EXHIBIT 5

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2488/27011

REPORT

Alternate Operating Modes
Evaluation Report - Consolidated Drains Treatment System

General Electric - Aircraft Engines
Lynn, MA

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O'BRIEN & GERE
ENGINEERS, INC.

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1. Introduction

1.1. Project background

In October 2000, the General Electric – Aircraft Engines (GEAE) Company completed construction, testing, and performance-period operation of the dry weather flow consolidated drains treatment system (CDTS) at its River Works facility in Lynn, Massachusetts. The purpose of this system is to capture dry weather flows and potentially "first-flush" flows from eight existing storm sewer drains (Drains 001, 007, 010, 019, 027, 028, 030, and 031) for treatment. The flow is treated to eliminate oil & grease exceedances (less than 10 mg/L) and visible sheens in accordance with National Pollutant Discharge Elimination System (NPDES) Permit requirements. This process does not involve capture, conveyance, or treatment of storm water flows under wet weather conditions.

To better manage storm water and dry weather flow discharges at the facility, in-ground oil/water separator vaults were installed at the eight drains during 1992. For the CDTS project, the vaults at each of the eight drains were modified to include slide gate valves for isolating the tide. In addition, new dry weather flow discharge pumps and piping to the treatment system have been installed to convey collected flows from each drain.

The centrally-located treatment facility consists primarily of two 463,000-gallon influent flow equalization tanks, influent pumps, a chemical conditioning system, a 300 gallon-per-minute (gpm) dissolved air flotation (DAF) treatment unit, an effluent holding tank, and effluent discharge pumps. The effluent pumps convey treated water to the discharge point in Drain 027. The treatment system also includes a pair of granular activated carbon (GAC) vessels located downstream of the effluent tank and pumps, which can be used for final polishing of the effluent, if deemed necessary. Figure 1 depicts the general treatment process within the CDTS.

1.2. System startup and testing

Following completion of construction, the components of the CDTS were individually tested out for installation and operational qualifications to ensure each was properly installed and prepared for full-scale system operation. By mid-summer the CDTS had been completely checked out and on July 5, 2000 the complete system was started up, initiating a 90-day operational performance period.

Treatment within the CDTS occurs in various stages. Initially, the oil-water separator vault at each of the drains provides for free-phase separation of oils and greases. Product is removed from the vaults with a tube skimmer and collected in an above ground oil-water separator. Secondly, the collected dry weather flows from each of the eight drains accumulate within the equalization tanks. The quiescent condition within these large tanks, in conjunction with a floating oil skimmer system, provides a second means for free-phase product separation and collection. Finally, the DAF treatment system provides the third stage of primary oil and grease removal from the collected dry weather flows at the site. In addition, the GAC units down stream of the DAF can be utilized, if deemed necessary, for final polishing of the system effluent.

The normal operating mode of the CDTS is pumping of collected water from the equalization tanks through the DAF, where the influent flow is chemically conditioned to enhance oil & grease removal. Following the DAF, the treated water is collected in the effluent holding tank, where it is then pumped directly to the final discharge point at adjacent Drain 027. The system, however, has enough flexibility to function in any one of five modes of operation, depending on the level of treatment necessary to achieve the NPDES Permit discharge limits. These alternate operating modes are further described in Section 2 of this report.

Sampling at various points within the system during the performance period operation was conducted to assess the treatment capabilities of the system components. The four sampling locations are illustrated on Figure 1. The results of this testing were used to evaluate the suitability of the system to operate in any one of the alternate operating modes.

1.3. Purpose

The purpose of this report is to convey the results of the system performance testing and to provide a recommended standard mode of system operation for the CDTS. In addition, this report provides recommended operating criteria to assess changes in modes of operation based on system performance and sampling results.

