

NONDEGRADATION REPORT

FOR

EAGLES GROVE

WEST YELLOWSTONE, MONTANA

MARCH 2025

PREPARED BY:



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MMI # 10514.001

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ATTACHMENTS:

Appendix A: Vicinity Map
Appendix B: Preliminary Site Plan
Appendix C: NRCS Soils Report
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Introduction

The purpose of this report is to provide the information necessary to conduct a review of the design flow calculation, drainfield configuration and nondegradation analysis for the proposed development at the Eagles Grove property. This report and supporting documentation are submitted to the Department to be reviewed concurrently with an expedited review for the non-community public water supply associated with this project.

The Eagles Grove public wastewater system is intended to serve a new development project located on a parcel with the legal description of S21, T13 S, R04 E, ACRES 15.43, THAT PORTION E2NE4SW4 LYING W OF LAZY A SUB & S OF W Y HW identified herein as the subject property. The property address is 1630 Targhee Pass Highway. The property is 15.43 acres and is generally located in the southwest quarter of Section 21 of Township 13 South, Range 4 East within Gallatin County as shown in the attached vicinity map included in Appendix A. The proposed development plan consists of short-term vacation rental units.

There are existing public on-site water and subsurface wastewater treatment facilities on the subject property. The existing public wastewater system was approved by DEQ under EQ #03-2050 and Gallatin County under permit #2004002. The system is comprised of buried concrete septic tanks and a standard subsurface drainfield. The existing public water supply well (GWIC ID: 219958) was the source for PWSID #MT0004318. These systems previously served commercial uses on the subject property only, but they are no longer in service and will be properly abandoned with this project.

The proposed development plan for the subject property consists of short-term vacation rental units. The proposed new well and wastewater treatment system will serve the subject property only. The system is not anticipated to serve more than 25 people for at least six months per year and will therefore be considered a transient non-community system.

The systems will be owned and operated by:

Eagles Grove at Yellowstone LLC
2528 S 2350 E
Saint George, UT 84790-7032

CHAPTER 1 DESIGN NARRATIVE

Site Evaluation

The site was first evaluated in 2004 for permitting of the existing drainfield. Gallatin County personnel were present during the evaluation on 8/30/04. The silt loam soils found in all three test pits indicated

an application rate of 0.4 gpd/ft². The three percolation tests indicated an application rate of 0.4 gpd/ft². The soil logs, percolation test logs, and the Gallatin County site evaluator notes are included in Appendix E and F. The locations of these test pits and percolation tests are shown on the attached preliminary site plan in Appendix B.

The site was subsequently evaluated by Water and Environmental Technologies on 10/3/22. Three test pits were evaluated. The sandy clay loam soils in test pit #1 indicated an application rate of 0.4 gpd/ft². The loam soils of test pit #2 indicated an application rate of 0.5 gpd/ft². Test pit #3 soils were not evaluated, and the pit was located near the creek to check for high groundwater near the surface water. No evidence of groundwater was found in this test pit to 8.5' indicating the creek is losing and not hydraulically connected to groundwater. Test pit documentation is included in Appendix E. The locations of these test pits are shown on the attached preliminary site plan in Appendix B.

A site evaluation was most recently conducted by Morrison-Maierle to assess the site soils for the proposed drainfield areas. Test pits and percolation tests A through I were conducted by Morrison-Maierle in accordance with DEQ-4. Test pits were evaluated on 6/18/24 and 7/10/24. Percolation tests were conducted on 7/16/24. Findings as they apply to drainfield design will be covered in the drainfield design section of this report. Test pit and percolation test documentation is included in Appendix E and F. The locations of these test pits and percolation tests are shown on the attached preliminary site plan in Appendix B.

The property is not located within a mapped floodplain. FEMA panel 30031C1600D indicates the property is in an area of undetermined flood hazard classified as Zone D. A portion of the East Fork of Denny Creek flows north along the east side of the property and continues under Bear Road and Targhee Pass Highway to Denny Creek. The proposed primary drainfield is sited approximately 140 feet away from the closest portion of the creek. If flooding were to occur as a result of backup at the Bear Road crossing, topography information suggests flood waters would likely overtop the road continuing north or flow northwest along Bear Road to the highway ditches rather than receding back to the drainfield area where ground elevation is at least five feet higher than at the Bear Road crossing. The FEMA flood hazard firmette for the project location is provided in Appendix D.

