

December 5, 2011

MEMORANDUM

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SUBJECT: Staff Analysis for Draft Reuse Permit LA-000147-03 (Municipal Recycled Water)
City of Murtaugh

1. PURPOSE

The purpose of this memorandum is to satisfy the requirements of the *Recycled Water Rules*, IDAPA 58.01.17.400.05, for issuing reuse permits. This memorandum addresses draft Permit LA-000147-03, for the Municipal treatment and reuse system, owned and operated by City of Murtaugh. City of Murtaugh's treatment and reuse system is currently permitted under the terms of Reuse Permit LA-000147-02.

2. SUMMARY OF EVENTS

The Department of Environmental Quality (DEQ) issued Permit LA-000147-02 to the City of Murtaugh on July 15, 2003. The permit is for continued operation of the recycled water treatment and reuse system serving City of Murtaugh. The mailing address for this facility is: P.O. Box 157, Murtaugh, ID, and it is located in Township 11South, Range 20 East, Section 6. The purpose of the current draft permit is to renew Permit LA-000147-02, which expired on July 15, 2008.

A permit renewal application from City of Murtaugh was received on November 2, 2011, and largely serves as the basis for the terms and conditions contained in the draft permit. As required by the *Recycled Water Rules*, the draft permit will be presented for a public comment period. After the comment period has closed, DEQ will provide written responses to all relevant comments and prepare a final permit for City of Murtaugh's wastewater reuse facilities.

The City entered into a Consent Order with Idaho DEQ (IDEQ) in November 2006, requiring their wastewater system to be improved so that permit limits for total nitrogen and TSS concentrations could be met. Analysis of the RIB's ground water impacts provided by the permittee's consultant supported a waiver, issued in March of 2009, which increased the Total-Nitrogen and TSS limits for the lagoon effluent applied to the RIBs. Construction of the modifications to the wastewater system, a condition of the Consent Order, was completed in 2010. This involved the addition of a 3rd rapid infiltration basin (RIB), coarse screening, Parshall flume, 4 aerators in the first lagoon, and the extension of the yard piping and control structure network.

The facility's compliance activities during the previous permitting period were completed. Seepage tests were performed on each lagoon, in June/July 2004 and in May/June 2011. Both sets of tests showed that the seepage rates from the lagoons were under the allowable limit. An updated Operations and Maintenance Manual was submitted by the City of Murtaugh to IDEQ on August 26, 2011. The final

copy of the manual, incorporating IDEQ comments, was submitted on October 19, 2011. Yearly inspection reports generally note that the facility is meeting its permit requirements, though the 2010 Inspection described a lack of signage around the facility.

3. PROCESS AND SITE DESCRIPTIONS

The City of Murtaugh's previous permit, LA-000147-02, and the accompanying staff analysis issued on May 20, 2003 can also be referenced for facility descriptions.

The City of Murtaugh owns and operates a municipal wastewater treatment system serving residential and commercial users. The treatment system consists of coarse screening headworks, a two-cell lagoon system, and a land application site. The facility is located approximately one-quarter mile east of the City of Murtaugh.

Process

Influent reaches the facility by gravity, through the City's sewer system. The wastewater is screened in the headworks before it enters the lagoon system. The first lagoon, which is partially aerated by four, floating mechanical aerators, has a maximum surface area of 1.12 acres and maximum storage volume of 1.69 million gallons. After an average hydraulic retention time of 33 (thirty-three) days, the partially treated wastewater flows to the second, facultative lagoon, which has a maximum surface area of 1.13 and a maximum storage volume of 1.50 million gallons. This facultative lagoon is the final of treatment before the wastewater is applied to the RIBs. The second lagoon is not aerated, resulting in a lagoon where both aerobic and anaerobic processes occur. To keep the aerobic/anaerobic processes balanced, a normal depth of 3 to 5 feet is maintained in this lagoon. Both lagoons were originally lined with bentonite clay, and were upgraded in 1995 with a high-density polyethylene (HDPE) liner. An August 2011 seepage test determined that the seepage rate for Lagoon No. 1 was 0.0054 +/- 0.0188 and was 0.0260 +/- 0.0244 for Lagoon No. 2. Seepage rates for both lagoons were under the allowable 0.25 inches/day.