2. Alternate operating modes description

2.1. Operating Mode 1

Operating Mode 1 is the original design basis for the CDTS. Figure 1 presents the primary components of this operating mode, which include the following:

- oil skimming/separation at the drains
- conveyance and collection of dry weather flows from the drain pump stations, into one of two equalization tanks
- flow equalization within the tanks (promoting phase separation) and transfer via the influent pumps
- chemical pretreatment by polyaluminum chloride (PAC) and anionic emulsion polymer
- treatment by the dissolved air flotation (DAF) unit
- gravity flow of treated water from the DAF to the effluent holding tank
- discharge of treated effluent via the effluent transfer pumps directly to the final chamber at the Drain 027 vault.

As noted previously, this mode of operation does not include the GAC units for final polishing of treated system effluent.

2.2. Operating Mode 2

In the event it is decided that the treatment system effluent requires additional polishing for removal of oil & grease or volatile organic compounds (VOCs), the system can be placed into Operating Mode 2. As illustrated on Figure 1, this mode includes the same unit process operations as Operating Mode 1 (equalization tanks, chemical pretreatment, DAF treatment, effluent holding tank), with the addition of the GAC polishing option prior to final discharge at Drain 027.

Implementation of this mode of operation would be exercised if required to meet effluent limitations, or if, in the opinion of the system operator, conditions exist such that further treatment of system effluent will ensure the highest probability of compliance.

To implement Operating Mode 2, the system operator first selects the desired GAC flow distribution setup (e.g., parallel or series operation) at the operator station. Then, via on-screen commands, the treatment system will automatically switch into Operating Mode 2 by simultaneously closing the discharge valve from the effluent holding tank to Drain 027 and opening the appropriate GAC inlet valve(s).

2.3. Operating Mode 3

Operating Mode 3 entails treatment (beyond the oil skimming/separation that occurs in the drain vaults and equalization tanks) solely by the GAC units. This setup consists of transferring water from the equalization tanks directly to the effluent holding tank, followed by pumping through the GACs prior to discharge to Drain 027, as shown on Figure 1.

Implementation of this operating mode would typically be exercised during times when the DAF system is down for maintenance, and the system influent still requires some level of oil and grease treatment prior to discharge.

To place the system into Operating Mode 3, the operator must select the desired GAC flow distribution setup at the operator station, as previously discussed. The influent pumps are then temporarily shut down while the operator manually opens a valve to isolate the DAF by-pass and effluent holding tank influent lines, and then manually closes the valves to the DAF influent and effluent lines. Once the appropriate valve adjustments are complete, the operator restarts the influent pumps, and the system will operate in Mode 3.

2.4. Operating Mode 4

Operating Mode 4 involves pumping collected dry weather flows from the equalization tanks directly to the effluent holding tank and discharging to Drain 027 without chemical, DAF, or GAC treatment. Implementation of this operating mode would typically be exercised during times when the chemical, DAF, and GAC portions of the system are down for maintenance. Additionally, this mode of operation may be implemented when monitoring of influent to the equalization tanks indicates the skimming and oil/water separation that occurs at the drain vaults and within the equalization tanks is sufficient to meet permitted effluent discharge limits. The flow sequence for this operating mode is depicted on Figure 1.

2.5. Operating Mode 5

Operating Mode 5 involves direct discharge to the river following the oil skimming/separation that occurs in the vaults at Drains 001, 007, 010, 019, 027, 028, 030, and 031 (i.e., the mode of operation prior to operation of the CDTS). Implementation of this operating mode would typically be exercised during times when the slide gates, pumps, and/or conveyance piping at the drain vaults (either at individual drains or collectively) or equalization tanks and equipment are down for maintenance.

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3. Performance period testing

3.1. 90-day performance period testing

During startup and system operation in the 90-day performance period, the CDTS functioned in Operating Mode 2. Operation with the GAC units on-line was considered to be the most conservative to ensure the highest probability of compliance in the event of possible unexpected influent conditions.

