Montana Department of Environmental Quality

Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

PERMIT FACT SHEET

MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee:	Grass Valley Gardens LLC
Permit Number:	MTX000331
Permit Type:	Domestic Wastewater
Application Type:	New
Facility Name:	Grass Valley Gardens Residential Subdivision
Facility Location:	14N 20W 20SW Missoula County Latitude: 46.955904° Longitude: -114.162644°
Facility Address:	8700 US Hwy 10, Missoula MT 59808
Facility Contact:	Hunter Morrical – WGM Group
Treatment Type:	Proposed: Advanced, Membrane Bioreactor Facility (MBR)
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Proposed Outfall, Type:	001, Rapid infiltration cells (RIC)
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 11.77 lbs/day Total phosphorus: NA
Flow Rate:	Design maximum: 180,000 gpd Design average: 120,000 gpd
Effluent sampling:	Monthly sampling for influent and effluent
Ground water sampling:	Quarterly, MW-1 and MW-2
Fact Sheet Date:	February 2025
Prepared By:	M. Peziol

1.0 PERMIT INFORMATION

The following fact sheet outlines the basis for issuing a new Montana Ground Water Pollution Control System (MGWPCS) wastewater discharge permit to Grass Valley Gardens LLC (Permittee) for Grass Valley Gardens Residential Subdivision (Facility). The MGWPCS permit application and supplemental materials provide the information that serves as the basis for the development of the effluent limits and the monitoring requirements outlined within this fact sheet. The scope of this permitting action is for the construction, operation, and maintenance of the wastewater treatment and disposal system.

Department of Environmental Quality (DEQ) issues MGWPCS permits for a period of five years. The permit may be reissued at the end of the period, subject to reevaluation of compliance, water quality, and operations and maintenance.

1.1 APPLICATION

DEQ received an application for a new discharge permit on August 15, 2024. Permit fees accompanied the application. DEQ identified deficiencies in the renewal permit application during completeness review and notified the permittee in a letter dated September 17, 2024. The permittee provided supplemental application information on September 23, 2024, October 17, 2024, and November 14, 2024, allowing DEQ to determine the application complete on December 2, 2024.

1.2 PERMIT HISTORY

No permit history exists as this is a proposed facility.

2.0 FACILITY INFORMATION

2.1 LOCATION

The Grass Valley Gardens Residential Subdivision is located northwest of Missoula, along U.S. Highway 10 West, in the "Wye" area. It is situated in the southern half of Section 20, Township 14 North, Range 20 West, with an approximate address of 8700 U.S. Highway 10 W (**Figure 1**).

The subdivision collection system will serve a population of 1,000 of 436 households, seven commercial lots, and 16 common areas. The subdivision is divided into four sub-phases. Most of the commercial development is planned for Phases 1 and 2. Each phase is estimated to take one year, resulting in the build out being completed in the first five years of construction. All wastewater components will be located on-site (**Figure 2)**.