After treatment in the facultative lagoon, which has a hydraulic retention time of 29 (twenty-nine) days, the wastewater is gravity drained to one of the three rapid infiltration basins. Each RIB is approximately 1 acre in size. The RIBs, two built in 1995 and one in 2010, have designs based on an average infiltration rate of 1.1 in/day.

Site

All of the land used in the treatment processes is owned by the City. Appropriate buffer distances from the land application sites are maintained for houses and private wells. The closest house to the RIBs is 450 feet away, safely beyond the recommended 300 foot buffer. No major surface water body is within 50 feet of the facility, though an irrigation lateral is 45 feet from the RIBs, just within the 50 feet buffer zone requirement. The nearest significant surface water body is Dry Creek, which is 500 to 600 feet east of the RIBs. The Snake River is 1,500 to 2,000 feet northeast of the facility.

The facility is not located in a Federal Emergency Management Agency-determined flood zone and is not near any recognized wetlands. It sits above the Eastern Snake River Aquifer, a designated sole-source aquifer, which provides the drinking water for the City of Murtaugh and the surrounding residences. Ground water in this part of the aquifer generally flows north-northeast, towards the Snake River. There are no drinking water wells between the facility and the Snake River along this flow path. The City of Murtaugh's public drinking water well is located approximately half a mile east of the recycling facility; and considering the predominantly north/northeast ground water flow in the region, is not likely to be impacted by the water recycling facility.

4. PREVIOUS PERMITTING PERIOD

The hydraulic loading limit of the previous permit, 16 MG/year, was not exceeded from 2007-2010. During this time period, an average of 7.38 MG/year of wastewater was applied to the RIBs, without any single year's application exceeding 9 MG/year. Similarly, annual application rates never reached half of the 1.1 inches/day designed rate, and averaged 0.38 inch/day for the same years. With a new RIB available for use, hydraulic loadings rates will decrease overall; and based on models projecting a population growth rate of 2 percent per year, suggests hydraulic loading rates should not become excessive during the next permit cycle.

Recommendation: The current limit of 16 MG/year should be maintained.

Nitrogen and TSS Application Limits

Two, 2008 technical memoranda, *Rapid Infiltration Evaluation (JUB)* and *Groundwater Nitrate Impacts from Rapid Infiltration Basins (JUB)*, examined the capability of the RIBs to prevent the elevation of ground water phosphorus and nitrate concentrations. These documents explained how, with plant modifications and improved operations, effluent could be more effectively treated by the RIBs, reducing the facility's influence on ground water quality.

The *City of Murtaugh Wastewater Treatment Facilities: Operation and Maintenance Manual (JUB)*, prepared in 2011, describes further the operational techniques that are most likely to promote effective RIB performance. Sequential discharge of effluent to each of the three (3) RIBs is recommended. A RIB pre-wetting, wetting, and drying cycle should begin with 1-2 inches of effluent for one to two days, then resting the RIB for 1 to 4 days before starting dosing. Dosing should last 7-9 days in summer, followed by resting for 10-15 days. The application cycle should be lengthened in winter so that dosing is limited to 9-12 days and resting lasts between 12-16 days. Application during freezing temperatures should be avoided unless storage in the lagoons is no longer possible. If application during freezing temperatures is necessary, then continuous application is recommended to keep the soil saturated.

As stated in the Recycled Water Rules, IDAPA 58.01.17.613.01.c, the rapid infiltration system shall be designed to provide even distribution of the recycled water. Chapter 6 of EPA, *Process Design Manual for Land Treatment of Municipal Wastewater: Supplement on Rapid Infiltration and Overland Flow* and Section 10.6.1 of *EPA Process Design Manual: Land Treatment of Municipal Wastewater Effluents*, are two sources that can be consulted concerning effluent distribution. A properly designed system of perforated pipes installed in the RIBs is one potential way to meet this requirement.