As noted previously, sample points at critical locations within the treatment process were installed to facilitate collection of data for evaluating the treatment capabilities of the individual operating modes. As illustrated on Figure 1, these sample points included:

- equalization tank influent (Sample Tap 1)
- equalization tank effluent/DAF influent (Sample Tap 2)
- DAF effluent (Sample Tap 3)
- final system effluent to Drain 027 (Sample Tap 4)

During the 90-day performance period, samples were collected from each of the four sample locations. Daily samples were collected at each point for the first 2 weeks of the program, followed by weekly sampling for the remainder of the 90-day period. As the primary constituents listed in the Drain 027 discharge permit are oil & grease, VOCs, and pH, each sample obtained was analyzed for these parameters, with the exception of VOCs. VOC analyses were conducted from the first three sampling locations to evaluate the effectiveness of equalization and the DAF in VOC removal. The oil & grease and pH sampling results are provided in Table 1 and the VOC concentrations detected are summarized in Table 2.

In addition to these constituents, daily samples at each of the four locations were obtained and analyzed for total suspended solids (TSS), total dissolved solids (TDS), iron, and methyl blue active substances (MBAS) during the first 2 weeks of the performance period. This sampling was conducted to provide a baseline concentration of these parameters for characterizing the influent water quality. The sampling results are provided in Table 3.

3.2. Data acquisition for Operating Modes 1, 2, 4, and 5

Although the CDTS functioned solely in Operating Mode 2 during the 90-day performance testing period, data from the various sampling points can be used to assess system operation in Operating Modes 1, 4, and 5. As depicted on Figure 1, Operating Mode 1 consists of DAF treatment followed by direct discharge to Drain 027. Although the system was operated with the GACs on-line, the DAF effluent sample (Sample Tap 3) provides representative data to demonstrate how the system could operate in this mode, considering the effluent holding tank provides no further treatment of the water.

Likewise, Operating Mode 4, which includes phase separation in the equalization tanks followed by direct discharge via the effluent holding tank to Drain 027, can be assessed from the results of the 90-day performance period sampling. By comparing the results from the equalization tank influent (Sample Tap 1) and equalization tank effluent (Sample Tap 2), it can be evaluated whether this mode of operation could consistently meet effluent limitations, or whether additional treatment (e.g., by the DAF or GAC units) would be necessary.

Operating Mode 5, which is the historic operating mode of phase separation and skimming at each of the drain vaults, can be assessed by the NPDES monitoring conducted at each of the drains prior to implementation of the CDTS as well as by the results of the equalization tank influent (Sample Tap 1) sampling.

3.3. Operating Mode 3 additional testing

Operation of the CDTS in Operating Mode 2 could not provide representative data for treatment in Operating Mode 3. Because this mode consists of treatment by the GACs without prior chemical conditioning or DAF treatment, the 90-day performance period results could not be used to assess the effectiveness of Operating Mode 3.

As a result, an additional 10-day testing period was conducted immediately following the 90-day performance period to simulate system operation in Operating Mode 3. During this additional testing period, the treatment system was operated manually for 4 hours a day in Operating Mode 3 by transferring water from the equalization tanks directly to the effluent holding tank, followed by pumping through the GAC units prior to discharge to Drain 027. During this time, samples were obtained at the equalization tank influent (Sample Tap 1), the equalization tank effluent/GAC influent (Sample Tap 2), and at the system effluent discharge point (Sample Tap 4) to Drain 027. The operator tested the daily samples for pH and oil & grease using field-screening meters, and the results are summarized in Table 4.

4. Performance testing results

4.1. Results of 90-day performance testing

Laboratory analyses during this period indicated that oil & grease concentrations at each of the four sampling points in the CDTS were below the method detection limits (Table 1) and no visible sheens were reported from the Drain 027 discharge. The non-detectable oil & grease levels in the system influent are not uncommon from what was observed during evaluation and design of the CDTS and the NPDES monitoring at each of the individual drains for the past few years. This may be attributed to several things, including the quality of the drain water and/or phase separation at the individual drains and equalization tanks.

Field-screening data obtained on July 26, 2000 exhibited 6 mg/L of oil & grease in the DAF influent and 3 mg/L in the DAF effluent. This information indicated good removal efficiency in the DAF unit, even at very low influent concentrations.