Demand Summary

The proposed development plan for the subject property consists of short-term vacation rental units. Rental units will either be single cabins or multi-unit cabins with private entries for each unit. Each rental unit will be a single bedroom similar to a hotel room. Fifty-six rental units are proposed. Units will be turn-key cabin style rentals rented by reservation only with no employees onsite. Property management staff will be located offsite and will occasionally visit the site on an on-call basis. All laundry will be washed off site by a laundry service and there will be no laundry facilities on the site.

Two employees are conservatively assumed in the daily flow calculation for cases where property management staff or cleaners are onsite and occasionally use bathroom facilities. An average of 2.2 people per rental unit will be assumed based on permitting for similar facilities in Gallatin County. For example, The Comfort Inn in Big Sky was permitted at 2 people per unit under permit #1997001. Occupancy is expected to have some variability through a typical week and seasonally. For design flow calculations, it will be conservatively assumed that occupancy will be 100% daily. With 56 rental units and 2.2 people per unit on average, there will be up to 124 rental customers and 2 employees per day at full capacity.

Referring to Table 3.1-2 in Circular DEQ 4, the proposed use most closely resembles 'Cabins, Resort' with a daily flow of 40 gpd/person. This is conservative for this application given there will be no laundry onsite. Employees visiting the site will use 13 gpd/employee. The average daily flow is calculated as follows:

Average Day Demand = (40 gpd/person) x (2.2 persons/cabin) x (56 cabins) + (13 gpd/employee) x (2 employees) = **4,954 gpd**

The drainfield will be designed for a total capacity of 5,000 gpd. The details of the drainfield design and configuration are outlined in the following section of the report.

Drainfield Design

The drainfield has been designed for a capacity of 5,000 gpd and is sized based on the soils and percolation tests at the drainfield location. The absorption trench sizing is based on DEQ 4, Table 2.1-1.

Morrison-Maierle, Inc. evaluated the project site for the proposed wastewater treatment system. Test pits and percolation tests were conducted to assess the on-site soils of the property at the proposed drainfield location. No groundwater or any other limiting layers were encountered in any of the test pits at the drainfield location.

The primary drainfield was sized based on test pits and percolations tests E, F, and G. The sandy clay loam soils of test pit E indicate an application rate of 0.4 gpd/ft², the sandy loam soils of test pit F indicate an application rate of 0.6 gpd/ft², and the silty clay loam soils of test pit G indicate an application rate of 0.3 gpd/ft². Percolation test E with a rate of 6.67 mpi indicates an application rate of 0.6 gpd/ft², percolation test F with a rate of 7.5 mpi indicates an application rate of 0.6 gpd/ft², and percolation test G with a rate of 15.0 mpi indicates an application rate of 0.5 gpd/ft². The average percolation rate is 9.7 indicating an application rate of 0.6 gpd/ft². The average application rate for the test pits is 0.43 gpd/ft². A conservative application rate of 0.4 gpd/ft² is used for the primary drainfield.

The replacement drainfield was sized based on test pits and percolations tests A, B, H, and 1(WET). The sandy loam soils of test pit A indicate an application rate of 0.6 gpd/ft², the sandy clay soils of test

pit B indicate an application rate of 0.2 gpd/ft², the sandy clay soils of test pit H indicate an application rate of 0.3 gpd/ft², and the loam soils of test pit 1(WET) indicate an application rate of 0.4 gpd/ft². Percolation test A with a rate of 5.45 mpi indicates an application rate of 0.8 gpd/ft², percolation test B with a rate of 60 mpi indicates an application rate of 0.2 gpd/ft², and percolation test H with a rate of 10.0 mpi indicates an application rate of 0.5 gpd/ft². There is no percolation test associated with test pit 1(WET). The average percolation rate is 25.15 indicating an application rate of 0.3 gpd/ft². The average application rate for the test pits is 0.35 gpd/ft². A conservative application rate of 0.2 gpd/ft² is used for the replacement drainfield.

