State of Oregon
Department of Environmental Quality | Memorandum

To: Dan Wiltse, Western Region, Eugene

Date: May 8, 2023

cc: DEQ File

From: Rick Hill, R.G., DEQ Eastern Region, Pendleton

Subject: Report*: Groundwater Impact Evaluation, Nitrate Balance, Lazy Days Community Redevelopment,* 52511 McKenzie Highway, Blue River, Oregon 97413, prepared for Homes For Good by PBS Engineering and Development Inc. (PBS), dated February 2023

I completed a review of the Groundwater Impact Evaluation, Nitrate Balance for the Lazy Days Community Redevelopment in Blue River, Oregon. The property was utilized as a residential RV community prior to its destruction by wildfire in 2020, and it is rebuilding the community with 30 manufactured homes that will utilize a large onsite septic system (LOSS) for sewage treatment at the site.

The purpose of the groundwater assessment is to evaluate the potential for adverse impact to groundwater from the drainfield discharge. In addition, this site is in the McKenzie River Basin and is subject to the Three Basin Rule (OAR 340-041-0350). To approve a large onsite septic system greater than 5,000 gallons per day (gpd), DEQ and the Environmental Quality Commission must find the following:

- There is no measurable discharge of waste to surface water;
- The new treatment system at the facility will protect groundwater, treated wastewater must have concentration limits not to exceed 10 mg/l, and the facility must have a plan to restore conditions if groundwater quality is adversely affected; and
- That the new treatment system at the facility improves protection relative to the current treatment system.

The wastewater at the property was formerly managed with three to five standard onsite septic systems of unknown size. The groundwater impact evaluation indicates the former inactive septic tank/drainfields are still in place but will be removed as part of the new community development.

The report indicates that the dominant geologic unit underlying the site is comprised of Quaternary Surficial deposits from the Missoula and Bonneville floods. The deposits include alluvium, colluvium, fluvial, coastal terrace, landslide, glacial, eolian, beach, lacustrine and playa and pluvial lake deposits. The well logs show mixtures of silt, sand, and gravel beneath the site.

As a part of the groundwater impact evaluation, PBS oversaw the installation of three shallow monitoring wells at the site (MW-1, MW-2 and MW-3). First groundwater was reported to be between 11 and 12 feet below ground surface (bgs) on the well logs, but the text indicated groundwater was encountered between 11 to 15 feet below ground surface. The static water levels were reported to be between 6 and 11 feet below the top of casing.

Three rising head slug tests were performed on monitor well MW-1 and the average of the hydraulic conductivities (K) from the three well tests were reported to be 15.1 feet per day (ft/day). A hydraulic gradient of 0.003 was calculated from the water level contour map for the site. The water level contour map showed the groundwater flow direction to be slightly west of south. All three wells were sampled, and the nitrate ranged from 0.05 to 2.37 milligrams per liter (mg/l) in the three monitoring wells and 0.029 mg/l in the supply well for the site.

The State of Washington, Department of Health (DOH) Level 1 Nitrate Balance Spreadsheet for Large On-Site Septic Systems was used at the site to predict nitrate concentrations at the drainfield and downgradient of the drainfield at the property boundary. The facility ran the LOSS model for untreated effluent (60 mg/l nitrate) and for effluent from an ATT system producing an effluent of 20 mg/l.

The site plan showed the outline of the property on a topographic map and included the location of the drainfield, monitoring well locations, water level contours, groundwater flow direction, a cross gradient water well, the width of the drainfield perpendicular to groundwater flow and the point of compliance (POC) at the drainfield, and the alternate point of compliance (APOC) at the property line. From the site map it was also estimated that the APOC was 170 feet from the drainfield. The site map cut off the intersection with the McKenzie River downgradient of the drainfield, but from other contour maps I estimated it at approximately 200 feet from the APOC to the river.

The submitted plan showed a planned wastewater volume of 3,050 gpd. The LOSS model run using no pretreatment for nitrogen predicted a concentration of 27.3 mg/l at the POC and 23.4 mg/l at the APOC. The LOSS model runs with pretreatment of nitrogen predicted concentrations of 9.61 mg/l at the POC and 8.26 mg/l at the APOC.