Techniques to decrease concentrations of TSS in the effluent before it is applied to the RIBs were also recommended. Lower concentrations of TSS should decrease surface clogging of soils and help maintain higher hydraulic infiltration rates. If discharging during algae blooms becomes necessary, then shortening the time of discharge as much as possible or discharging at night will reduce the algae associated TSS load. TSS loading can lead to the formation of organic mats and the associated lowering of infiltration rates, but by maintaining plant coverage or scarifying the RIB surface one or two times a year, mat formation will be limited.

After reviewing the memoranda and improved RIB operation techniques, DEQ revised the City's 30-day average permit limit for the lagoon effluent total-nitrogen to 30 mg/l, an increase of the original 20 mg/l limit. Historical concentrations of total-nitrogen have typically been less than this revised permit limit, particularly since the system improvements were constructed in 2010, though it is only since these improvements were made that the former 20 mg/l was regularly met. A number of operational strategies were also developed in *Rapid Infiltration Evaluation*, and were incorporated into the operation manual. Since these recommendations have been made effluent, TSS concentrations have consistently been below the permit's original 100 mg/l limit.

Recommendation: The 30 mg/l total nitrogen and 150 mg/l TSS limits should be maintained for the current permit cycle as long as the system shows minimal effect on ground water nitrate concentrations. Lagoon operation should be optimized to remove as much nitrogen as possible. The previous permit did not contain a phosphorus limit, and modeling suggests that the phosphorus absorption capacity of the soil in the RIBs will be adequate to deal with the current phosphorus loadings to the RIBs, though DEQ reserves the right to implement phosphorus limits in the future. Compliance Activity 147-02 requires that a plan be submitted to DEQ that will ensure that even distribution of effluent occurs in the RIBs. Proper operational techniques should be continued to maintain RIB performance.

Ground Water

As shown in Figure 1, ground water concentrations of nitrate have occasionally exceeded the MCL. Though it appears that downgradient wells have higher nitrate concentrations than upgradient wells; this trend is not consistent among all downgradient wells or during all seasons. As the City’s permit renewal application suggests, the spike in nitrate concentration of downgradient wells may merely be an artifact of season influx of irrigation water, which affects both constituent concentrations in, and flow of, local ground water.