Based on the test pit data and percolation test data provided in Appendix E and F respectively, and DEQ-4, Table 2.1-1, design application rates for the primary and replacement drainfields are as follows.

Design Application Rate (primary)	= 0.4 gpd/ft²
Design Application Rate (replacement)	= 0.2 gpd/ft²

The proposed primary drainfield and 100% replacement area are shown on the preliminary site plan sheet included in Appendix B. The primary drainfield was sized with a 50% reduction for using SepticNET advanced treatment. The 100% replacement area was sized for standard absorption trenches, with no reduction in size as required in DEQ 4, section 6.6.2.3.

Based on the soil test pit data provided in Appendix E and F, the minimum separation between groundwater and the bottom of the proposed drainfields at each tract exceeds four feet.

The typical cross drainfield slope for the primary drainfield is on the order of 0.03 to 0.05 ft/ft to the northeast and 0.05 to 0.07 ft/ft to the northeast for the replacement area. Based on a design flow rate of 5,000 gpd, the above application rates, and a trench width of three feet, the drainfield sizing is as follows.

Primary Drainfield area = 12,500 ft² (no reduction)
Primary Drainfield area with 50% advanced treatment reduction = 6,250 ft²
Number of laterals = 18
Lateral length = 116 feet
Lateral spacing = 7 feet

100% Replacement Drainfield area = 12,500 ft² (no reduction)
Number of laterals = 72
Lateral length = 116 feet
Lateral spacing = 7 feet

CHAPTER 2 NONDEGRADATION ANALYSIS

Overview

Nondegradation analysis was performed for the Eagles Grove project located in West Yellowstone, Montana. *'How to Perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems Under the Subdivision Review Process'* (MDEQ October 2015) was used as guidance for the following analysis. Cumulative effects were considered in the calculations. The worst-case scenarios were analyzed involving the primary drainfield, which is smaller than the replacement area, and the two closest neighboring drainfields which also serve multiple units.

Groundwater Flow Direction

Impacts are evaluated along an established groundwater flow direction for the project vicinity. A comprehensive study was conducted in 2016 on the property across the street to establish groundwater flow direction. The data was collected approximately 500 feet north of the Eagles Grove property. Considering the completeness of the study and its close proximity, the groundwater flow direction from the study will be used for this project. The study was initially accepted by DEQ in 2016 and recently deemed appropriate for use with this project by the Department on 12/13/24. The study is included in Appendix G.

Surface Water

Potential impacts to nearby surface water were evaluated for this project. The closest surface water includes the East Fork of Denny Creek which flows northeast across the subject property. The East Fork of Denny Creek was determined to be a losing stream based on a test pit analyzed 14 feet from the stream on the subject property during earlier permitting for the existing system on the property under GCCHD Permit #2004002. This was later confirmed in 2022 by Water and Environmental Technologies (WET) when another 8.5-foot-deep pit was excavated next to the creek. Morrison-Maierle confirmed this again in June of 2024 with a new 15-foot-deep test pit within 20 feet of the creek during the most recent site evaluation for the Eagles Grove project. A monitoring well has been installed and continues to be dry during subsequent site visits. The portion of Permit #2004002 addressing the losing stream along with the more recent WET test pit information is included in Appendix K. Monitoring data from the 2024 Morrison-Maierle monitoring well is also included in Appendix K.

