# RAC V

RESPONSE ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and
Non-Time Critical Removal Activities at Sites of Release
or Threatened Release of Hazardous Substances in Region V

**GROUNDWATER TREATMENT FACILITY**
**SHUTDOWN/RESTART PLAN**

**ONALASKA LANDFILL SITE**
**ONALASKA, WISCONSIN**

**Long-Term Remedial Action**

**WA No. 103-RALR-05L5/Contract 68-W6-0025**

**December 7, 2001**

PREPARED FOR

U.S. Environmental Protection Agency


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# GROUNDWATER TREATMENT FACILITY SHUTDOWN/RESTART PLAN

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**Figure**



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# Introduction

This plan is provided as an addendum to the Operations and Maintenance Summary Manual for the Onalaska Groundwater Treatment System dated May 1997. The purpose of this plan is to provide long-term shutdown procedures as well as plant restart procedures in conjunction with the natural attenuation study.

# Summary

The basic plan entails the following:

- Properly shutting down and cleaning equipment and tanks in preparation for a long-term shutdown.
- Addressing protection of equipment and piping during the winter.
- Operating the five extraction well pumps for 5 to 10 minutes once a month. The building sump pumps, clearwell pump, and stripping tower fan must be running to treat the groundwater discharged by the extraction well pumps prior to discharge to the Black River.
- Bumping (turning on for a few seconds and then turning off) remaining equipment once per month to rotate shafts, impellers on pumps, gears, and motors, thereby reducing the likelihood of equipment seizing.
- Keeping equipment greased and oiled.
- Continuing housekeeping and groundskeeping.
- Continuing providing basic utilities, services, and supplies.
- Restarting the plant if necessary.

# Initial Shutdown Procedures

## Polymer System

Finish any open drum of polymer during normal operation before shutdown. Once finished, flush the pump and piping with clean water. The main piping and hoses can be cleaned by installing a clean filter on the supply water to the polymer system and running water through them at a high rate for several days. The pump and piping up to the injection tee will need to be disassembled and flushed manually with a hose or in the laboratory sink. The injection tee and static mixers also need to be disassembled and thoroughly cleaned after flushing to remove residual scaling and staining. Reinstall these after cleaning so that they are ready for service. After cleaning, drain all pipes by opening valves or fittings at all low points.

## Caustic System

Finish the caustic during normal operation before shutdown. Once finished, flush the tank, pump, and piping with clean water. To do this, use a clean filter on the supply water to the polymer system and connect a hose to the piping downstream of the filter. Fill the caustic

tank with water through the fill line or the top manhole. Run as many extraction well pumps as necessary to prevent exceeding a pH of 8 to 8.5 in the clarifier during each of the following flushing steps. Crack open the tank drain and then crack open the spill containment drain to the sump. Repeat if necessary until the water draining from the tank is in the pH 7 to 8 range. Then connect the hose from the filter directly to the discharge piping from the caustic pump and flush the line overnight. Disconnect the caustic pump and flush the wetted parts. After cleaning everything, drain all pipes by opening valves or fittings at all low points. After cleaning the pump, reinstall the pump so that it is ready for service.

## Other Process Equipment

Shut down all process equipment at the main control panel once the caustic and polymer equipment and piping have been flushed and there has been sufficient time for residual caustic and polymer to flow through the groundwater treatment plant. Shut down the sump pumps from the field panel adjacent to the pumps.

## Pump Cleaning

Clean the impellers, pump casing, and other wetted parts that have accumulated iron or calcium scaling. This will minimize the chances of scaling causing moving parts to seize.

## Tank Draining and Cleaning

Follow the long-term shutdown procedures in the Operations and Maintenance (O&M) Summary Manual amended as follows:

- Wash out all residual solids in the aeration tank, clarifier (including the effluent collection pipes and orifices), and solids tank.
- Touch up the paint on the clarifier as needed to prevent rusting.
- Leave the drain valves from the aeration tank and clarifier to the sump open. Rain water conveyed to the sump from the aeration tank and clarifier drains will be allowed to overflow into the sump standpipe for conveyance to the river.
- There is no need to close the extraction well valves.

## Pipe Draining

Initially, drain all pipes by opening valves or fittings at all low points. After the initial draining, only the exterior pipes that will fill during monthly operation will need to be drained. The special winter provisions for draining exterior pipes are discussed in greater detail below.

## pH Probe Removal, Cleaning, and Storage

Remove the pH probe from the clarifier and the pH probe in the treated groundwater effluent. Clean scale from the probes using a mild acid (e.g., vinegar or citric acid cleaning solution) and soap. Rinse the probes thoroughly in water and rinse with distilled water after cleaning. Store the probes in the storage solution recommended by the manufacturer. Cover any exposed wires where the probes were disconnected with electrical tape to minimize the potential for corrosion.

# Miscellaneous Shutdown and Startup Procedures

## Hot Water Heater

It is recommended that the valve on the water supply to the hot water heater be closed and the hot water heater drained (using tubing to a floor drain or a bucket to convey water out of the undersink cabinet) and the power disconnected. The hot water heater shall be reactivated if requested by samplers during groundwater sampling events or other circumstances and isolated, drained, and powered off in between such events.

# Building Entry and Departure Startup and Shutdown Procedures

## Plant Air Compressors and the Heating and Ventilation System

The ventilation system must be operated while personnel are present to provide minimum ventilation rates required by code. The building heating system must be operated to protect equipment and piping from freezing and to provide an acceptable temperature to personnel. The basic plan is to leave the four unit heaters controlled by electric thermostats active year round, turn on the compressors and the pneumatically-controlled ventilation system immediately upon entering the building, and to turn off the pneumatically controlled ventilation equipment and compressors before leaving.