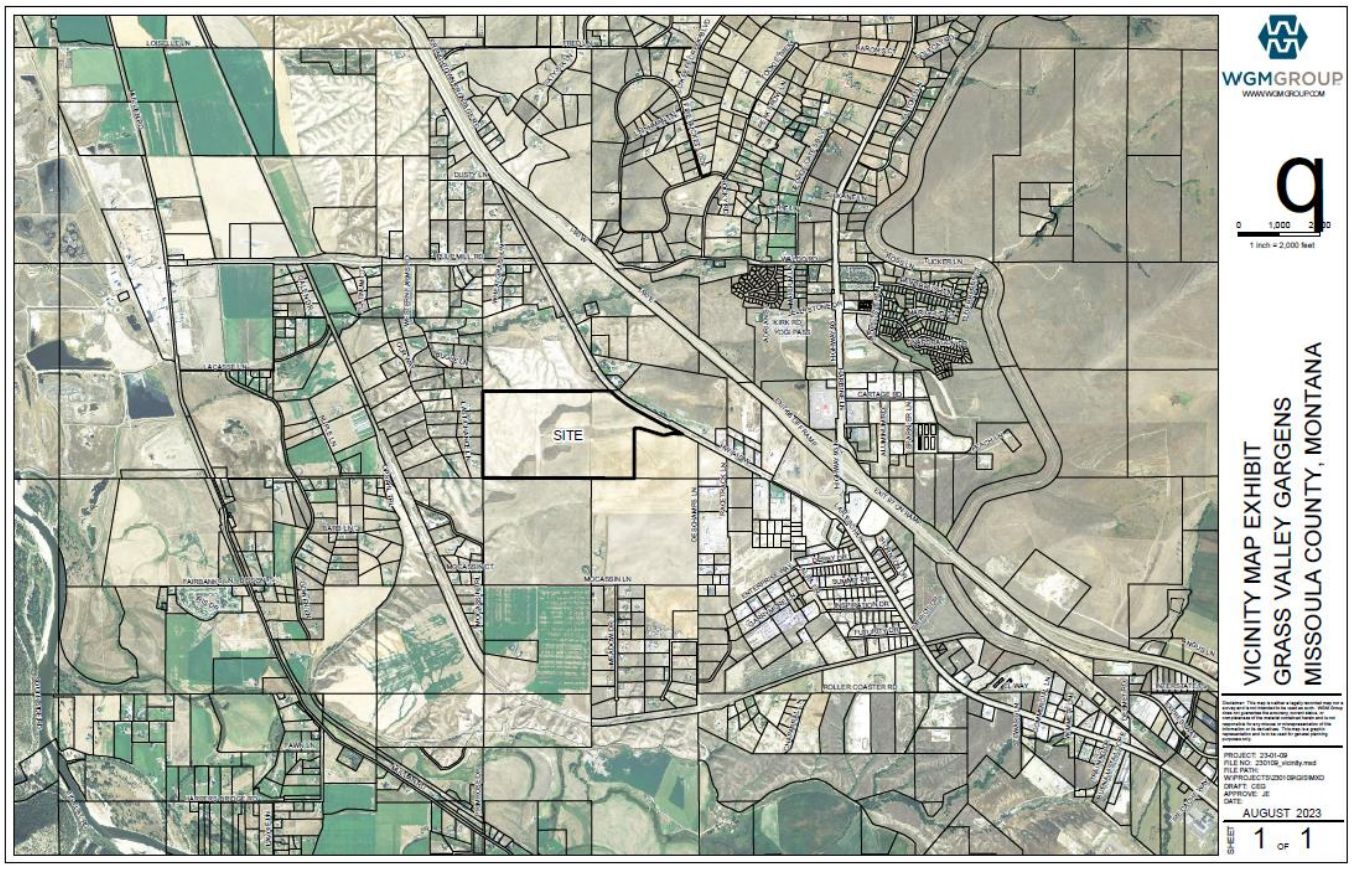

Figure 1. Vicinity Map

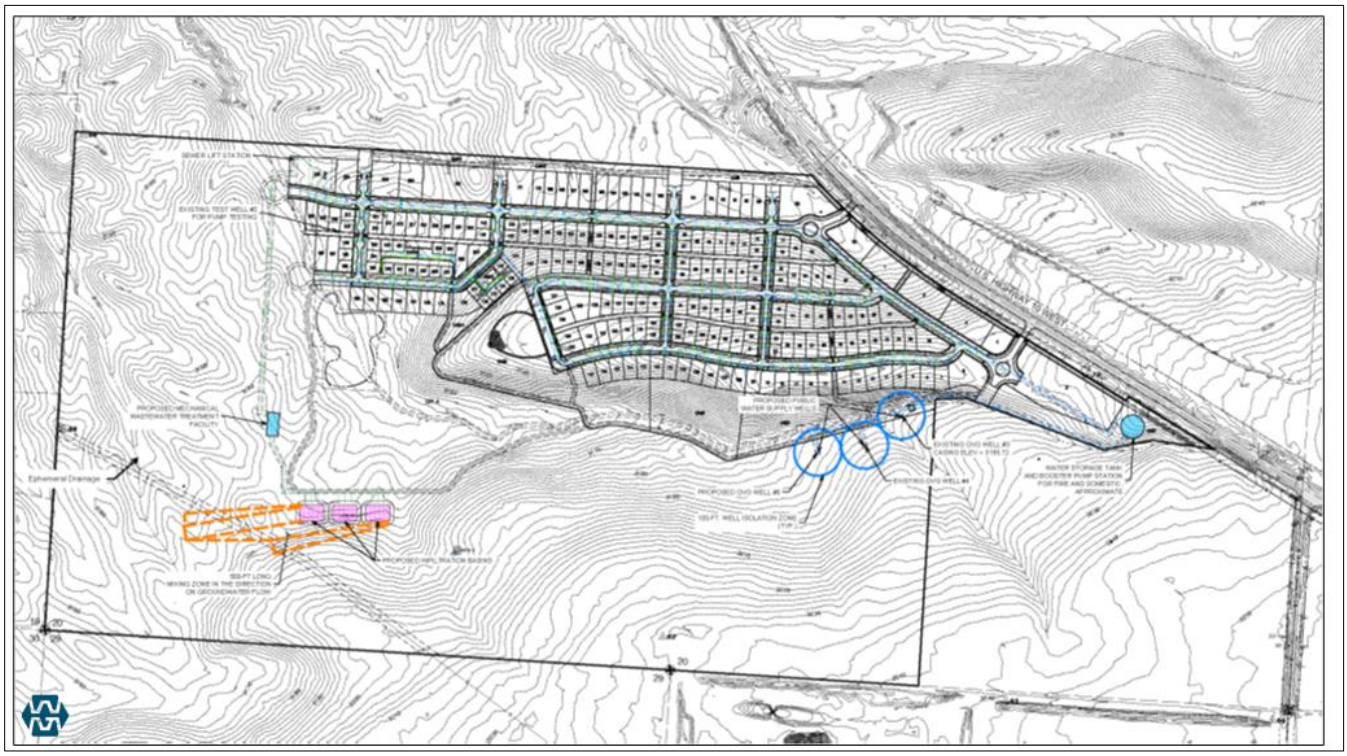

Figure 2. Facility Layout

2.2 OPERATIONS

The Grass Valley Gardens Subdivision is designed to handle up to 180,000 gallons per day (gpd) of domestic wastewater. Wastewater treatment and disposal will be managed through a Membrane Bioreactor (MBR) and a Rapid Infiltration system (RIC). The planned discharge infrastructure includes a lift station that will transport treated effluent to a RIC system located at the southern end of the development. Discharge is located 1,000+ feet upgradient from the adjacent homes and wells to the west (MGWPCS, 2024). System operations are summarized in **Table 1,** see **Figure 2** for a facility layout, a proposed RIC plan is provided as **Figure 3** and a wastewater line diagram as **Figure 4**.

Table 1: Operations Summary	
Collection	
Facility:	Grass Valley Gardens Residential Subdivision
SIC Codes:	1623: Water, Sewer, and Utility Lines and 1522: Residental Construction
Treatment:	Proposed Membrane Bioreactor (MBR)
Location:	46.955904° -114.162644°
Wastewater Sampling/Monitoring	
INF-001:	The influent wastewater sample to be collected from a sample port on equalization tank.
EFF-001:	The effluent wastewater sample to be collected from a sample port on dose tank.
FM-001:	The effluent flow meter sample to be collected.
Sampling plan:	The permittee is required to develop and implement a Wastewater Sampling, Analysis, and Reporting Plan for their community system (**Section 7**).
Disposal Operation	
Method:	Proposed subsurface disposal using rapid inflitration cells (RIC)
Location:	Outfall 001
Outfall 001:	46.951529° -114.160508° 14N 20W 20SW Missoula County
Capacity:	Average design flow 120, 000 GPD Maximum design flow 180, 000 GPD