Other surface water within a half mile in the direction of groundwater flow includes Denny Creek to the northeast of the property which flows east and a small ditch that connects to Denny Creek on the north side of Targhee Pass Highway. Figure MW in Appendix I shows the established groundwater flow direction, downgradient surface water, and wells located approximately ½ mile away along the groundwater flow direction. These wells include GWIC ID: 158043 and GWIC ID: 208380 on Tract 3 and 4 of COS 1994, and GWIC ID: 247335. The well log for GWIC ID: 158043 shows static water at 48

feet in the month of May and GWIC ID: 208380 shows static water at 63 feet in the month of October. The third well (GWAMMON Well #247335) is currently used for long term monitoring. This well is located at the Hebgen Basin Fire Station 3 and is monitored by Montana Bureau of Mines and Geology (MBMG). Constant year-round monitoring since 2010 at this site approximately ½ mile from the project along the direction of groundwater flow shows that the groundwater level ranges from 47 to 64 feet below ground. The spring and fall static water measurements in the other two wells align with this seasonal range monitored over the last fifteen years. Based in this data, it is reasonable to conclude that Denny Creek is not hydraulically connected to groundwater at this point 1/2 mile from the project. Trigger value analysis is not provided since data suggests surface water within 1/2 mile of the project in the direction of groundwater flow is not hydraulically connected to groundwater and will not be impacted.

Nitrate

Nondegradation analysis for Nitrate was performed for the proposed drainfield. Cumulative effects were considered for two worst-case scenarios with nearby existing drainfields. The site-specific groundwater flow direction and hydraulic gradient were used for this analysis which yielded more conservative results than those used in the previous permitting on the neighboring drainfields. The results demonstrate that Nitrate levels at the end of mixing zones in the neighboring unrelated subdivision do not exceed 10 mg/L and are therefore not significant. Calculations are included in Appendix M.

Hydraulic Conductivity (K):

The Fetter Method was used in the calculation of hydraulic conductivity. Hydraulic conductivities have been calculated using three well logs for existing nearby wells in the project vicinity. Well logs using an air test, known to be the least reliable test method, were not considered. Well logs with incomplete drawdown data were not used. Well logs used in the calculation are bailer tests with complete drawdown data. Figure MW in Appendix I shows the approximate location of the wells according to GWIC mapping. The average of the wells results in a hydraulic conductivity of 122.5 ft/day.

Hydraulic Gradient (I):

The hydraulic gradient was taken from the neighboring site-specific study (Allied, 2016) approved by the Department for use in this project. Based on this study, the groundwater gradient is approximately 0.0054 ft/ft in the project area. The study is included in Appendix G.

Depth of Aquifer (D):

The depth of mixing assumed is based on a standard mixing zone thickness of 15 feet per the DEQ nondegradation guidance manual.

Mixing Zone Length (L):

The proposed system will utilize SepticNET advanced treatment. Drainfields using this technology do not have a nitrate mixing zone and standard mixing zone requirements are not applicable. However,

there will be a provisional setback envelope that will have the same dimension and location as is used to designate a standard groundwater mixing zone. A setback envelope of 150 feet is used to keep the envelope from crossing downgradient property boundaries and impacting neighboring property owners.

Width of Drainfield Perpendicular to Ground Water Flow (Y):

The width of the drainfield perpendicular to ground water flow for each drainfield is as follows:

Eagle Grove:	248 ft
COS 1639 East:	69.5 ft
COS 1639 West:	108.5 ft

Background Nitrate (as Nitrogen) (Ng):

The existing well on the subject property is not in use and there is currently no power connected to the pump. Water sample results from the closest neighboring well are used for background nitrate. The sampled well (GWIC# 158051) is located across the street approximately 200 feet north of the subject property and is a PWS serving the Mountain Vista Hotel. The test results are included in Appendix J and indicate a background of 0.32 mg/L.

Nitrate (as Nitrogen) in Precipitation (Nr):

The nitrate in precipitation is assumed to be 1.0 mg/L per the DEQ nondegradation guidance manual.

Nitrate in Effluent (Ne)

The proposed system will utilize SepticNET advanced treatment. Therefore, 7.5 mg/L nitrate in effluent value is used for the proposed drainfield. Standard drainfields are used for the neighboring systems in the cumulative effects analysis. Therefore, 50 mg/L nitrate in effluent value is used for these neighboring drainfields.

Quantity of Effluent per Single Family Home (QI):

For each single-family home included in the analysis, a discharge of 26.7 ft³/day is used. Eagles Grove has a design flow of 5,000 gpd. COS 1639 East is permitted for a 6-bedroom house and one-bedroom house. COS 1639 West is permitted for two (2) 2-bedroom houses and a shop with 1 employee per Permit #18032. The following single-family equivalent values for each drainfield were used in the calculations.