The plan is accomplished by following the manufacturer's O&M manuals to:

1. Maintain the unit heaters for automatic operation based on temperature (see the special winter provisions under monthly operation below for the unit heaters).
2. Plug in the backup compressor and verify the isolation valve is open between the backup compressor and compressed air piping. The backup compressor turns on and off based on pressure and will only operate if the main compressor is not providing sufficient air pressure.
3. Turn on the main compressor at its local control panel. Do not open the water supply valve to the aftercooler since the service water pump and sump pumps will not be operated between monthly O&M. The backup compressor should turn off automatically when sufficient pressure is provided by the main plant air compressor.
4. Turn on ventilation equipment at the heating and ventilation control panel (located on the wall in the main room adjacent to the window from the laboratory and the door to the washroom). It is not anticipated that the propane heater on the air supply unit will need to be activated to supplement the heat provided by the four unit heaters. However, if it is to be used, open the propane gas isolation valve to the air supply unit.
5. Upon leaving:
    a. Turn off the heating and ventilation equipment at the control panel and close the propane supply valve to the air supply unit. The equipment must be turned off and the propane supply valve be closed because the controls are pneumatic and will not

function properly without the air pressure provided by the plant air compressor. Potential consequences if the pneumatically controlled heating and ventilation systems are left on without compressed air include: over consumption of propane, which wastes energy; running out of propane followed by potentially serious damage to equipment and pipes if they freeze; and overheating the building.

b. Unplug the backup air compressor.

c. Turn off the primary plant air compressor.

## Monthly Operation

Equipment is controlled from the main control panel unless noted otherwise in the steps below. Follow the manufacturer's O&M manuals for details on turning equipment on and off.

1. Activate the compressors and building ventilation as described above before proceeding.
2. Verify that the aeration tank drain valve is open so that water entering the aeration tank will drain to the plant sump. Leave the drain open. This will preclude the possibility of the valve freezing closed in the winter, preclude failure to remember to open the valve each month, and prevent residual groundwater and precipitation from freezing in the aeration tank.
3. Verify that the building sump pump discharge is valved to direct flow to the clearwell tank. Leave the valving this way.
4. Put the sump pumps in automatic at the field panel adjacent to the sump pumps.
5. Turn on the stripping tower fan.
6. Put the clearwell pump in automatic so it will turn on when the level reaches the Pump On setpoint and so it will turn off when the level reaches the Pump Off setpoint.
7. Turn on the extraction well pumps. Groundwater will flow into the aeration tank and out the aeration tank drain into the sump. From there it will be pumped into the clearwell and then to the stripping tower. It is anticipated that groundwater will drain from the aeration tank at a significant rate so that groundwater will not reach the weirs at the top of the aeration tank and discharge to the clarifier. However, if groundwater does discharge to the clarifier, the sample/drain valve on the pipe between the aeration tank and clarifier will need to be closed temporarily. See the winter provisions below regarding the necessity of reopening this sample/drain valve when the extraction well pumps are turned off to prevent freezing and bursting the pipe.
8. After the sump of the stripping tower has filled and treated groundwater is being discharged to the river:

   a. Put the service water pump in automatic.

b. Open hose valves with hoses directed to a floor drain or the building sump. Do this at each hose valve location to flush stagnant water containing iron solids. Allow the water to run at each hose valve location until the water runs clear.

c. Turn off the service water pump.

9. After the extraction well pumps have run for 5 to 10 minutes, turn off (i.e., place switch in the off position) equipment in the following order:

   a. Extraction well pumps.

   b. After verifying the aeration tank is completely drained, run one of the sump pumps in manual to pump out the sump, then put both sump pumps in the off position.

   c. Clearwell pump after the clearwell pump has reached low level and turned off in automatic.

   d. Stripper tower fan.

10. Bump all remaining motorized or electric solenoid operated equipment, including the aeration tank blower, air injection well blower, clarifier mixer, clarifier sludge rake, caustic pump, all other solenoid pumps whether or not installed, precoat tank mixer, precoat recirculation pump, and the hydraulic pump for the plate and frame sludge press. Equipment that is not intended to run dry must not be allowed to run for more than a few revolutions, since damage could occur without water. Other equipment such as the air compressors for the aeration tank and bioventing injection wells will not be damaged and therefore it is recommended that they be operated for up to 5 minutes. Determine what is acceptable by reviewing the manufacturer's O&M manuals or discussing this with the equipment manufacturer if not addressed in the manufacturer's O&M manuals. Compile a list documenting the findings and note the relevant section and page number from the manufacturer's O&M manual or the name of the manufacturer's representative and the date discussed. **Do not run the clarifier sludge rake when there is ice or more than a dusting of snow in the bottom of the clarifier.**

11. Provide plant air to the clarifier sludge transfer pump and plate and frame sludge feed pump and let them cycle for a few strokes.

12. Turn off the building ventilation and air compressors as described herein before leaving.

## Additional Winter Operation and Maintenance Requirements

1. Verify the unit heaters are operating properly and verify the propane supply valve to each of the four unit heaters is open. The individual propane supply valves to each unit heater should be left open year round so that there is no risk of forgetting to open these each winter. The thermostats were last set to the lowest setting to conserve energy. It is anticipated that this setting will be sufficient to protect equipment and pipes from freezing and to provide a suitable working environment. However, temperature can be increased if desired by adjusting the thermostat setting on one or more of the unit heaters (see if adjusting one is sufficient before adjusting others). The electric thermostats (the original pneumatic thermostats were replaced) controlling the unit heaters are mounted on the unit heaters and are accessible with a ladder. Verify the unit

heaters fire up before freezing temperatures occur. If an isolation valve from the propane gas tank is closed at the unit heaters or at the propane tank for an extended period of time (e.g., over the summer) then it is possible for the propane gas in the line downstream of the closed valve to be replaced with air. If this occurs, the unit heaters may not successfully ignite until the air is purged from the line. This can be accomplished by resetting the unit heater at the circuit breaker (on the east wall just inside the entrance to the building) after a failed ignition sequence. To reset the unit heater, flip the circuit breaker switch from off to on. Past experience indicates that as many as six resets may be necessary. The unit heater must be allowed to go through its full ignition sequence (less than 1 minute) before each reset. This issue is not expected to occur if the propane gas is not isolated from the unit heaters.

2. Connect a hose from the sample valve on the combined groundwater extraction pump discharge header, just downstream of the influent flow measurement and control manifold from the extraction well pumps, and route the hose into the sump. Leave this valve open all winter (it should be possible to leave this valve open even while running the extraction well pumps) to drain the horizontal pipe that runs outside to the aeration tank. The combination of the open drain from the aeration tank and this open sample valve should drain the exterior pipe and protect it from freezing.

3. Verify the sample valve on the pipe between the aeration tank and clarifier is open and leave this valve open to keep this pipe drained.

4. Make sure the drain tube that runs to the clearwell tank from the horizontal pipe section of the clearwell pump discharge is flowing freely. This drain automatically drains the exterior vertical pipe leading to the top of the stripping tower to prevent freeze damage. The drain pipe could plug, in which case it would need to be backflushed with air or water or a wire could be used to dislodge the obstructing solids.