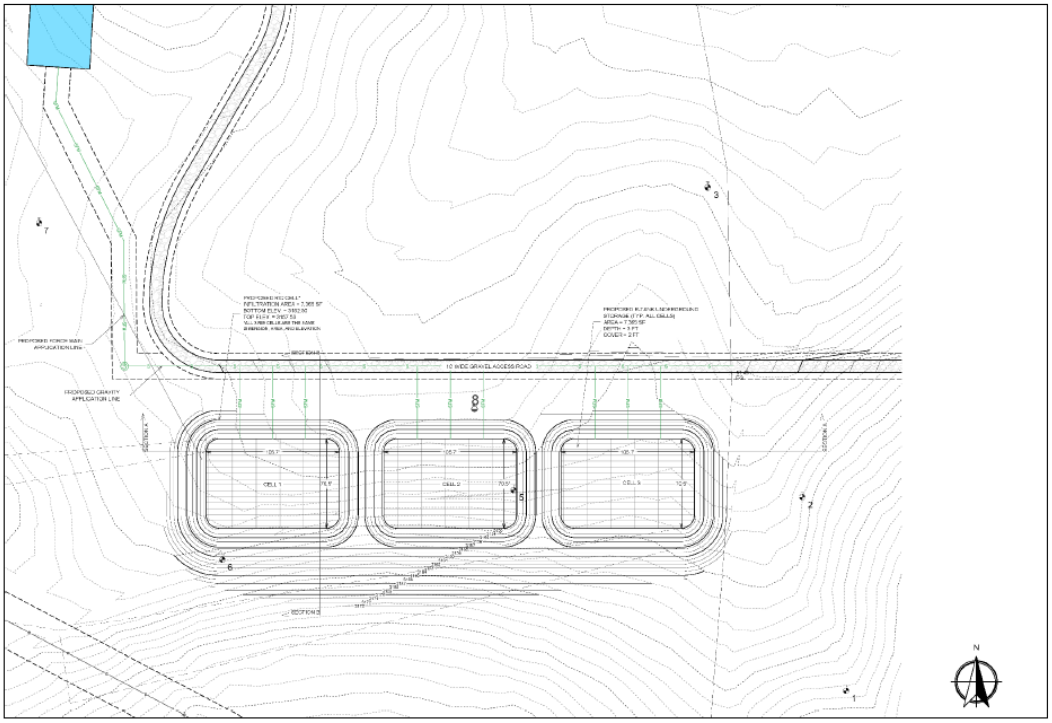

Figure 3. Proposed RIC System Layout

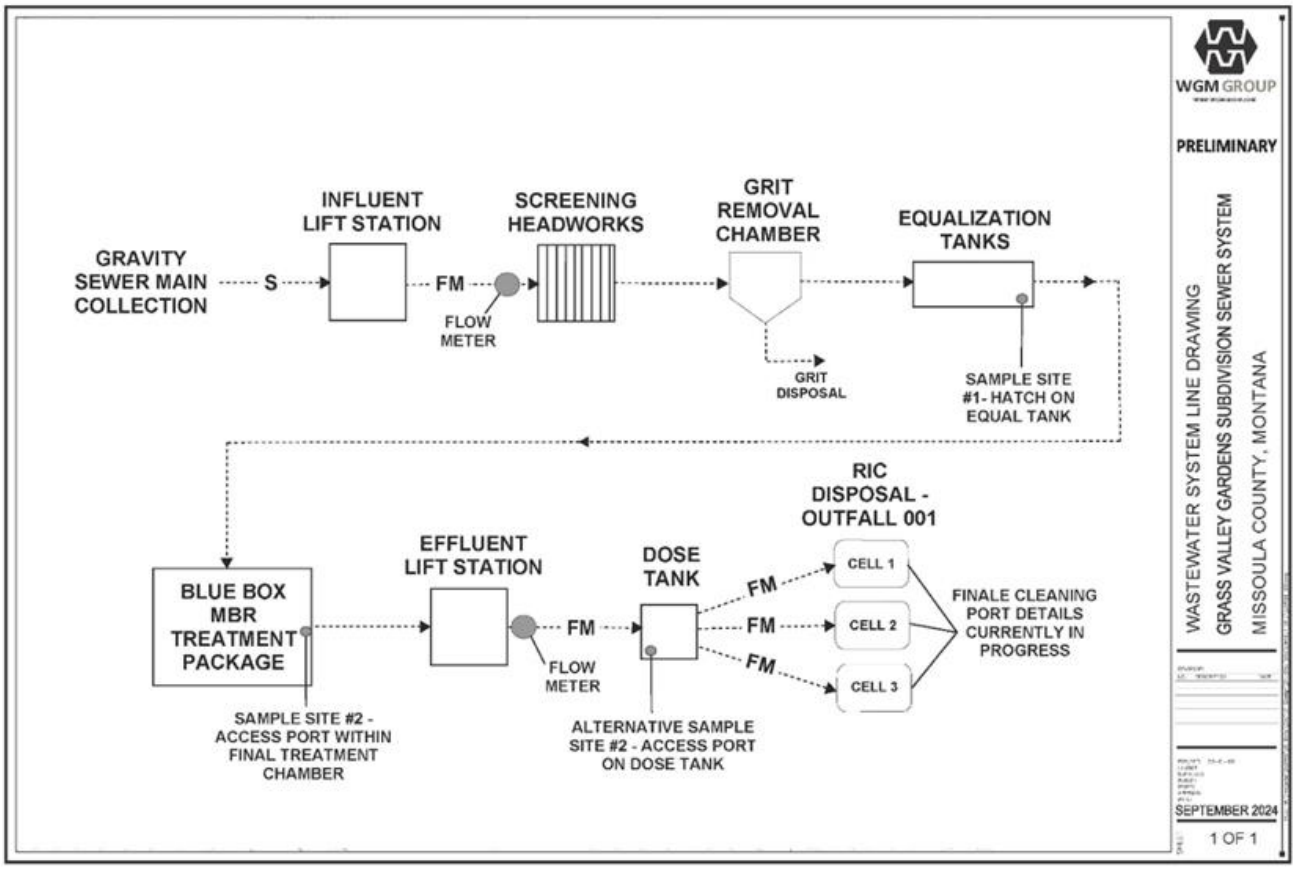

Figure 4. Wastewater Treatment System Line Diagram

2.3 GEOLOGIC CONDITIONS

WGM conducted thirteen test pits across the site, revealing a soil profile of silty clay, silty clay loam, and loamy sand. Clay layers were typically found beneath the topsoil at depths of 18 inches to six feet, with sandy layers extending from below the clay to depths of 10 to 13 feet. No groundwater was detected, and soil borings indicate relatively transmissive subsurface conditions. The disposal area was chosen based on soil properties, prioritizing areas with better infiltration rates while avoiding poorly draining soils. The central site location was found to have more pervious soils than the perimeter (MGWPCS, 2024).

Test pit locations are shown on **Figure 5** and a summary of the wastewater tests is provided in **Appendix A**.

