monitor and remotely control the pump station from the main control room. It would provide the ability to control pump start/stop, adjust the pump speed if VFDs are used (See the IPS TM), remotely change the lead-lag sequence, monitor the pump motors for temperature and vibration, see the totalized pump run times and the water level in the wetwell and the trash rack channel by use of ultrasonic level sensors, obtain generator operational information, including the amount of fuel in the tank if a diesel generator is used, and remotely perform any and all pump station functions through the SCADA system. Digital and analog signals would be sent from the PLC in the IPS to the control room PLC, and the data would be displayed on the SCADA screen. Float switches as described in 3.1.2 would be installed as backup systems in the event that the ultrasonic level sensors fail.

This alternative could provide maximum operational control of the IPS from the control room. If the data sent back from the pumps, motors and electrical system are used properly, it would allow the operator to optimize station electrical usage and could help the operator determine best times for equipment preventive and corrective maintenance. It would also likely reduce station operating cost enough to make this an attractive life-cycle cost alternative.

This flexibility comes at a higher capital cost. There is significantly more instrumentation with this alternative, more robust PLC hardware, more detailed programming, and SCADA monitors instead of status panels. There is also the possibility that this equipment could be installed and then not used to optimize the system; there would have to be a commitment from operations and management staff to use the technology properly, or the expense would not be validated.

3.2 Capital Improvements

The current funding procedure for WWTP improvements is not meeting the needs of the WWTP. If the current lack of funding for capital improvements continues, eventually the WWTP will suffer an equipment or system failure that will result in a prohibitive discharge from the plant. Per the Consent Decree, this is an automatic violation of the Decree and the City or the plant operator would be subject to penalty.

Please note that the City is creating a Facility Plan for Savanna Street WWTP under a separate schedule. This parallel pursuit will allow the City to pursue funding for Consent Decree work in a timely manner. The Facility Plan must be coordinated with the CCP and the WWTP Basis of Design (BOD) Report in the future to insure that the City's funding does not get jeopardized by inconsistencies between the documents.

3.2.1 Review Need Annually and Fund in City's Budget (Do Nothing Alternative)

This alternative continues the practice of allocating money in Jackson's capital budget to address WWTP infrastructure improvements. Unfortunately, this practice has not served the City well in the recent past. The City has had to make budgetary decisions that have taken the capital funding from the WWTP and reallocated it to WWTP and WCTS emergency operating expenses. It is likely that, given the financial constraints the City continues to face, that this tendency to have to make hard choices will continue. Given the overall state of the WWTP and WCTS, continuing this practice is not recommended. This could result in the failure of a plant critical system or mechanical component that directly impacts water quality, thus increasing the possibility of a prohibited discharge.

3.2.2 Modify Funding Categories in the City's Budget to Fund Capital and Operations Expenses

This alternative would modify the budgeting process to include a line item for capital funding and a line item for operating expenses that includes a contingency fund for emergency operations. This contingency fund would provide a buffer in the budget to fund emergency operations without having to take away from the capital fund. It is noted that there must be a commitment to keeping the contingency fund whole during a budget year, or this alternative likely would not be an effective alternative.

3.2.3 Delegate Capital Spending Authority to Contract Operator, with a City-Approved Cap

This alternative delegates the control over the capital spending of Savanna Street WWTP infrastructure to the contract operator (if contract operations continues – see below). The amount of capital expenditures would be negotiated as part of the contract. This would include a cap that the City mandates; any funding over that cap would have to be approved by the City. This alternative provides flexibility for the contract operator to spend the capital funds available to them at their discretion as needs arise in the plant. Also, these capital expenditures may be able to be negotiated as a "pass through" type of cost, similar to an expense report: the operator spends the money, then turns in the invoices to the City for payment. If the operator does not spend the money, the City keeps it. However, it is likely that the operator would ask for a guarantee that the money would be available when needed, such as an escrow account, and would ask for a small percentage as a "management fee".

3.2.4 Note on Near-Future Capital Expenditures

It is noted that, due to the nature of improvements needed to meet Consent Decree requirements, required capital expenditures may be relatively low during the 5-year Consent Decree improvement program. During the program, virtually all capital expenditures would be included

in the program, and in the first 5 or so years following completion of the improvements, there should be few capital expenditures required because the entire plant will undergo some type of capital improvement. This fact can be used as part of the negotiation to lower the contracted capital fee cap under section 3.2.3 or under any other scenario where a contract operator has capital spending authority.

3.3 Plant Operations, Maintenance and Capital Alternatives

The current operations and maintenance agreement with UWS-MS has not been executed and administered to achieve best results at the WWTP. Alternatives are described below that may provide more positive results for the City and future contract operators. It is noted that, as of the date of this document, a Request for Proposal is being advertised for a new Operations and Maintenance Contract.