5. After completing the monthly operation steps above, remove the plug in the bottom of the stripping tower and drain the stripping tower sump so that it will not freeze.

6. Replace the plug in the bottom of the stripping tower after completely draining (otherwise the threads could freeze and prevent reinstallation of the plug the following month).

## Monthly Maintenance

Grease and top off oil in equipment requiring lubrication. Follow manufacturers' instructions regarding frequency of oil changes using their hours of operation criteria. Consult oil and grease manufacturers' information to determine if there is a "shelf life" for the oil and grease in equipment, and completely change the oil and grease before the shelf life is exceeded if the hours of operation criterion does not trigger changing the oil and grease before this.

Perform all other required maintenance using the equipment manufacturers' hours of operation criteria and other frequencies noted in the manufacturer's O&M manuals. A maintenance summary titled "Maintenance Plan Information" is provided as Attachment A. The information included in this attachment was primarily based on a review of the

manufacturer's O&M manuals. However, the summary may not be complete. The maintenance frequencies noted (e.g., daily, weekly, etc.) were based on continuous plant operation and are not appropriate for an idle plant. However, some of the information included may be of use for determining maintenance requirements during the shutdown. Also, most of the information is applicable if the plant is restarted.

## Non-routine Maintenance

Equipment and parts replacement, spare parts, repairs requiring a manufacturer's representative or maintenance specialist, and necessary equipment rentals will be reimbursed under an equipment repairs and replacement, parts, and rentals allowance. Approval by the Wisconsin Department of Natural Resources (WDNR) prior to procurement is required for all such items and services. A 15-percent markup will be allowed for these expenditures. Receipts are required for all expenditures under the allowance as an attachment to the SUBCONTRACTOR's invoice. Major equipment replacement or piping modifications may be provided directly by WDNR at the discretion of WDNR.

## Housekeeping

The interior and exterior of the facility shall be kept clean and neat. Trash and debris shall be removed from the site and disposed of properly. Equipment, materials, supplies, and personal belongings not relevant to the site shall not be stored at the site. The interior shall be maintained in a swept, dusted, and washed condition. Modes of entry for bugs and pests shall be sealed off. Physical hazards (e.g., water on floors, snow and ice in areas of pedestrian traffic) shall be removed to the extent practicable.

## Groundskeeping

Grass and weed cutting shall be provided around the facility, including the fenced-in areas, bioventing injection and monitoring wells area north of the facility, and paths to and around piezometers and monitoring wells. The grass shall be cut at a minimum of once every 3 weeks during the growing season and more frequently as required to keep the grass at a manageable height during peak growing season. In addition to the grass cutting in the areas described above, the grass shall be cut in the week prior to scheduled groundwater monitoring and sampling to provide clear paths to all monitoring wells, air injection wells, and piezometers and to clear away growth in a 3-foot-radius around all wells and piezometers (see Figure 1 from the Natural Attenuation Plan for locations). This includes remote piezometers PZ-02, PZ-03, and PZ-04 to the west and southwest, and remote monitoring wells MW-1S and MW-1M accessed from a canoe launch/bike path parking lot approximately 0.5 mile from the plant. Monitoring and sampling will occur quarterly in 2002 and semiannually (typically spring and fall) thereafter.

Tree branches, seedlings, saplings, and shrubbery growing too close to the building, fences, access road and paved area in front of the plant, truck turn around area near MW-4S, motorized vehicle pathway around the building, wells, and piezometers shall be removed each year.

Snow removal shall be provided for the entire length of the access road from Sportsman's Club Road to the building and the southeast portion of the paved lot in front of the building to provide easy access to the propane tank, front door, south rollup door, and to provide space for parking two vehicles in front of the building. The SUBCONTRACTOR shall submit to WDNR two independent quotes for snow removal. The SUBCONTRACTOR shall enter into an agreement with the low quote snow removal provider at the quoted price. The cost of snow removal will be reimbursed under the snow removal allowance. A 15-percent markup will be allowed for these expenditures. Copies of the provider's invoice are required for all expenditures under the allowance as an attachment to the SUBCONTRACTOR's invoice.

## Other Services and Supplies

SUBCONTRACTOR shall arrange for propane delivery for building heating. The SUBCONTRACTOR shall submit to WDNR two independent quotes for propane (if two suppliers exist). The SUBCONTRACTOR shall enter into an agreement with the low quote propane provider at the quoted price. The cost of propane will be reimbursed under the propane allowance. A 15-percent markup will be allowed for these expenditures. Copies of the supplier's invoice are required for all expenditures under the allowance as an attachment to the SUBCONTRACTOR's invoice.

SUBCONTRACTOR shall arrange for electric service. The cost of electricity will be reimbursed under the electricity allowance. A 5-percent markup to the electric utilities invoice will be allowed for these expenditures. Copies of the electric utility's invoices are required for all expenditures under the allowance as an attachment to the SUBCONTRACTOR's invoice.

SUBCONTRACTOR shall procure materials and services as required for satisfactory maintenance and use of the facility. These items are the responsibility of the SUBCONTRACTOR and will not be reimbursed separately. Services (e.g., local telephone and sewage removal) and supplies (e.g., water) must be available at all times to all WDNR-authorized people working at the site, including non-SUBCONTRACTOR employees, for purposes of safety and convenience. Such items include, but are not limited to:

1. Potable water (not intended for drinking) for the two 450-gallon potable water tanks serving the two sinks, toilet, safety eye washes, and safety showers (historically, filling has been required every 3 to 6 months). Use is expected to be less with the plant shutdown.
2. 5-gallon bottles of potable water for the existing drinking water dispenser.
3. Sewage removal and disposal from a buried 2,000-gallon holding tank (collects floor drainage from the bathroom, sinks drainage, and toilet wastewater and historically emptying has been required once or twice per year).
4. General trash disposal.
5. Oils and greases for lubrication.
6. Tools.

7. Personal protective equipment.
8. A photo ionization detector such as manufactured by HNU for detecting organic vapors and a lower explosive limit (LEL) detector for detecting potentially explosive atmospheres when needed (e.g., for confined space entry).
9. Cleaning supplies.
10. Personal hygiene supplies (e.g., hand soap, toilet paper, paper towels, etc.).
11. Office and general supplies needed by the SUBCONTRACTOR.
12. Telephone service (including payment of local and long-distance bills).