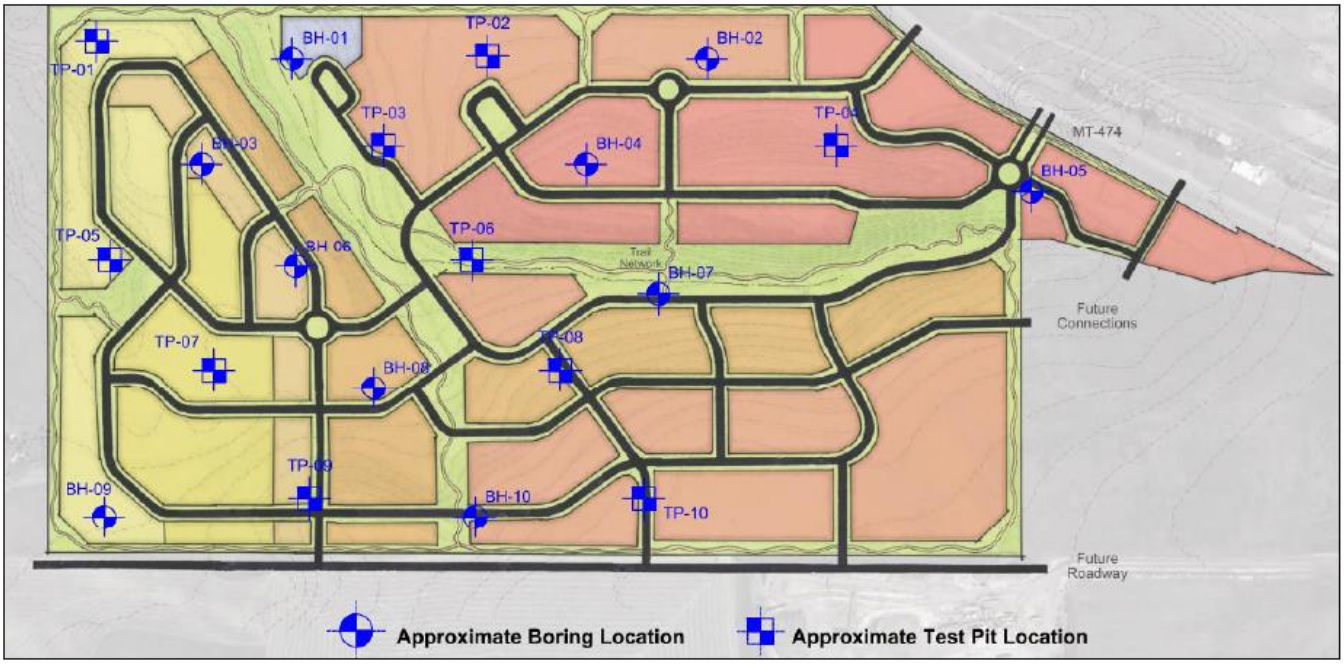

Figure 5. Test Pit Locations

2.4 HYDROGEOLOGIC CONDITIONS

Site specific hydrogeologic data determined ground water flow direction to be S78°W. The nearest potable water wells are located approximately 1,500 feet downgradient of the proposed wastewater infiltration site. The closest surface water feature downgradient is the Clark Fork River, 11,500 ft, with several irrigation ditches, including the Grass Valley French Ditch (0.7 miles away), situated between the disposal site and the river. Based on regional groundwater levels, the ditch is considered a losing feature in this area (MGWPCS, 2024).

The site lies within a semi-confined, shallow to deep basin-fill aquifer, characterized by layers of sand, gravel, and cobbles interspersed with Glacial Lake Missoula clay and silt. The aquifer is recharged primarily by leakage and underflow from O'Keefe Creek, tributaries, and surrounding hills. Classified as an "open" aquifer by the DNRC, it serves over 40,000 homes in the Missoula area and is documented as being productive enough to support the proposed subdivision (MGWPCS, 2024).

Two seperate mounding analyses were conducted by WGM Group, ultizing the Hantush Method to assess the ability of the water to dissipate in the subsurface. It was determined that the mounding potential of the proposed rapid infiltration cells will not interfere with the infiltration capacity of the cells, and will not cause the groundwater to artificially surface.

Hydrogeologic characteristics are summarized below in **Table 2**.

Table 2: Hydrogeologic Summary

Shallowest depth to ground water:	61 ft
Ground water flow direction:	S78°W
Hydraulic conductivity:	50.20 ft/day
Hydraulic gradient:	0.0062 ft/ft

2.5 GROUND WATER MONITORING NETWORK

Five monitoring wells were established as part of the facility's site-specific hydrogeologic investigation. Well information is provided in **Table 3.** A map of the wells is included above as **Figure 6.** Well lithology and construction reports are provided in **Appendix B.**