The report goes on to outline a series of worthwhile best management practices (BMPs) for the site. The report then summarizes its findings and concludes that based on the groundwater impact evaluation and treatment to 20 mg/l TN at a flow rate of 3,050 gpd that the redevelopment project is not anticipated to result in degradation of groundwater at the site.

The flow presented in the groundwater impact evaluation is less than 5,000 gpd and the three-basin rule does not apply. Based on a flow of less than 5,000 gpd combined with a predicted concentration of less than 10 mg/l, the impact to groundwater is acceptable; therefore, I can recommend approval of the system as submitted with treatment to 20 mg/l total nitrogen (TN) at a flow of 3,050 gpd.

However, after discussions with Dan Wiltse on the permit for the site, this submittal is half of the flow that is anticipated for full buildout (6,100 gpd) at the facility. We don't want to recommend and approve half of the flow if additional treatment would be needed for the full flow to meet the three-basin rule requirements. I made several additional LOSS model runs in an effort to evaluate various scenarios and the potential groundwater impacts at partial and full buildout. In addition, I did further modeling to evaluate the potential surface water impacts after groundwater is mixed with the surface water.

To meet the requirements of the three-basin rule this site should meet the requirements of an existing system, because one LOSS is being utilized to replace five standard onsite systems. There are no records for two of the systems. One of these systems was small and appears to have been installed without a permit, and the only information on the other system is a drawing with no sizing information. The other three systems have a combined total of 1,510 lineal feet (lf) of drainfield. Our rules require 35 lf of drainfield per 150 gpd, which would suggest the other three systems totaled more than 6,400 gpd. Therefore, the new system will be slightly smaller than three of the existing systems and have significantly more treatment. The new LOSS will only have about 1/3 of the nitrogen load going to the aquifer that the old systems were contributing.

To meet the groundwater requirements associated with the three-basin rule, an existing system must meet the groundwater requirements in OAR 340-040-0030. As an existing system concentration limits can be established anywhere between background concentrations and reference or guidance limits outlined in Table 1, Table 2, or Table 3 or OAR 340-040, unless background is higher the numerical values where the concentration limit is set at background. In this case background is approximately 2 mg/l and an existing system can be permitted up to the reference level for nitrate-nitrogen of 10 mg/l.

Using all the LOSS model parameters provided in the PBS report, I changed the flow to try and identify the maximum flow that was less than or equal to 10 mg/l at the property boundary and would still meets the maximum concentration limit that could be allowed under 340-040-0030(3)(a). The LOSS model predicts a concentration of 10 mg/l at the property boundary with a flow of 4,630 gpd (Figure 1). This represents 75.9 % of the full design flow (6,100 gpd). Most of the time, large onsite systems are operated at closer to 50% to 60% of the design flow. Consequently, treatment to 20 mg/l is predicted to meet the required concentration limit of 10 mg/l most of the time. However, there could still be isolated exceedances if the flow goes up to the design criteria.

To evaluate the potential groundwater impacts at full design flow, I again ran the LOSS model using all the parameters provided in the PBS report at a flow of 6,100 gpd. At 6,100 gpd the LOSS model predicts a concentration of 12.37 mg/l at the drainfield (POC) and a concentration of 11.14 mg/l (Figure 2) at the property boundary (APOC). This exceeds the maximum allowable concentration limit for an existing facility by 1.14 mg/l. Because the model predicts concentrations will exceed the maximum allowable concentration limit for an existing facility, this indicates a groundwater concentration limit variance would be needed. One caveat on this scenario is that a change in the drainfield size could cause the predicted concentrations to change slightly. If a change in the drainfield size resulted in reducing the predicted nitrate concentration to less than or equal to 10 mg/l, a variance would not be needed. It is unlikely this will occur, but any changes to the site will need to be thoroughly evaluated to see if predicted concentrations change.

To evaluate the potential surface water impact at the full buildout of 6,100 gpd I used the predicted LOSS model outputs and plugged aquifer characteristics and precipitation plus drainfield recharge from the LOSS model into the Summers mixing model. The Summers mixing model takes groundwater flow/concentration and mixes it with the stream flow to predict a downgradient stream concentration. The attached graph (Figure 3) shows flow in the McKenzie River since 1988 and the lowest flows are near 1,500 cubic feet per second (cfs), so I selected a flow of 1,500 cfs for the river to see if we get a measurable increase with mixing of the groundwater. It was assumed there is no upstream nitrate in the river. The modified summers model predicts mixing the groundwater flow with the surface water flow will result in a down stream concentration of 0.00011 mg/l of nitrate in the river (Figure 4). This is less than standard detection levels of 0.005 for nitrate-nitrogen and constitutes no measurable change to the river. Therefore, even at the design flow 6,100 gpd there should be no measurable impact to the river.