# Restart Procedures

## pH Probes

The pH probes should be reinstalled and calibration attempted before starting the plant. It may be necessary to replace the two pH probes because they have a limited shelf life. If the probes do not calibrate, they should be replaced before starting the plant.

## Polymer System

If iron removal is to be resumed, then a new polymer pump must be purchased. Consistent polymer feed was critical to efficient iron removal. Efficient iron removal without polymer was tested and it required operating at an unacceptably high pH. The pH is limited by a pH discharge limit of 9.0 and pH dependent discharge limits for ammonia. Furthermore, the caustic cost required to operate at a high pH was more than the combined cost of polymer and caustic at a target operating pH between 8 and 8.5.

Concentrated liquid polymer is difficult to pump because of its viscosity, the potential for air bubbles to cause air binding, and the extremely high viscosity that can result from contact with water in the absence of high intensity mixing. The Watson Marlow peristaltic pump used over the past year was loaned to the plant by an equipment supplier for testing and was recently returned in conjunction with this shutdown. As was the case with a previously tested peristaltic pump by another manufacturer, the tubing was subject to frequent failures due to wear or pressure (i.e., tubing typically lasted on the order of days to a week). Therefore, peristaltic pumps are not recommended for this application if the plant is started back up. Similarly, LMI Milton Roy and Pulsafeeder electric solenoid diaphragm pumps proved to be unreliable (feed rates would vary significantly and the pumps would frequently stop pumping due to air binding and plugging) and also required a very high level of operator attention and maintenance. In order to provide a more reliable feed, a small progressive cavity pump from a respected manufacturer (e.g., Seepex) is recommended. Because the desired feed rate is so low (e.g., 1 gallon per day, which is 0.04 gallons per hour or 2.7 mL per minute) relative to even small progressive cavity pumps, a manually or automatically adjustable valved recycle discharging back into the pump suction piping or polymer supply container, and a magnetic flow meter to the injection point downstream of the recycle, are required to control the desired feed rate. Based on the best jar testing results, Mitco Mitfloc 5115E low charge, high molecular weight anionic liquid emulsion polymer

was the primary polymer used between 1997 and 2001. Allied Colloids, Inc. Alcomer 120L was also used on a couple of occasions. A feed of 1 gallon per day raw polymer was the target with the Mitco polymer. Jar and full-scale testing would be necessary to determine the optimum feed rate with the Allied Colloid polymer or any other polymer. Manufacturer's recommendations must be used for determining the dilution water flow rates for activating and feeding the polymer.

A potential alternative to overcoming the difficulty in pumping concentrated liquid emulsion polymer is a package dry polymer mixing, aging, and feed system. The economics of such a system should be compared to the progressive cavity option noted above before startup.

A third alternative is no iron removal (i.e., no caustic or polymer feed) and more frequent replacement of the air stripping tower packing. The load based iron discharge limits are flow dependent and result in an allowable discharge concentration of over 6 mg/L for the range of possible operating flows at the plant. Although the combined influent iron concentration from the extraction wells was above 20 mg/L during initial startup in the spring of 1994, the iron concentration dropped to a 3 to 4 mg/L range in 2001. Therefore, unless iron concentrations rise significantly as a result of the plant being shutdown, this alternative is viable from a discharge limit standpoint. The packing was replaced in June 2001 and therefore should be relatively clean at the time of shutdown (approximately 5 months of service). Therefore, it should be suitable for a test of how long the plant could be operated without iron removal before the packing plugs. The costs of more frequent packing replacement, which includes labor and materials to remove the packing, disposal cost, packing purchase and shipping costs, and labor and materials for packing installation, could be compared to the costs of polymer, caustic, and O&M to determine if this alternative is viable from an economic standpoint.

## Chemicals

Caustic and polymer will need to be ordered before startup if removing iron.

## Startup Procedures and Additional Information

Follow the O&M Summary Manual, manufacturers' O&M manuals, and additional information below to restart the plant.

1. Bleed air from pipes to prevent air binding by opening valves or fittings at high points during pipe filling.
2. Fill the clarifier slowly to minimize potentially damaging turbulent water by limiting the number of operating extraction wells until the clarifier is full.
3. The service water pump is started and stopped in automatic mode based on two adjustable spring loaded pressure switches, PSL 11-2 and PSH 11-2, located in front of the service water pressure tank. Suggested settings based on the tops of the adjustable spring compression disks are 55-60 psi for PSL 11-2 and 65 psi for PSH 11-2. The following considerations must be considered if adjusting these switches:

a. PSH 11-2 must not be set higher than the maximum achievable pressure generated by the pump. If it were set higher, PSH 11-2 would never be reached and the pump would run continuously.

b. PSL and PSH must be set sufficiently apart from each other to minimize frequent on and off cycling of the pump.

c. PSL must be set above the minimum pressure required for the polymer makeup water.

4. The EIMCO control panel for controlling sludge feed to the filter press has been bypassed, and the sludge feed pump that transfers sludge from the sludge storage tank to the press is now operated via manual adjustment of the air flow. This was necessary because the control panel failed and attempts to have it fixed were unsuccessful (it was removed and shipped to EIMCO and their panel supplier but the panel continued to be problematic). Furthermore, that control panel is no longer manufactured.

5. Similarly, the control of the smaller clarifier sludge transfer pump is manually controlled with a valve on the air supply.