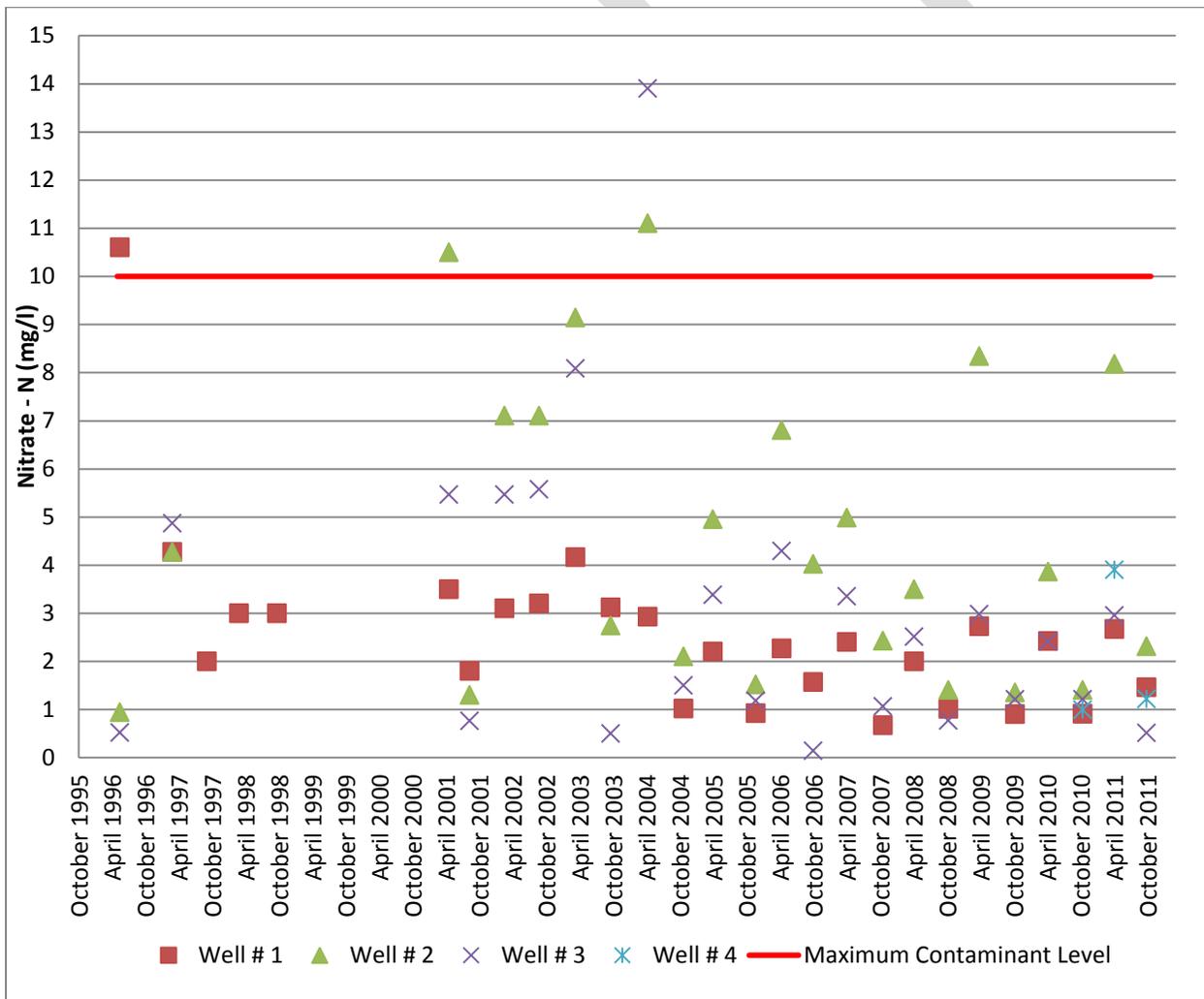


Figure 1, Historic Ground Water Nitrate Concentrations

Recommendations: With the installation of a 3rd downgradient monitoring well (MW 4), a better indication of how seasonal changes affect ground water should be available, and could show that the application of effluent to the RIBs is not the primary cause of the high nitrate concentrations found in MW 2. Ground water modeling performed by the permittee's consultant suggests that the RIBs should not raise ground water nitrate concentrations beyond an acceptable amount; however, continued analysis of ground water monitoring will be required to determine if this modeling reflects reality. If further monitoring and analysis reveal that the locations of MW 3 and MW 4 provide a better indication of how well the RIBs are able to remove nitrogen, then no plan on how to increase RIB nitrogen removal capacity will be necessary.

Common ion measurements would also be of great value in determining the direction of flow and mixing of the ground water around the RIBs. Measurement of the concentrations of calcium, magnesium, potassium, sodium, bicarbonate, carbonate, chloride, and sulfate in each ground water monitoring well and in the wastewater effluent, performed during the first and last year of the permit, could help elucidate the effect of land application on the ground water. More information on this method can be found in Section 7.2.4.2.3 of the *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater*.

Increasing the frequency of static water level measurement in the monitoring wells will provide some additional clarification of the seasonal ground water flows, especially when incorporated into a local potentiometric map. If the potentiometric map from the first two years of quarterly monitoring is consistent, then monitoring of static water levels in the wells can return to a semi-annual basis for the remainder of the permit.

5. PERMITTING DISCUSSION

The following sections outline changes made to the terms of the draft renewal permit, based on changes requested by the permittee, evaluations of past performance with previous permit requirements, and/or updates required by changes to the *Recycled Water Rules* or any other applicable regulatory standards. Terms and conditions that are unchanged from the previous permit and remain applicable to the facility are not addressed in this document. Changes made to update language and regulatory references are also not addressed in this document.