Table 2 presents the VOC analytical results from the performance period sampling. As shown, the VOC sampling during the first 2 weeks of operation indicated no appreciable changes in concentration, whereas during the remaining weeks of the performance period, notable decreases in VOC concentrations were evident within the CDTS, primarily between the influent equalization tanks and the DAF.

The initial 2 weeks of daily water quality sampling results for TSS, TDS, iron, and MBAS are summarized on Table 3. As exhibited in the table, no significant removals were observed. However, as noted previously, the primary purpose of these data was to provide a baseline concentration in characterizing the influent water within the CDTS.

As shown in Tables 1 and 4, the measured pH ranged between 6.8 and 7.3. These measured values were well within NPDES permitted range of 6.5 to 8.5.

Laboratory analytical data from the 90-day performance period testing for all sampled parameters are included in Appendix A (bound separately).

4.2. Results of 10-day additional testing

As summarized in Table 4, the additional 10 days of field screening in Operating Mode 3 produced similar results to the 90 days of performance sampling, with the result from each sampling point exhibiting an oil & grease concentration less than 5 mg/L. Field screening data from the 10-day additional testing period for oil & grease and pH are included in Appendix B (bound separately).

5. Conclusions and recommendations

5.1. Conclusions

The 90-day performance testing data indicate that influent oil & grease concentrations are typically less than the laboratory detection limit (5 to 7 mg/L). The NPDES Permit average monthly discharge limit for oil & grease is 10 mg/L, while the daily maximum allowable discharge for oil & grease has been established as 15 mg/L.

Based on these data, it could be concluded that little to no treatment for the removal of oil & grease beyond that provided by the skimming/separation that takes place at the individual drain vaults may be necessary. This scenario (Operating Mode 5) indicates that operation of the CDTS in any of Operating Modes 1 through 4 would ensure the highest probability of compliance by providing additional oil & grease removal capabilities.

5.2. Recommendations

5.2.1. Standard system operating mode

Based on a review of the performance period testing data, it is recommended that standard system operation be in Operating Mode 1. Although operation in Mode 4 or 5 is feasible, based on the results from the 90 days of performance period sampling, additional monitoring of the system operation may be necessary to confirm these results for long-term operation. Continued sampling of the equalization tank influent and effluent during operation in Operating Mode 1 should help in evaluating whether Operating Modes 4 or 5 will be reliable for long-term operation.

5.2.2. Operating mode selection criteria

As noted in Section 5.2.1., the recommended initial mode of normal system operation is Operating Mode 1, which consists of treatment at the drain vaults, the equalization tanks, and DAF, followed by direct discharge to Drain 027. The system may be operated, at the discretion of GEAE, in the following modes.

Operating Mode 2: Operation in this mode (both DAF and GAC treatment) may be advisable if the DAF treatment efficiency for oil & grease begins to decline. This may be due to significantly elevated system influent concentrations or the DAF requiring routine or emergency maintenance.

Operating Mode 3: Operating Mode 3 involves skimming/equalization and treatment by the GAC units. This mode of operation may be implemented to facilitate maintenance of the chemical conditioning and DAF. However, because the CDTS has been designed primarily as an oil & grease removal system, more frequent monitoring of influent oil & grease concentrations is recommended if this mode of operation continues for an extended period of time.

Operating Mode 4: Discharge of effluent from the equalization tanks directly to Drain 027 may be implemented for routine normal operation following collection of a dependable database of low or non-detectable oil & grease levels in the system influent. Operating Mode 4 may also be implemented on a short-term basis to facilitate system maintenance or address high volume flows.

Operating Mode 5: Implementation of this operating mode (direct discharge from the individual drain vaults to the river following phase separation and skimming) would typically be exercised during times when the slide gates, pumps, and/or conveyance piping at the drain vaults (either at individual drains or collectively) or equalization tanks and equipment are down for maintenance. Operating Mode 5 is the typical wet-weather discharge operation for the facility.