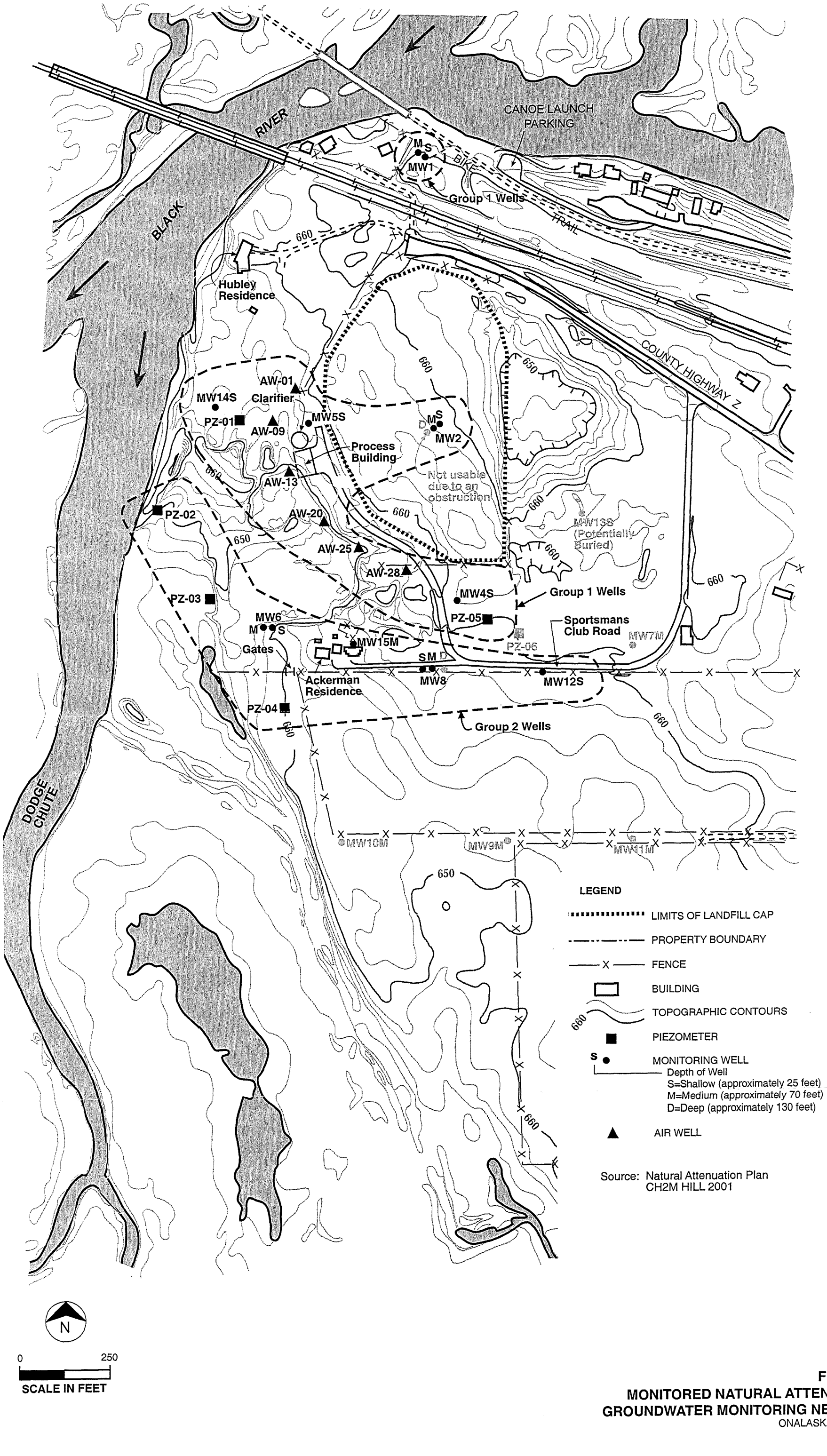
6. In addition to the clarifier sludge transfer pump, sludge can be transferred from the clarifier to the sludge storage tank via gravity when the sludge level in the sludge storage tank is less than the water level in the clarifier and via air lift by adjusting the valving to bypass the pump and to partially open the valve supplying compressed air to the sludge line (the plant air connection was added to allow purging out the sludge pipe to the clarifier when it plugs but the air can also be used as an air lift to transfer sludge). A third option is to transfer sludge directly to the filter press with the larger pump (a valved cross connection was added).

7. A combination of air release from treated effluent that is super saturated with oxygen and nitrogen after passing through the stripping tower, and high river levels can limit the hydraulic capacity of the plant at times to well under 800 gpm. The hydraulic limitation can be observed as treated effluent flowing out the building sump standpipe into the sump. This can cause a high sump alarm that turns off the extraction well pumps until the alarm clears. The sump pumps add this flow back into the plant, which in turn can result in a high clearwell tank alarm because the clearwell pump capacity can be exceeded. This will also turn off the extraction well pumps until the alarm clears. To avoid cycling the extraction well pumps on and off, the flow from the extraction well pumps must be controlled by adjusting the position of the butterfly valves at the influent flow measurement and control manifold from the extraction well pumps. The allowable total flow throughput varies between 500 and 800 gpm.

8. Three vents were added to release air on the treated groundwater discharge pipe from the stripping tower to the submerged discharge in the Black River. These vents significantly reduced air binding and thereby reduced the frequency and severity of the hydraulic throughput limitations noted above. The first vent is located at the connection from the stripping tower sump high level overflow just outside the back door of the building. The second vent is located near PZ-01 and is connected to the buried effluent pipe with a saddle tap. The height of the second vent was increased to minimize water being sprayed out as air is released. The third vent is a manhole just before the slope of

the discharge pipe and the ground increases down to the river. The occasional "belching" of air and water can be heard at these vents.

9. A copy of Operator Extraction Well Flow and Process Monitoring Logs is included in Attachment B. The logs are used to record operator tasks and data on a daily basis.




Source: Natural Attenuation Plan
CH2M HILL 2001

**FIGURE 1**
**MONITORED NATURAL ATTENUATION**
**GROUNDWATER MONITORING NETWORK**
ONALASKA LANDFILL

Attachment A

# Maintenance Plan Information

ATTACHMENT A

# Maintenance Plan Information

## Daily

- **General:** Check alarm panel and investigate alarms.
- **General:** Verify that each piece of equipment that is supposed to be running is running by checking both the panel and direct observation of each piece of equipment.
- **Aeration Tank Blower:** Verify daily press readings are roughly 7 to 8.5 psi. Clean if pressure readings exceed this (see annual task description).
- **Caustic and Polymer Pump:** Check for leaks, noise, temperature, cleanliness, and volume pumped versus target rates. Check pressure readings on polymer pump discharge.
- **Polymer System Makeup Water:** Check for proper flow. Check pressure readings upstream and downstream of rotometer.
- **Clarifier:** Visual inspection daily. See page 77 of the O&M manual for overall troubleshooting and also page 34 of the mixer section in the O&M manual for additional troubleshooting.
- **Stripper Tower Fan:** Check and record fan discharge pressure readings. At the end of each month alert CH2M HILL when the average of daily fan discharge pressure readings averages above 7.75 inches water column or when any individual reading reached 8.3 inches or more.
- **Clarifier Effluent:** Clean basket strainer or bag filter with hose if directed by CH2M HILL to use the mesh basket strainer or bag filters.