5.1. Section D. Facility Information

Since the previous permit, a new RIB and ground water monitoring well have been added to the facility. A new headworks structure, including a coarse screen and a Parshall flume flow monitor was also constructed. Installation of aerators in the first lagoon, along with new yard piping with control structures and gate valves, completed the general system upgrade. The seepage rates of the lagoons were tested in 2011 and will need to be retested in 2021.

5.2. Section E. Compliance Schedule for Required Activities

- CA-147-01 Plan of Operation: An updated plan of operation was submitted to DEQ on October 19, 2011. An addendum to this Operation and Maintenance Manual shall be submitted to DEQ for review one (1) year after permit issuance. This addendum shall revise the manual to reflect the changes introduced in the new permit, LA-000147-03. The addendum shall also include a Quality Control and Quality Assurance Plan. Section 7.1.6 of the DEQ *Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater* provides a more detailed discussion of Quality Assurance and Quality Control. The addendum shall also explain design and operation modifications to employ that will ensure effluent is distributed evenly along the RIBs.

- CA-147-03 Application for Permit Renewal: Per Subsection 300.01 of the Recycled Water Rules (IDAPA 58.01.17), any facility that intends to continue to operate as a reuse facility must have a permit issued by DEQ. Subsection 400.01 requires that a permit application be submitted to DEQ at least one hundred and eighty (180) days prior to the expiration of the facility's current permit. This compliance activity is proposed for inclusion in the attached draft permit so that this important deadline is not missed. For the full text, see Section E of the draft permit.

5.3. Section F. Permit Limits and Conditions

Effluent dosed to RIBs shall be limited to concentrations of total nitrogen and TSS of 30 mg/l and 150 mg/l respectively.

5.4. Section G. Monitoring Requirements

Wastewater effluent total coliform monitoring is no longer required; fecal coliform monitoring will be sufficient. Common ion measurement is now required in the first and last years of the permit. pH measurements are required for influent and effluent quality samples. Documenting flow measurement calibration for the Parshall flume and effluent weirs shall be included in the annual report. A potentiometric map illustrating seasonal ground water flow, based on quarterly static water level measurements from all four ground water monitoring wells, shall be included in annual reports. All other current monitoring practices shall be continued.

5.5. Appendix 1. Environmental Monitoring Serial Numbers

The following environmental monitoring serial numbers have been added since the previous permit:

MU-014703 Rapid Infiltration Basin #3
GW-014704 Monitoring Well #4 or D

5.6. Appendix 2. Site Maps

See Appendix 2 of the City of Murtaugh's Water Reuse Permit for updated site maps. MU-014703 and GW-014704 were added to the site maps.

6. RECOMMENDATIONS

Based on review of applicable state rules, staff recommends that DEQ issue draft Reuse Permit LA-000147-03 for a public review and comment period. The draft permit contains effluent quality requirements for the recycled water treatment system, as well as terms and conditions required for operation of the reuse system in Section F. Monitoring and reporting requirements to evaluate system performance and to determine permit compliance have been specified in Sections G and H, and compliance activities have been incorporated into Section E of the permit.

7. REFERENCES

- Idaho Department of Environmental Quality (DEQ). 2007. Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater.
- J·U·B ENGINEERS, Inc. (JUB). 2011. City of Murtaugh: Recycled Water Permit Renewal Application.
- J·U·B ENGINEERS, Inc. (JUB). 2011. City of Murtaugh Wastewater Treatment Facilities: Operation and Maintenance Manual.
- J·U·B ENGINEERS, Inc. (JUB). 2008. Wastewater Facilities Plan: Rapid Infiltration Basin.
- J·U·B ENGINEERS, Inc. (JUB). 2008. Wastewater Facilities Plan: Groundwater Nitrate Impacts from Rapid Infiltration Basins.
- U.S. Environmental Protection Agency (EPA). 2006. Process Design Manual: Land Treatment of Municipal Wastewater Effluents (EPA 625/R-06/016).
- U.S. Environmental Protection Agency (EPA). 1984. Process Design Manual for Land Treatment of Municipal Wastewater: Supplement on Rapid Infiltration and Overland Flow (EPA 625/1-81-013a).

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