Eagle Grove:	25
COS 1639 East:	2.15
COS 1639 West:	2.05

Precipitation (P):

Per Western Regional Climate Center Data for the West Yellowstone area, the average annual precipitation is approximately 21.56 inches per year.

Percent of Precipitation Recharging Ground Water (V):

A 20% Precipitation Recharge Rate has been assumed per the DEQ nondegradation guidance manual.

Phosphorous

Nondegradation analysis for Phosphorous was performed for the proposed drainfield. Cumulative effects were considered for two worst-case scenarios with nearby existing drainfields. The site-specific groundwater flow direction discussed above is used to measure the distance to the nearest hydraulically connected surface water. The analysis demonstrates that there is sufficient soil adsorption capacity exceeding 50 years prior to discharge to the nearest hydraulically connected surface water. Calculations are included in Appendix N.

Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow (Lg):

The length of primary drainfield as measured perpendicular to ground water flow for each drainfield is as follows:

Eagle Grove:	248
COS 1639 East:	69.5
COS 1639 West:	108.5

Length of Primary Drainfield's Long Axis (L):

The length of primary drainfield's long axis for each drainfield is as follows:

Eagle Grove:	232
COS 1639 East:	85
COS 1639 West:	100

Length of Primary Drainfield's Short Axis (W):

The length of proposed primary drainfield's short axis for each drainfield is as follows:

Eagle Grove:	59
COS 1639 East:	21
COS 1639 West:	45

Depth to Limiting Layer from Bottom of Drainfield Laterals (B):

Test pits at the proposed drainfield locations were dug to 15.0 feet depth and a limiting layer was not encountered. Three feet will be subtracted from the total depth conservatively assuming trenches may be constructed to maximum depth of 36 inches below grade. Therefore, depth to a limiting layer of 12.0 feet is used for these calculations. A depth to a limiting layer of 6.0 feet is used for COS 1639 East since permit 16507 indicates an 8-foot-deep test pit and the as-built information indicates 24-inch-deep

trenches. A depth to a limiting layer of 7.0 feet is used for COS 1639 West since permit 13197 indicates an 8-foot-deep test pit and 12-inch-deep trenches.

Distance from Drainfield to Surface Water (D):

The nearest surface water in the direction of groundwater flow is the East Fork of Denny Creek before it passes under the highway. Multiple test pits of depths 8-15 feet next to the creek (from 2004, 2022, and 2024) demonstrate that this portion of the creek is losing and not hydraulically connected to groundwater. Conservatively, the phosphorus breakthrough is calculated to 400 feet before crossing the north side of the highway right-of-way and before reaching any other surface water.

Phosphorous Mixing Depth in Ground Water (T):

Soils below the level of the drainfield laterals are fine grained according to the soils data. Therefore, a value of 1.0 has been used for the analysis.

Soil Weight (Sw):

100 lb/ft³ is assumed per the DEQ nondegradation guidance manual.

Phosphorous Adsorption Capacity of Soil (Pa):

200.0 ppm is assumed per the DEQ nondegradation guidance manual.

Number of Single-Family Homes on the Drainfield (#):

Each single-family home is assumed to discharge an estimated 6.44 lbs/yr of phosphorus. Eagles Grove has a design flow of 5,000 gpd. COS 1639 East is permitted for a 6-bedroom house and one-bedroom house. COS 1639 West is permitted for two (2) 2-bedroom houses and a shop with 1 employee per Permit #18032. The following single-family equivalent values for each tract were used in the calculations.

Eagle Grove:	25
COS 1639 East:	2.15
COS 1639 West:	2.05

Conclusion

The purpose of this report is to provide the information necessary to conduct a review of the design flow calculation, drainfield configuration and nondegradation analysis for the proposed development at the Eagles Grove property. Impacts from Nitrate and Phosphorous have been evaluated and the results of the analysis show that impacts are below regulatory limits.