## Weekly

- **Clarifier Effluent:** Clean basket strainer with an acid wash if directed by CH2M HILL to use the mesh basket strainer. Clean or replace bag filters if directed by CH2M HILL to use bag filters.
- **Polymer System Makeup Water:** Inspect and clean strainer. Inspect paper filter and replace if nearly plugged.
- **Clear Well Pump:** Keep the oil glass about half full, and tighten or loosen packing until a slight stream of seal water is available for the packing. See pages 4 and 5 of the O&M manual, and for troubleshooting see pages 77 through 84.
- **Service Water Pump:** Tighten or loosen packing until a slight stream of seal water is available for the packing.

- **Air Stripper Tower:** Check the air intake for fouling. Watch for leaks or noises. See page 12 in the O&M manual.
- **Service Air Compressor:** Check coolant level glass to make sure there is plenty of coolant. Make sure condensate trap is functioning.
- **After Cooler:** Verify sufficient water is flowing through the after cooler (look for water flow to drain and feel water to make sure it is cold) between the service air compressor and the air dryers.
- **Air Dryers:** Check green dry air indicator to make sure air is dry. See page 16 of the O&M manual, and for troubleshooting, see pages 52-55.

## Monthly

- **Well Pumps:** Watch for change in pumping rates. May need chlorinating or acid cleaning to get rid of bacteria and fouling. For troubleshooting see pages 7 and 8.
- **Aeration Tank Blower:** Check oil level.
- **Stripper Tower Fan:** Inspect and replace belts. Check v-belt alignment. Inspect impellers for bug and dirt build-up and clean. Lubricate blower/bearings monthly with #2 grease. See pages 9 and 12 for schedule, and page 7 for troubleshooting in the O&M manual.
- **Polymer System:** Inspect rotometer, static mixers, polymer tubing, and discharge check valve. Clean if fouled (replace tubing if worn out or if more economical to replace than clean) and thoroughly dry out before reinstalling.
- **Clarifier Drive Mechanism:** Check drive-chain tension and lube.
- **Air Dryers:** Check timing of recharging cycle. Check filters and exercise petcocks to keep operable and to drain water. Check petcocks for desiccant dusting. The desiccant life expectancy is 3 years normally, but we have had to replace the cartridges early because of moisture problems. Change filters as necessary. The last 4 pages of the O&M manual discuss the filter replacement, and page 9 has the troubleshooting guide.
- **Acid Containment:** Pump out sump whenever sump is full.
- **Sludge Pump to Press:** Oil (just a small amount) the air inlet to lubricate the air distribution valve with a lightweight oil (SAE 10 wt. maximum).

## Every 6 Weeks

- **Aeration Tank Blower:** Change oil (use Mobile DTE.BB, or Amoco 220).
- **Air Well Blower:** See the notes for the Aeration Tank Blower. This machine is shut down at the moment.
- **Service Air Compressor:** Inspect coolant filter, coolant level, and air filter, replace if necessary.

- **Air Stripper Duct and Tower:** Check for leaks.

## Every 3 Months:

- **Aeration Tank Blower:** Grease bearings (use Darina #2 or Mobilith SHC 220) and replace air filter. See page 7 in the O&M and page 9 for troubleshooting.
- **Air Well Blower:** See the notes for the Aeration Tank Blower. This machine is shut down at the moment.
- **Service Water and Clearwell Pumps:** Check oil level, inspect packing and seals for leaks.
- **Filter Press:** Lube sidebars, rollers, etc. Inspect filter and oil for debris, change if necessary.
- **Plant Drain Sumps:** Grease with #2 grease every 1,000 hours. See page 4 of the O&M manual and for troubleshooting go to page 3.

## Semi-Annual Items

- **Service Air Compressor:** Lube bearings and change filters, inspect seals for leaks.
- **Plant Drain Pumps:** Inspect and if necessary grease and lube bearings and fittings to bearings.

## Annual Items

- **Clarifier Rake Mechanism:** Drain and replace "main oil bath." with Mobilegear 632.
- **Clarifier Mixer:** Drain and replace oil.
- **Gear Reducer:** Drain and replace oil. See pages 5 of O&M. (Above three items should be scheduled concurrently).
- **Service Air Compressor:** Change coolant and coolant filter, inspect v-belt and change if necessary.
- **Air Stripper Tower Fan:** Check current draw. See page 10 in the O&M manual.
- **Stripper Tower:** Remove lower two manhole covers on Stripper Tower and inspect for fouling with a bright light. Open drain plug and wet vac out or shovel/sweep out any iron sludge deposits and broken packing.
- **Aeration Tank Cleanout:** Turn off wells, drain aeration tank to sump and route to clarifier. Clean diffuser and air piping at diffusers to remove all solids (attempt to remove with a brush and water but use iron or lime bathroom tile type dissolving cleaners if necessary). Use coat hanger or similar wire rodding device to fully open all orifices.

- **Clarifier Cleanout:** Turn off wells, remove sludge to storage tank or filter press. Drain clarifier to sump and route to clearwell, to stripper, and discharge. Close drain valve to sump when drained. Inspect clarifier and clean. Pump dirty washdown water to sludge storage tank or filter press. Paint exposed surfaces. **(NOTE:** Above two items should be scheduled in sequence)
- **Service Water Pump:** Drain and replace oil. Inspect packing and replace as necessary. See pages 5 and 22 in the O&M manual, and for troubleshooting pages 17, 33, and 69.
- **Clearwell Pump:** Drain and replace oil. Inspect packing and replace as necessary.
- **Filter Press:** Change oil and replace the filter. Use Mobile oil D.T.E. 25 hydraulic oil. Grease the railings as needed. See pages 60 and 61 of the O&M manual, and for troubleshooting see pages 77 through 84.
- **Recirculation Pump:** Use #2 grease for motor, see pages 28 and 29 for maintenance, and page 15 for troubleshooting in the O&M manual. This pump is used for pre-coating filter press which is not routinely used.
- **Electric Motors (Misc.):** Information of this subject is found just after the air well blower11372. Too much grease can be just as harmful as too little. Falk steel flex couplings, after the electric motors, should be lubricated once a year. See pages 5 and 6 of the O&M manual and for troubleshooting see page 7.
- **Verimot/Euro Drive Gear Units:** Verimot sealed for life, and for maintenance which is 2 years, or 10,000 hours, see pages 9, 23, and 28. For troubleshooting go to page 34.