It is noted that the improvements required to meet the Consent Decree amount to a significant capital investment by the City. The current financial situation of the City dictates that research into funding mechanisms is required for the City to meet the financial burdens of this work. The State Revolving Fund (SRF), government bonds, a rate study to determine rate adjustments, and other funding mechanisms should be reviewed.

3.3.1 Expand the Scope of an O&M Agreement and add Performance Goals

One alternative that may provide improved results in an Operations and Maintenance contract is to expand the scope of the contract to add more plant responsibility – more control over predictive and corrective maintenance and control of the capital budget are two examples – but tie the operator's work to certain Key Performance Indicators that reward the operator for exceeding the indicators but penalize the operator for not meeting the indicators. The City could retain certain administrative functions, such as billing, and would retain ownership of the system assets, but turn the operation and upkeep over to the contract operator in a partnership type agreement. It is noted that if these items are not included in the current RFP, the City could choose to add them as part of negotiations with the successful proposer.

3.3.2 Contract Operator Assumes Full Control of the System, but the City Retains Ownership of the Assets

Another form of contract that allows the City to retain ownership of the assets is to allow the successful operator to assume full control of the operation, maintenance, and capital expenditures of the system. Contract terms can be negotiated in a variety of ways, but the basic form of the agreement is that the operator is responsible for all aspects of operations, maintenance and system capital improvements. Rates are typically controlled by the operator as a means to generate the revenue needed for system operation, maintenance and capital expenditures, but other financial arrangements are possible. Administrative functions can be retained by the City under this arrangement, if desired, or they can be performed by the operator's staff.

3.3.3. Sell the Wastewater System Assets to a Private Owner or Authority

An alternative to consider is to sell all or part of the system assets to a private owner or an authority. There are multiple forms this sale could take – three examples are to sell just the

WWTPs, to sell all physical plant (WWTPs and Sewage Lift Stations) or to sell all sewer system assets (physical plant and pipelines). Administrative functions – billing, staffing, payroll, benefits, etc. – could also be turned over to the buyer.

It is noted that this alternative may take City council action and, possibly, a vote of the City's population to approve the sale of the City's assets. It is also noted that further research of the viability of this alternative while the City is under a Consent Decree is required. The work of the Consent Decree as it relates to the SSWWTP may have to be performed by the City prior to a potential sale.

There are significant advantages and disadvantages with selling assets. Primary items are listed below.

Advantages:

1. The City would be paid for selling the assets. This would provide a short-term boost to the City's economic ledger, or the payments could be annuitized to spread the economic impact out over a longer period of time.

2. The City delegates all financial responsibility and, if the contract is worded right, liability (or at least a portion thereof), for the portion of the system being sold.

3. Any financial expenditure associated with staff dedicated to the wastewater system (salaries, fringe benefits, pensions and the like) is eliminated.

4. Responsibility for meeting regulatory compliance, including NPDES permit compliance, would be assumed by the buyer.

Disadvantages:

1. The revenue stream from sewage bills would be eliminated.

2. The assets of the system that are sold would be removed from the city's property asset ledger and may be subject to taxation, as the sale is a source of revenue for the City.

3. While liability against lawsuits can be negotiated in the contract, it is possible that in the event of personnel accidents, permit violations, or mechanical failures that cause sewer overflows, the City could still be drawn into the litigation process.

4. While the system is now owned by a different entity and this entity would be responsible for meeting all regulatory requirements, the City does not "control" the owner to the extent that it "controls" their own staff or a contract operator. If the owner does not conscientiously execute the operation of the plant, the City can suffer a negative impact because the City sold the system to an owner who could not meet compliance requirements.

5. The City would no longer control rates. If the owner requested to significantly raise rates, there could be a backlash against the City for selling to an owner who is trying to gouge the population.

3.3.4 City of Jackson Resumes Operation of the Plant – No Contract Operator

The City can choose to resume operation of the plant. This would entail staff additions as necessary to operate the plant and resumption of all the operation, maintenance, administrative, and capital infrastructure functions of the plant. This would also place the full burden of regulatory compliance and with the Consent Decree under the control of the City.

The City would need to perform an analysis to determine if this alternative is viable at this time. Factors to consider are how the City would meet the staffing requirements of the system (for example, hiring an equal number of employees, with the same number of certified operators, as the current O&M contract means that 44-48 employees would be added to the City's employment base); if the City is ready to accept full responsibility for meeting all regulatory requirements of the existing NPDES and the requirements of the new NPDES, which will be issued in 2017; and the impacts and implications of making this change while under a Consent Decree.