Table 1

General Electric Aircraft Engines - Lynn, MA
CDTS Performance Period Sampling Results

Oil & Grease and pH

Week	Sample Date	Oil & Grease [1]				pH [2]
		EQ Tank Influent[3]	DAF Influent[4]	DAF Effluent[5]	System Effluent[6]	System Effluent[6]
1	7/7/00	<6	<7	<6	<5	7.3
	7/8/00	<5	<5	<5	<5	7.1
	7/9/00	<5	<5	<5	<5	7.1
	7/10/00	<5	<6	<6	<6	7.1
	7/11/00	<6	<6	<5	<6	7
2	7/12/00	<6	<6	<6	--- [7]	--- [7]
	7/13/00	<6	<5	<5	--- [7]	--- [7]
	7/14/00	<5	<5	<5	--- [7]	--- [7]
	7/15/00	<6	<6	<6	--- [7]	--- [7]
	7/16/00	<6	<5	<5	--- [7]	--- [7]
3	7/26/00	5 [8]	6 [8]	3 [8]	3 [8]	7.1
4	8/1/00	<5	<5	<5	<5	7
5	8/9/00	<5	<5	<5	<5	6.9
6	8/15/00	<5	<5	<5	<5	6.8
7	8/22/00	<5	<5	<5	<5	6.8
8	8/28/00	<5	<5	<5	<5	7
9	9/6/00	<5	<5	<5	<5	6.8
10	9/12/00	<5	<5	<5	<5	6.8
11	9/19/00	<5	<5	<5	<5	6.8
12	9/25/00	<5	<5	<5	<5	7.1
13	10/4/00	--- [7]	--- [7]	--- [7]	<5	7.1

NOTES:

< Less than minimum detection limit indicated

(1) Oil & Grease results reported in milligrams per liter (mg/L).

(2) pH results reported in standard units (SU).

(3) Sample Tap 1

(4) Sample Tap 2

(5) Sample Tap 3

(6) Sample Tap 4

(7) --- = No sample taken

(8) Data from field screening analysis, utilizing a Wilks Enterprises portable monitor following protocol similar to EPA Method 1664.

Table 2

General Electric Aircraft Engines - Lynn, MA

CDTS Performance Period Sampling Results

Total Volatile Organic Compounds [1]

Week	Sample Date	EQ Tank Influent[2]	DAF Influent[3]	DAF Effluent[4]	System Effluent[5]
1	7/7/00	35	36	34	ND [6]
	7/8/00	17.2	25.8	28.8	ND [6]
	7/9/00	39.7	ND [6]	ND [6]	--- [7]
	7/10/00	ND [6]	52.9	69.4	--- [7]
	7/11/00	5.4	5.0	5.4	--- [7]
2	7/12/00	45.7	41.5	39.8	--- [7]
	7/13/00	33.8	39.6	40.5	--- [7]
	7/14/00	30.1	43.3	41	--- [7]
	7/15/00	50.6	58.1	56.7	--- [7]
	7/16/00	33	51.5	47.7	--- [7]
3	7/26/00	--- [7]	--- [7]	--- [7]	--- [7]
4	8/1/00	11.8	6.2	11.7	ND [6]
5	8/9/00	42	39	38	--- [7]
6	8/15/00	ND [6]	ND [6]	10.7	--- [7]
7	8/22/00	144	29	31	--- [7]
8	8/28/00	--- [3]	15.9	17.4	--- [7]
9	9/6/00	33.2	5.2	ND [6]	7.8
10	9/12/00	160	32	33.4	--- [7]
11	9/19/00	40	15.3	13.1	--- [7]
12	9/25/00	45	15.7	13.1	--- [7]
13	10/4/00	--- [7]	--- [7]	--- [7]	21

NOTES:

(1) Analyses performed per EPA Method 624. Results reported in ug/L.