## Every 3 Years

- **Air Dryer:** Replace desiccant and desiccant filters.

## As Needed

- **Sludge Transfer Pump:** Tear down to unplug or to evaluate unusual sounds. Visually inspect. See pages 2 and 6 of the O&M manual, and pages 3 and 4 for troubleshooting.
- **Sludge Feed Pump:** This is the same maintenance as the Sludge Transfer pump. See pages 3 and 4 of the O&M manual.
- **Potable Water Tank:** Almost no maintenance here, except once in awhile, if needed, use some anti-bacterial growth powder.
- **Acid Feed Pump:** Check for leaks, noise, vibration, temperature, and cleanliness. See pages 12 and 15 of the O&M manual, and for troubleshooting go to pages 7 and 8. Acid is not used very often.

Attachment B

# Extraction Well Flow and Process Monitoring Operation Logs

*Operator:* WLW / JDJ
*Month:* October-01

**E F S**
Environmental Field Services, Inc.

## EXTRACTION WELL FLOW

| DATE / TIME | Run Time | WELL #1 | | WELL #2 | | WELL #3 | | WELL #4 | | WELL #5 | | Totals | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (minutes) | Reading1 | gpm2 | Reading1 | gpm2 | Reading1 | gpm2 | Reading1 | gpm2 | Reading1 | gpm2 | Reading1 | gpm2 | gpm3 | MGD3 |
| 9/27/01 2:00 PM | | 2718897 | 146.7 | 2498718 | 127.9 | 1249388 | 64.4 | 2760702 | 150.7 | 2726676 | 147.6 | 11954381 | 637.3 | | |
| 10/3/01 12:00 PM | 8520 | 2739298 | 157.7 | 2515901 | 127.9 | 1258195 | 65.4 | 2780366 | 150.7 | 2744551 | 144.9 | 12038311 | 646.6 | 98.5 | 0.14 |
| 10/4/01 10:00 AM | 1320 | 2759996 | 157.9 | 2532707 | 128.0 | 1266778 | 65.2 | 2800156 | 150.7 | 2763818 | 147.9 | 12123455 | 649.7 | 645.0 | 0.93 |
| 10/5/01 2:30 PM | 1710 | 2787185 | 157.9 | 2554681 | 127.9 | 1277985 | 65.1 | 2826084 | 150.7 | 2789266 | 147.7 | 12235201 | 649.3 | 653.5 | 0.94 |
| 10/8/01 12:30 PM | 4200 | 2853218 | 156.6 | 2607944 | 126.7 | 1288318 | 66 | 2889189 | 150.6 | 2851047 | 147.3 | 12489716 | 647.2 | 606.0 | 0.87 |
| 10/9/01 12:00 PM | 1410 | 2875512 | 156.8 | 2625893 | 126.2 | 1297626 | 65.2 | 2910599 | 150.4 | 2871950 | 147.4 | 12581580 | 646.0 | 651.5 | 0.94 |
| 10/10/01 11:30 AM | 1410 | 2897532 | 156.2 | 2643610 | 125.7 | 1306782 | 64.7 | 2931782 | 150.6 | 2892627 | 146.9 | 12672333 | 644.1 | 643.6 | 0.93 |
| 10/11/01 4:00 PM | 1710 | 2923217 | 151.5 | 2665239 | 125.4 | 1317964 | 65.1 | 2957715 | 150.6 | 2917935 | 146.8 | 12782070 | 639.4 | 641.7 | 0.92 |
| 10/12/01 11:00 AM | 1140 | 2940351 | 151 | 2679439 | 124.9 | 1325334 | 64.8 | 2974790 | 150.5 | 2934604 | 146.9 | 12854518 | 638.1 | 635.5 | 0.92 |
| 10/15/01 12:30 PM | 4410 | 3008480 | 154.5 | 2734108 | 123.8 | 1353801 | 64.8 | 3040924 | 150.3 | 2999175 | 146.9 | 13136488 | 640.3 | 639.4 | 0.92 |
| 10/16/01 2:00 PM | 1530 | 3032598 | 154.1 | 2753411 | 123.5 | 1363877 | 64.7 | 3064408 | 150.3 | 3022102 | 146.7 | 13236396 | 639.3 | 653.0 | 0.94 |
| 10/17/01 2:00 PM | 1440 | 3054569 | 154.2 | 2770967 | 122.9 | 1373051 | 64.3 | 3085823 | 150.3 | 3043011 | 147 | 13327421 | 638.7 | 632.1 | 0.91 |
| 10/19/01 1:30 PM | 2850 | 3098445 | 153.3 | 2806005 | 122.4 | 1391348 | 63.9 | 3128717 | 150.3 | 3084867 | 146.5 | 13509382 | 636.4 | 638.5 | 0.92 |
| 10/20/01 1:00 PM | 1410 | 3120039 | 152.9 | 2823239 | 122.4 | 1400340 | 63.6 | 3149869 | 150.1 | 3105500 | 146 | 13598987 | 635.0 | 635.5 | 0.92 |
| 10/22/01 11:00 AM | 2760 | 3162368 | 152.9 | 2857015 | 121.8 | 1417915 | 63.2 | 3191414 | 150.0 | 3146026 | 146.3 | 13774738 | 634.2 | 636.8 | 0.92 |
| 10/23/01 12:30 PM | 1530 | 3185781 | 152.1 | 2875674 | 121.0 | 1427623 | 63 | 3214437 | 149.8 | 3168477 | 146.1 | 13871992 | 632.0 | 635.6 | 0.92 |
| 10/24/01 3:00 PM | 1590 | 3209892 | 151.8 | 2894859 | 120.9 | 1437615 | 63 | 3238177 | 149.8 | 3191626 | 146 | 13972169 | 631.5 | 630.0 | 0.91 |
| 10/25/01 12:00 PM | 1260 | 3228678 | 152 | 2909778 | 121.0 | 1445391 | 62.9 | 3256677 | 149.9 | 3209669 | 146.3 | 14050193 | 632.1 | 619.2 | 0.89 |
| 10/26/01 5:30 PM | 3030 | 3255760 | 0 | 2931241 | 0.0 | 1456572 | 0 | 3283368 | 0.0 | 3235702 | 0 | 14162643 | 0.0 | 371.1 | 0.53 |
| 11/6/01 1:00 PM | 15570 | 3279847 | 152.8 | 2952518 | 135.6 | 1467127 | 66.6 | 3311775 | 180.0 | 3268800 | 213.4 | 14280067 | 748.4 | 75.4 | 0.11 |

NOTE:
1 x10
2 Instantaneous reading
3 Calculated value

Operator Notes:
Plant down beginning
and end of the month.