3.3.5 Design-Build-Operate Alternatives to Administer the Consent Decree Work and Subsequently Operate the Plant

Alternatives the City can explore to execute the work of the Consent Decree include design-build-operate (DBO) and design-build-operate-finance (DBOF). DBO is a process by which the contracted firm performs the function of designing and building the improvements required to meet the Consent Decree, then assumes operation of the plant upon completion of the improvements. The City retains responsibility for financing of the improvements in DBO. In DBOF, the contracted firm is responsible not only for making the improvements and operating the plant after the improvements are made, they are also responsible for financing the work. The City would have to agree to the financing terms, but it is possible that more favorable financing can be achieved. Using the contracted firm's credit rating to obtain lower loan rates than the City can obtain is one example of this potential financial benefit. It is noted that operation of the plant during construction can be performed by the City's selected contract operator under the currently advertised RFP, if the City desires.

These alternatives encompass both the operation of the plant as it stands today (the DBO or DBOF contractor could operate the plant during construction, if the City chooses) and the design and construction of the improvements required to meet the Consent Decree. The contract could include bonuses and/or penalties on the operator for meeting or not meeting the Consent Decree requirements. These alternatives are attractive for the primary reason that it places the responsibility of maintaining the plant for the present and the future in the hands of one contracted firm. The firm would be allowed the flexibility to perform the work in the most cost-effective manner possible, while maintaining operation of the existing facility as an integral part of construction, if the City desires. Then, that one point of contact would assume control of the work they built, so the responsibility for meeting regulatory and KPI requirements would stay squarely on the shoulders of the contract operator. The City's administrative function associated with the WWTP portion of the Consent Decree could be limited to as little as one contract, one firm, and one invoice a month, if the City desires.

A full analysis of these alternative is beyond the Scope of this report. The City would need to analyze these alternatives in much greater detail to determine if these are viable long-term alternatives that serve the City's best interests.

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Section 4
Conclusions and Recommendations

4.1 Conclusions

4.1.1 IPS Pump Operations

For IPS pump operations, the following conclusions have been drawn:

- The "do nothing" alternative is not an acceptable method of operating the IPS.
- Providing additional controls is a viable alternative; the station can be operated safely under this alternative and costs are minimized to the extent practicable.
- Providing full controls is a viable alternative; station performance can be optimized and the station can be operated safely, but costs are higher and some of the functionality may never be used, which would minimize any long-term financial benefit of paying for the functionality.

4.1.2 Capital Improvements

For providing capital funding for plant improvements, the following conclusions have been drawn:

- The "do nothing" alternative is not meeting the needs of the City.
- Creating separate capital and operation funds, with an emergency operation expense contingency line item within the operating fund, is a viable alternative, but the commitment to funding the contingency line item must remain firm through a budget year for this to work.
- Delegating capital spending flexibility to the contract operator, with a spending cap agreed to by the City, is viable if the City approves an operations contract that includes contract operator capital spending authority and a spending cap. It is noted that capital spending outside of the Consent Decree program should be minimal over the next 10 years, so this alternative may be attractive at this time.

4.1.3 Operations, Maintenance and Capital Alternatives

For future operations and maintenance of the Savanna Street WWTP, the following conclusions have been drawn:

- Modifying the operating contract to expand operator authority and responsibility, but holding them to meeting key performance indicators, is viable. These conditions could be negotiated with the successful responder to the current contract operations RFP, if the City desires.

- Having a contract operator assume full operational control of the system, while the City retains the wastewater system assets, is viable. These conditions could be negotiated with the successful responder to the current contract operations RFP, if the City desires.
- Selling all or part of the City's wastewater infrastructure to a private owner or an authority is viable, but will likely take approval from City council and a vote of the City's populace and it must be clarified if the City can sell these assets while under the Consent Decree. This may be a more attractive alternative in the future.
- Resumption of Wastewater System operation by the City requires further study by the City to determine if this is a viable alternative.
- Design-Build-Operate and Design-Build-Operate-Finance alternatives were mentioned as possible methods to combine the Consent Decree work with contract operations, but further analysis is required to determine if these alternatives are viable long-term alternatives that serve the City's best interests.

4.2 Recommendations

4.2.1 IPS Pump Control

CDM Smith recommends that, as part of the IPS pump station improvements project, additional pump system controls be added to allow for remote operation of the station, in accordance with paragraph 3.1.2. This level of control provides a cost-effective approach to improving pump station operation and operator safety. These improvements should be designed to be integrated into future system integration packages, should the City wish to increase the level of control in the future. The SOP of this system must be updated to reflect this improvement, as well.

4.2.2 Capital Improvements

The planned capital improvements at the SSWWTP will largely be contained within the Consent Decree program for 5 years from the time the CCP is approved until the program improvements are completed, so the focus for capital funding will remain on the program during this period. During the program period, it is recommended that the City develop a capital funding plan that can be executed more effectively than the existing procedure, with the knowledge that capital improvements in the first 5 after the Consent Decree work will likely be relatively small because the Consent decree program will rebuild or modify almost every system at the WWTP.

4.2.3 Operations and Maintenance Contract

As of the date of this document, the City has an RFP advertised for contract operations. It is recommended that the City complete this process, but review the alternatives noted above and determine if there are benefits that can be gained by incorporating any of these alternatives into the RFP selection process.

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