Maytown Aggregates Groundwater Monitoring Plan

Revision 2

Purpose

The purpose of this groundwater monitoring plan is to generate information that will address the following issues and regulatory requirements:

- The potential for impairment of off-site water supply wells
- Changes in water levels and quality resulting from mining
- NPDES monitoring requirements

These requirements have been established through communication between Allen & Company and Thurston County, with the primary references being:

- Appendix F of Appendix A to the Expanded Environmental Checklist of July 2002 contained a detailed groundwater monitoring plan for water levels and groundwater turbidity, including procedures and reporting requirements.
- Response to Comments on the Expanded Environmental Checklist in a letter from Pacific Groundwater Group to Thurston County of October 25, 2002 proposed monitoring to comply with the NPDES general permit.
- The MDNS Re-Issuance document written by the County dated May 4, 2004, which stipulated that a monitoring well be established upgradient and downgradient of each pit.
- Pacific Groundwater Group’s response to MDNS comments briefly discussed the feasibility of identifying small mine-related water level changes.
- The June 8, 2004, letter from Tony Kantas of Thurston County to Jay Allen of Allen & Company, which requested a plan to remedy impaired off-site wells, if any.

Overview

This plan addresses the requirements above through monitoring of on-site water levels and water quality, including measurement of background conditions, and by documenting the construction and performance of off-site water supply wells prior to mining. The plan includes monitoring and action elements referenced in all of the documents listed above.

Water monitoring is required at 17 stations within and surrounding the mine. Four stations are specific to NPDES monitoring of the process water. The other 13 stations serve the purposes of monitoring for protection of off-site wells and the wetland. Five stations are near
(upgradient and downgradient) of proposed pit lakes. The remaining eight stations surround the pit lakes on the east, south, and west and lie between the pits and off-site water resources that require protection. These perimeter stations will provide the best data for assessing off-site impacts because they are closest to the off-site water resources. This plan will provide ample data to address the three monitoring objectives listed above, and will augment the conservation agreement reached between Allen & Company and the environmental organizations. Providing a monitoring well upgradient and downgradient of each pit lake, as stipulated by the County in the May 4, 2004, MDNS document, is not necessary or advisable to address the monitoring objectives and is not proposed herein.

The plan is divided into the following major sections:

- Remedy if Off-site Supply Wells are Impaired
- Groundwater Level and Temperature Monitoring
- Overview of Groundwater Quality Monitoring for the NPDES General Permit

The elements of this plan need to be considered along with monitoring that will be performed by State agencies and environmental organizations for full appreciation of the scope of environmental monitoring.

**Remedy if Off-Site Supply Wells are Impaired**

This portion of the plan stipulates that nearby off-site water supply wells be documented and that wells that are shown to be impaired by mining activities be fixed or replaced. To avoid repeated intrusion into private and public supply wells, groundwater level monitoring will occur in on-site wells that are representative of (and more affected than) off-site conditions.

Wells in the following areas will be field-verified within one year of receipt of the mining permit. The inventory will be updated every five years during mine operation.

**T16N R2W:**

- west half of section 6
- northwest quarter of section 7
- southwest quarter of section 2
- northeast quarter of section 10
- south one-half of section 11
- south one-half of section 12

Assuming that access is granted by land owners and that the well is configured so that measurements can be taken, the following data will be collected for each well. If allowed, a unique well identifier provided by the State Department of Ecology will be affixed to the well. The County will be provided a report that documents the well inventory.
Table B-1. Off-Site Well Inventory Parameters

<table>
<thead>
<tr>
<th>Owner</th>
<th>Pumping rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Typical water use and well problems</td>
</tr>
<tr>
<td>Contact information</td>
<td>Water treatment facilities</td>
</tr>
<tr>
<td>Well log</td>
<td>Specific conductance</td>
</tr>
<tr>
<td>Diameter</td>
<td>pH</td>
</tr>
<tr>
<td>Total depth</td>
<td>turbidity</td>
</tr>
<tr>
<td>Depth of openings</td>
<td>odor</td>
</tr>
<tr>
<td>Pump set depth</td>
<td>iron-related bacteria activity measurement</td>
</tr>
<tr>
<td>Depth to static water level</td>
<td>appearance of wellhouse, well, and water</td>
</tr>
<tr>
<td>Depth to pumping water level</td>
<td>photo of well house and well head</td>
</tr>
</tbody>
</table>

To avoid repeated access to these private and possibly public water supply sources, routine (ongoing) water level measurements will not be collected from these wells. Instead, monitoring wells will be established to measure mining effects between the off-site supply wells and the mine. The following wells will be used for this purpose:

Table B-2. On-Site Monitoring Locations to Assess Off-Site Water Level Changes

<table>
<thead>
<tr>
<th>Location</th>
<th>Location Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast and East of the site:</td>
<td>MT-9, MT-11</td>
</tr>
<tr>
<td>South of the site:</td>
<td>A new monitoring well drilled as far south as possible between Wetland A fingers 3 and 4</td>
</tr>
<tr>
<td>West of the site:</td>
<td>PP-10</td>
</tr>
</tbody>
</table>

The monitoring wells will be surveyed and manual water levels and water temperatures will be measured six times yearly starting not later than the issuance of the mining permit, and will continue for the duration of mining. Alternatively, the operator may choose to install data loggers in the wells. In that case, manual measurements may be reduced to four times per year, with the loggers programmed to collect daily water levels. In addition to routine reporting discussed below, data will be made available to County staff upon reasonable request.

Well owners with problems that they believe are caused by the mine must first contact the County and provide evidence of the impairment. Based on the evidence presented, a licensed County hydrogeologist or engineer may choose to visit the site and perform an inspection. Although the County inspection would not be required, such an inspection is required before the County may request action by the mine operator, and the County must present evidence to the mine operator of probable cause that the impairment is caused by the mine. With regard to problems related to pumping rates or volumes, probable cause must include a preliminary analysis indicating that the static water level in the well has declined more than would be caused by natural variability plus changes in local water use. With regard to
changes in water turbidity, probable cause must include evidence of increased turbidity that is not explained by local conditions, including bio-fouling of the well and pump problems. The mine operator will provide the County with any requested monitoring data during this evaluation.

Upon request by the County, and after the County’s preliminary evaluation referenced above, the mine operator will contact the well owner and quickly perform an independent evaluation of the reported well problem. If the County’s inspection results in a finding of probable cause as defined above, and the results of the mine operator’s independent evaluation concurs with the County’s finding, the mine operator shall either repair the identified impairment or replace the well. The standard of acceptance for a repaired or replaced well will be one that yields a similar amount of water as the original, and that has comparable water quality. At anytime during this process, the mine operator may choose to repair or replace the well without further evaluation.

In the event that the results of the independent evaluation do not concur with the County’s finding, the County and the mine operator shall engage a third party, either a licensed hydrogeologist or engineer, to evaluate the claimed impairment and shall be bound by the results of his or her findings. The mine operator shall pay for the third party’s analysis. The third party shall be chosen as follows: the mine operator shall identify three licensed hydrogeologists or engineers and County shall choose one of these licensed hydrogeologists or engineers to perform the evaluation. If the conclusion is a finding of probable cause as defined above, the mine operator shall either repair the identified problem or replace the well to the standard specified above.

**Groundwater Level and Temperature Monitoring**

**Monitoring Stations**

Stations listed in Table B-3 will continue to be used to monitor groundwater and wetland water levels and temperatures.

<table>
<thead>
<tr>
<th>Wells</th>
<th>Surface Water Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT-5</td>
<td>DL1</td>
</tr>
<tr>
<td>MT-6</td>
<td>BC1</td>
</tr>
<tr>
<td>MT-8</td>
<td>BC2</td>
</tr>
<tr>
<td>MT-9</td>
<td>wetA1</td>
</tr>
<tr>
<td>MT-10</td>
<td></td>
</tr>
<tr>
<td>MT-11</td>
<td></td>
</tr>
<tr>
<td>PP08</td>
<td></td>
</tr>
<tr>
<td>PP10</td>
<td></td>
</tr>
</tbody>
</table>
Water Level and Temperature Monitoring Schedule

Background and foreground water monitoring will occur. Background water level data are considered to be those measurements collected before mining penetrates the water table south of the train tracks. Foreground monitoring begins immediately after background monitoring. The same parameters and frequency of data collection will occur in the background and foreground periods.

Monitoring will begin under this program no later than receipt of the mining permit and continue until one month after reclamation is complete. Monitoring will continue during periods of gravel-mine inactivity, unless approved otherwise by the County.

If data loggers are not used, manual water levels and temperatures will be measured every other month at each station. If data loggers are used, they shall be programmed for daily water level and temperature measurements, and manual measurements may be decreased to quarterly. Data logger data shall be downloaded and secured quarterly.

Data Management

One copy of data collection forms will be kept on file at the site or the operator’s corporate office and another copy will be provided to the County. The County shall maintain a secure file of project data. In addition, the owner will enter the data into a computer database which will record the date, time, person, depth-to-water, and water temperature at each station. A copy of the database will be provided to the County annually.

Data Analysis and Reporting

The owner will summarize the mining and water monitoring activity in a report to the County every two years. The hydrologic report will include:

- A map showing the extent of aggregate extraction (below the water table) at the beginning and end of the two-year period.
- The depth of each pit below the water table, if applicable.
- A summary of water use during the two-year period.
- Plots of water levels and temperature over time for the entire period of record.
- Comments on mine activities or the monitoring program pertinent to interpretation of the data.