Table 3: Monitoring Well Summary
GVG#1
MBMG GWIC #: 326745 Use: Data collection for on-site deep aquifer characteristics Permit Status: Active. Constructed on March 23, 2023 Location: T14N, R20W, Section 20 Latitude: 46.95221° Longitude: -114.14864° Total depth 418 feet. Static water level 152 feet. The well represents the deeper aquifer underlying the facility.
GVG#2
MBMG GWIC #: 328213 Use: Well had perforations set at elevations where the shallowest depth of water was discovered for data collection on shallow groundwater characteristics. Permit Status: Active. Constructed on September 7, 2023 Location: T16N, R15W, Section 20 Latitude: 46.952213° Longitude: -114.16453° Total depth 280 feet. Static water level 61 feet. The well was utilized to calculate groundwater direction, gradient and hydraulic conductivity.
GVG#3
MBMG GWIC #: 330384 Use: Data collection for on-site deep aquifer characteristics Permit Status: Active. Constructed on January 23, 2024 Location: T14N, R20W, Section 20 Latitude: 46.953556 Longitude: -114.152306 Total depth 400 feet. Static water level 106 feet. The well represents the deeper aquifer underlying the facility.
GVG#4
MBMG GWIC #: 332088 Use: Data collection for on-site deep aquifer characteristics Permit Status: Active. Constructed on July 12, 2024 Location: T14N, R20W Section 20 Latitude: 46.953306° Longitude: -114.153111° Total depth 340 feet. Static water level 104 feet. The well represents the deeper aquifer underlying the facility.
MW-1
MBMG GWIC #: 333352 Use: Well had perforations set at elevations where the shallowest depth of water was discovered for data collection on shallow groundwater characteristics. Permit Status: Active. Constructed on April 17, 2024 Location: T14N, R20W, Section 20 Latitude: N 46° 57' 6' Longitude: W 114° 9' 36' Representation: Well is side gradient of the RIC disposal, Outfall 001. The well was utilized to calculate groundwater direction, gradient and hydraulic conductivity. Water samples collected will be representative of ambient quality of the shallow aquifer specifically for this permit.