(2) Sample Tap 1

(3) Sample Tap 2

(4) Sample Tap 3

(5) Sample Tap 4

(6) ND = Non-detect

(7) --- = No sample taken

Table 3

General Electric Aircraft Engines - Lynn, MA
CDTS Performance Period Sampling Results

Water Quality Data Summary

Week	Sample Date	TSS [1]				TDS [1]				Iron [1]				MBAS [1]			
		EQ Inf.[2]	DAF Inf.[3]	DAF Eff.[4]	System Eff.[5]	EQ Inf.[2]	DAF Inf.[3]	DAF Eff.[4]	System Eff.[5]	EQ Inf.[2]	DAF Inf.[3]	DAF Eff.[4]	System Eff.[5]	EQ Inf.[2]	DAF Inf.[3]	DAF Eff.[4]	System Eff.[5]
1	7/7/00	56	39	22	--- [6]	19,000	13,000	13,000	--- [6]	0.54	0.74	0.58	--- [6]	<0.1	<0.1	<0.1	--- [6]
	7/8/00	49	53	55	47	21,000	20,000	20,000	18,000	0.62	0.56	0.51	0.09	<0.1	<0.1	<0.1	<0.1
	7/9/00	14	16	21	7	16,000	16,000	16,000	17,000	0.65	0.60	0.36	<.05	<0.1	<0.1	<0.1	<0.1
	7/10/00	15	15	9	--- [6]	12,000	14,000	15,000	--- [6]	0.36	3.30	0.47	--- [6]	<0.1	<0.1	<0.1	--- [6]
	7/11/00	32	16	22	--- [6]	14,000	14,000	14,000	--- [6]	0.28	0.37	0.27	--- [6]	<0.1	<0.1	<0.1	--- [6]
2	7/12/00	<5	<5	<5	--- [6]	13,000	14,000	13,000	--- [6]	0.44	0.85	0.37	--- [6]	<0.1	<0.1	<0.1	--- [6]
	7/13/00	13	75	7	--- [6]	16,000	16,000	16,000	--- [6]	1.10	1.80	0.62	--- [6]	0.1	<0.1	0.1	--- [6]
	7/14/00	9	<5	12	--- [6]	16,000	15,000	16,000	--- [6]	1.10	0.88	0.54	--- [6]	<0.1	<0.1	<0.1	--- [6]
	7/15/00	<5	9	19	--- [6]	15,000	16,000	16,000	--- [6]	0.84	0.92	0.68	--- [6]	<0.1	<0.1	<0.1	--- [6]
	7/16/00	6	8	13	--- [6]	16,000	16,000	15,000	--- [6]	0.80	1.50	0.58	--- [6]	<0.1	<0.1	<0.1	--- [6]

NOTES:

< Less than minimum detection limit indicated

(1) All results reported in milligrams per liter (mg/L).

(2) Sample Tap 1

(3) Sample Tap 2

(4) Sample Tap 3

(5) Sample Tap 4

(6) --- = No sample taken

Table 4

General Electric Aircraft Engines - Lynn, MA
CDTS - Additional Field-Screening (Mode 3)

Oil & Grease and pH Results

Sample Date	EQ Tank Influent[1]		GAC Influent[2]		System Effluent[3]	
	O&G [4]	pH [5]	O&G [4]	pH [5]	O&G [4]	pH [5]
10/9/00	0	7.3	1	6.9	1	--- [6]
10/10/00	1	7.1	1	7.3	2	--- [6]
10/11/00	1	7.1	1	7	1	7
10/12/00	2	7.2	1	7	2	--- [6]
10/13/00	2	7.1	2	7.2	2	--- [6]
10/16/00	3	7	2	7.2	2	--- [6]
10/17/00	3	7	3	7	2	6.9
10/18/00	4	7.2	3	7.1	3	--- [6]
10/19/00	2	7	3	7.1	4	--- [6]
10/20/00	2	7.1	2	7.1	1	--- [6]

NOTES:

(1) Sample Tap 1

(2) Sample Tap 2

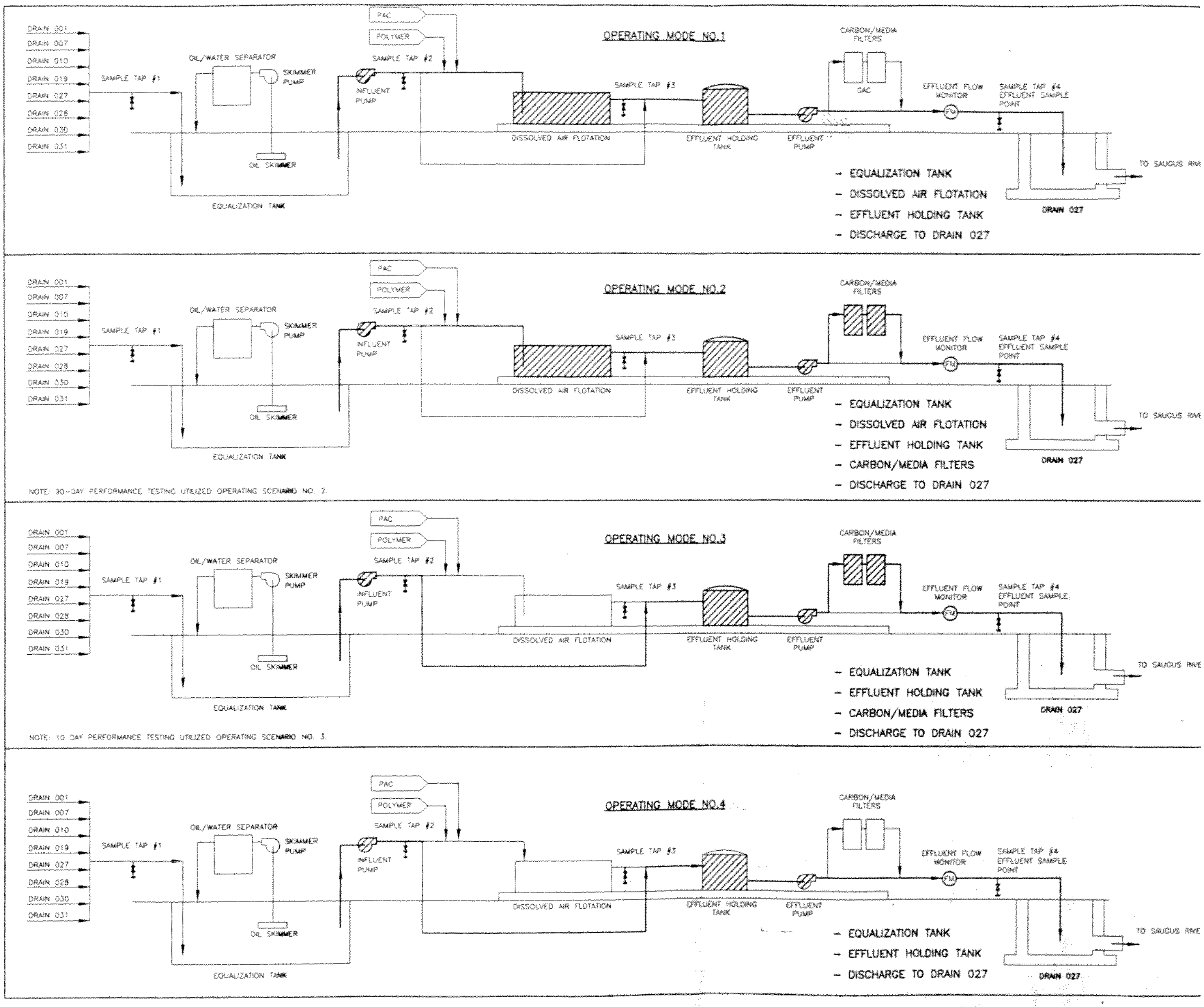
(3) Sample Tap 4

(4) Oil & Grease (O&G) results reported in mg/L via field-screening using a Wilks Enterprises portable monitor following protocol similar to EPA Method 1664.

(5) pH results reported in standard units (SU).

(6) --- = No sample taken

DWG PATH: I:\DIV58\PROJECTS\2488\21934\DWGS\MECH\001.DWG SF=1



PLOT DATE: 11/10/00 PWW SYR