A licensed hydrogeologist will generate the report or review the report and comment on the program at this two-year interval.
Some of the wells are located within future pits and will be destroyed in the process of mining. Wells MT-8 and MT-10 would likely be destroyed within the first 5 years of mining, whereas wells MT-6 and MT-5 would not be destroyed until 10 to 15 years after mining starts. The perimeter wells will not be destroyed by mining.

One additional monitoring station will be established between Wetland A fingers 3 and 4 prior to any pit being excavated below the water table (Table B-4).

### Table B-4. Monitoring Stations to be Added

<table>
<thead>
<tr>
<th>Wells</th>
<th>Surface Water Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>One well as far south as possible between fingers 3 and 4</td>
<td>None</td>
</tr>
</tbody>
</table>

The new well will be constructed of 2-inch diameter PVC and be screened slightly below the water table. All wells will be physically secured to prevent entry or vandalism. Measuring points will be clearly marked and surveyed to NGVD29 datum. Unused wells will be decommissioned in accordance with Chapter 173-160 WAC regulations.

### Monitoring Personnel

Professional or on-site personnel will perform the water level monitoring. If on-site personnel are used, a licensed professional hydrogeologist will train the on-site personnel during an initial round of monitoring, assist in setting up the data management system, and must stamp any report consistent with State licensing requirements.

### Water Level and Temperature Monitoring Parameters

The time, date, measuring point, depth-to-water, and water temperature will be recorded at each monitoring well, along with the name of the person making the measurement. Also, related mine-activity data will be recorded to assist in the reporting discussed below.

Measuring depth-to-water in the wells will require the use of an electric water level sounder. Stage height at the gaging stations will require a hand tape. At station wetA1, the height of water above the measuring point is read directly from the stage gage.

Temperature measurements will be made with a hand-held, remote-reading, down-hole thermometer. The thermometer will be lowered into the bottom portion of the well screen and the temperature of the groundwater will be read off of the hand-held meter. The wells will not be purged.
The owner will analyze the water monitoring data every second reporting period (every four years). The analysis will be summarized in an expanded report to the County and include the data and comments listed above plus:

- An analysis of water level and temperature changes or trends considering potential mining effects, background (regional) changes, water level changes permitted under existing water rights, beaver activity, and other factors the owner recognizes as pertinent.
- Identification of significant adverse water level or temperature changes likely caused by mining (the lakes or gravel extraction).

The report will be generated or reviewed and approved by a licensed hydrogeologist.

**Overview of Water Quality Monitoring for the NPDES General Permit**

Training of samplers, water sampling at selected stations, and reporting will meet requirements of the NPDES Sand and Gravel General Permit. There will be no discharges to surface water, therefore sampling requirements are those for discharging stormwater and process (wash) water to the ground. The wash water will be discharged to sand-lined sedimentation ponds and largely reused. Analysis requirements are monthly testing of water in sedimentation ponds for pH, and daily visual examination for oil sheen.

In addition, the project will conduct groundwater monitoring at least quarterly, nearby and down-gradient of the sedimentation pond, regardless of whether the volume of discharge to groundwater exceeds 15,000 gallons per day (which is the regulatory threshold). Background samples will be collected from monitoring stations prior to mining. Groundwater analysis parameters will include temperature, specific conductance, turbidity, and possibly dissolved iron and manganese.

Surface water and groundwater monitoring stations are proposed to comply with General Permit requirements. Surface water stations will be the sedimentation pond or ponds, as well as other locations where stormwater collects. The following wells will be used to monitor groundwater quality downgradient of the sedimentation ponds:

- PP02 (a shallow downgradient water supply well)
- PP04 (a shallow downgradient/cross-gradient water supply well)
- One new monitoring well

PP02 is the supply well for the on-site residence and office. PP04 is one of the supply wells for the onsite industrial facilities. In both cases, samples will be collected from the spigot closest to the well (if possible, upstream of any storage or pressure tank that may be present).

The new monitoring well will be located near the downgradient (west) side of the sedimentation pond. Special attention to well development and sampling procedures will be
implemented to reduce initial drilling-induced turbidity, and to produce consistent turbidity
data over time.

All wells will be physically secured to prevent entry or vandalism. Measuring points will be
clearly marked and surveyed to NGVD29 datum.

On-site or professional personnel will perform the monitoring. If on-site staff are used, a
professional hydrogeologist will train the on-site personnel during an initial round of
monitoring, and assist in setting up the data management system, as requested.

The operator will report NPDES monitoring data quarterly in accordance with General
Permit requirements, using the standard forms available from Ecology.

In addition, the data collected from NPDES monitoring stations will be incorporated into
groundwater monitoring reports submitted to the County as described earlier for other
groundwater monitoring.