*Operator:* WLW / JDJ
*Ending:* 10/15/2001

**EFS**

**Environmental Field Services, Inc.**

## PROCESS MONITORING

| DAY: | WEDNESDAY | THURSDAY | FRIDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | MONDAY |
|---|---|---|---|---|---|---|---|---|---|
| **DATE:** | **10/3/01** | **10/4/01** | **10/5/01** | **10/8/01** | **10/9/01** | **10/10/01** | **10/11/01** | **10/12/01** | **10/15/01** |
| TIME: | 12:00 | 10:00 | 2:30 | 12:30 | 12:00 | 11:30 | 4:00 | 11:00 | 12:30 |
| | | | | | | | | | |
| CHECK ALARM PANEL[1] | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| AERATION BLOWER PRESSURE (psi) | 8 | 8.2 | 8.2 | 8.4 | 8.2 | 8.2 | 8 | 8 | 8 |
| CLARIFIER MIXER / RAKE (on and ok) | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| SLUDGE DEPTH (feet) | 0 | | | | | | | | |
| AIR STRIPPER INTAKE (visual) | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR |
| STRIPPER FAN PRESSURE (in. w.c.) | 5.2 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 |
| CLAIRIFIER pH (panel reading) | 8.1 | 8.1 | 8.1 | 8.2 | 8.1 | 8.1 | 8.1 | 8.1 | 8.2 |
| CLARIFIER pH (portable wkly check) | NA | NA | NA | 8.2 | NA | NA | NA | NA | 8.3 |
| OUTFALL pH (panel reading) | 8.2 | 8.2 | 8.2 | 8.3 | 8.1 | 8.2 | 8.2 | 8.1 | 8.3 |
| OUTFALL pH (portable wkly check) | NA | NA | NA | 8.3 | NA | NA | NA | NA | 8.4 |
| EXTRACTION WELL pH | NA | NA | NA | 7.6 | NA | NA | NA | NA | 7.6 |
| IRON INFLUENT (mg/l) | NA | NA | NA | 3.6 | NA | NA | NA | NA | 3.4 |
| IRON EFFLUENT (mg/l) | 2.2 | 2.6 | 2.6 | 2.2 | 2.4 | 2.8 | 2.6 | 2.4 | 2.2 |
| EFFLUENT TEMPERATURE (°C) | NA | NA | NA | 12 | NA | NA | NA | NA | 12 |
| CAUSTIC VOLUME (gal) | 180 | 160 | 135 | 50 | 30 | 930 | 910 | 890 | 790 |
| CAUSTIC USAGE (gph) | 1.27 | 0.91 | 0.88 | 1.21 | 0.85 | 1.06 | 0.70 | 1.05 | 1.36 |
| Polymer actually used gpd | 1.5 | 1.5 | 1.5 | 4.5 | 1.5 | 1.5 | 1.5 | 1.5 | 5 |

OK = Item has been checked and found to comply with all operational specifications
NA = Not applicable as item is either monitored weekly or was not operational during the identified period.

[1]Note any alarms or other operational information here:

***Operator:*** WLW / JDJ
***Ending:*** 10/26/2001

**EFS**
**Environmental Field Services, Inc.**

## PROCESS MONITORING

| DAY: | TUESDAY | WEDNESDAY | FRIDAY | SATURDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY |
|---|---|---|---|---|---|---|---|---|---|
| **DATE:** | **10/16/01** | **10/17/01** | **10/19/01** | **10/20/01** | **10/22/01** | **10/23/01** | **10/24/01** | **10/25/01** | **10/26/01** |
| TIME: | 2:00 | 2:00 | 1:30 | 1:00 | 11:00 | 12:30 | 3:00 | 12:00 | 5:30 |
| | | | | | | | | | |
| CHECK ALARM PANEL[1] | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| AERATION BLOWER PRESSURE (psi) | 8 | 8 | 8.2 | 8.2 | 8 | 8.2 | 8.2 | 8.6 | 8.4 |
| CLARIFIER MIXER / RAKE (on and ok) | OK | OK | OK | OK | OK | OK | OK | OK | OK |
| AIR STRIPPER INTAKE (visual) | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR | CLEAR |
| STRIPPER FAN PRESSURE (in. w.c.) | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 | 5.4 |
| CLAIRIFIER pH (panel reading) | 8.1 | 8.1 | 8.1 | 8.1 | 8.2 | 8.1 | 8.1 | 8.1 | 8.1 |
| CLARIFIER pH (portable wkly check) | NA | NA | NA | NA | 8.2 | NA | NA | NA | NA |
| OUTFALL pH (panel reading) | 8.2 | 8.2 | 8.1 | 8.2 | 8.2 | 8.1 | 8.1 | 8.2 | 8.2 |
| OUTFALL pH (portable wkly check) | NA | NA | NA | NA | 8.2 | NA | NA | NA | NA |
| EXTRACTION WELL pH | NA | NA | NA | NA | 7.4 | NA | NA | NA | NA |
| IRON INFLUENT (mg/l) | NA | NA | NA | NA | 3.2 | NA | NA | NA | NA |
| IRON EFFLUENT (mg/l) | 2.4 | 2.4 | 2.4 | 2.6 | 2.2 | 2.2 | 2.4 | 2.4 | 2.6 |
| EFFLUENT TEMPERATURE (°C) | NA | NA | NA | NA | 11.8 | NA | NA | NA | NA |
| CAUSTIC VOLUME (gal) | 765 | 745 | 700 | 680 | 630 | 605 | 580 | 560 | 530 |
| CAUSTIC USAGE (gph) | 0.98 | 0.83 | 0.95 | 0.83 | 1.09 | 0.98 | 0.94 | 0.95 | 0.59 |
| Polymer actually used gpd | 1.5 | 1.5 | NOTES | | | | | | |

OK = Item has been checked and found to comply with all operational specifications
NA = Not applicable as item is either monitored weekly or was not operational during the identified period.

[1]Note any alarms or other operational information here:
Used the last of our Polymer.