The three-basin rule requires no measurable impact to the river from the discharge and that all aspects of OAR 340-040-0030 must be met for groundwater. At the full design flow of 6,100 gpd the LOSS model predicts a concentration of 11.14 mg/l of nitrate will be leaving the site. This is above the numerical threshold of 10 mg/l for a concentration limit as specified in 340-040-003(3)(a) and exceeds the acceptable concentration limit threshold at an existing facility. This indicates a variance from the EQC could be needed for a discharge leaving the site in excess of 10 mg/l. Because the modeling shows no impact to the river, a variance should be possible, it would have to go to a public hearing to obtain the EQC approval. However, the modeling was done at full design flow of 6,100 gpd. On average the flow should be less than the design flow and modeling shows they could be below the 10 mg/l threshold at an average flow up to a rate of 4,630 gpd. Therefore, entering a monitoring program might be a preferable option to obtaining a variance, which would include monitoring for a minimum of two years.

Possible alternatives for the site come down to a combination of treatment for the system and the design flow for the onsite system at the site.

The modeling indicates that treatment to a concentration of 20 TN will not exceed a predicted groundwater concentration of 10 until the flow exceeds 4,630 gpd. The modeling also predicts that a flow in excess of the 4,630 gpd could produce a groundwater concentration greater than 10 mg/l; however, a flow up 6,100 gpd is not predicted to result in a measurable impact to the surface water. Therefore, with treatment to 20 mg/l and a flow of up to 4,630 mg/l would meet both the groundwater and surface water concentrations required in the three-basin rule. As such at this level of treatment and flow would not require a variance or a groundwater monitoring program.

While treatment to 20 mg/l TN with a flow of greater than 4,630 gpd and up to 6,100 gpd predicts groundwater concentration could exceed a concentration greater than 10 mg/l, but also predicts that no measurable impact to the McKenzie River will occur. Consequently, a groundwater variance could be necessary. However, as an alternative to a groundwater variance, we can require a groundwater monitoring program with a concentration limit of 10 mg/l. Should the facility exceed the concentration limit of 10 mg/l, the facility will need to be prepared to add additional measures to the system to reduce nitrate going to the drainfield.

The modeling predicts that both groundwater and surface water will meet the requirements of the three-basin rule if the effluent to the drainfield is treated to a TN concentration of 17 mg/l. As such if the system is constructed to discharge 17 mg/l TN, then a groundwater variance or groundwater monitoring program is not necessary.

In summary, to protect groundwater and meet the requirements of the three-basin rule, I recommend any of these three options:

1. Treat the effluent to 20 mg/l TN prior to discharge to the drainfield with a design flow not to exceed 4,630 gpd and a groundwater variance or monitoring program are not required.
2. Treat the effluent to 20 mg/l TN prior to discharge to the drainfield with a design flow between 4,631-6,100 gpd and either a variance or groundwater monitoring program is required. The concentration limit for the groundwater monitoring program would be 10 mg/l and a groundwater variance would need to be established at 11.5 mg/l. If a groundwater variance is obtained, the facility would also need to monitor the groundwater for a minimum of two years, before the facility can request a reduction in groundwater monitoring.
3. Treat the effluent to 17 mg/l TN prior to discharge to the drainfield with a design flow of up to 6,100 gpd and no groundwater variance or groundwater monitoring program will be required.

Please feel free to email me at rick.hill@deq.oregon.gov or call me on my temporary cell phone (971) 263-1120 with any questions about my recommendations.

Attachments:
Figure 1. LOSS TN 20 mg/l at 4,630 gpd
Figure 2. LOSS TN 20 mg/l at 6,100 gpd
Figure 3. McKenzie River Flow
Figure 4. Lazy Days GW/SW NO3 Mixing
Figure 5. LOSS TN 17 mg/l at 6,100 gpd