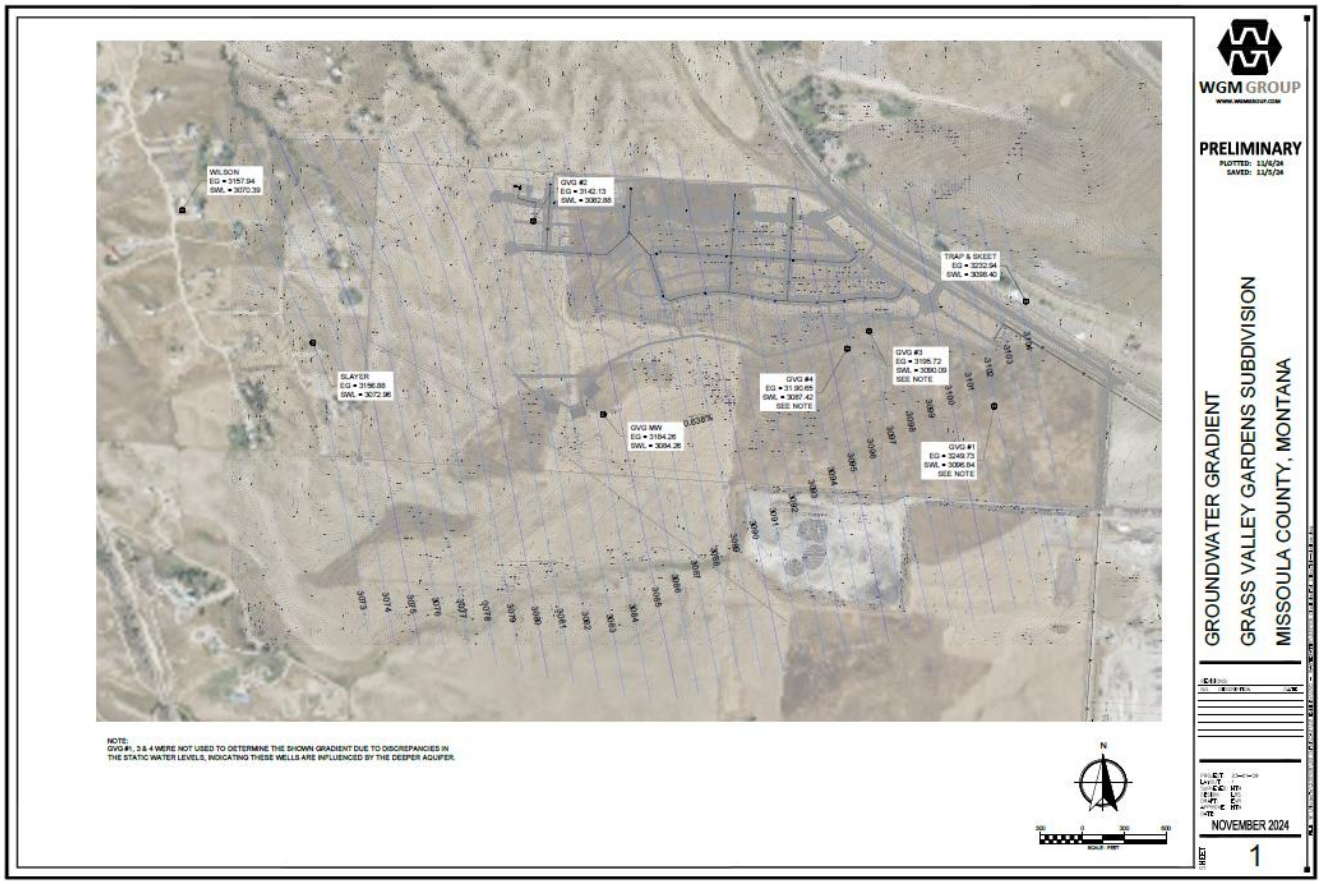

Figure 6. Monitoring Well Map

2.6 WATER QUALITY INFORMATION

The Applicant has proposed an advanced wastewater treatment system that can remove approximately 90% of the raw wastewater nitrogen load. A summary of the estimated influent and effluent characteristics is provided in **Table 4.**

Table 4: Estimated Influent and Effluent Quality – Outfall 001

Parameter[(1)]	Units	Influent Limits	Effluent Limits	Source of Data
Biochemical Oxygen Demand (BOD_5)	mg/L	350	<10	APP
TSS	mg/L	350	<10	APP
Nitrogen, Total Kjeldahl (as N)	mg/L	60	<2.5	APP
Nitrogen, Total Ammonia (as N)	mg/L	43.0	<1	APP
Nitrogen, Nitrate + Nitrite (as N)	mg/L		<2.5	APP
Nitrogen, Total [as N]	mg/L	60	<5	APP
Oil & Grease	mg/L	<10	<6	APP
pH Maximum	s.u.		9	APP
pH Minimum	s.u.		6	APP
Phosphorus, Total (as P)	mg/L	<2	<2	APP
Total Dissolved Solids (TDS)	mg/L	29.0	20.0	APP
Max Wastewater Temperature	°C	25		APP

Footnotes:
APP = MGWPCS Application and supplemental materials from applicant
CFU = Colony Forming Unit
s.u. = standard units
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics

Ambient ground water quality characteristics of the shallow aquifer were collected from MW-1 on April 18, 2024, June 12, 2024, and July 9, 2024. A summary of the ground water quality is provided in **Table 5**.

Table 5: Ground Water Monitoring Results

Monitor Source[(1)]	Parameter	Units	Reported Minimum Value	Reported Maximum Value	Reported Average Value
MW-1	Chloride (Cl)	mg/L	6	7	6
	Escherichia coli Bacteria	CFU/100 ml	0	0	0
	Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.56	3.47	2.38
	Nitrogen, Total Kjeldahl (as N)	mg/L	0.00	0.70	0.23
	pH	s.u.	7.50	8.00	7.73
	Specific Conductivity (@ 25°C)	µS/cm	286	309	300
	Total Organic Carbon (TOC)	mg/L	0.50	1.10	0.77
	Total Dissolved Solids (TDS)	mg/L	161	189	179

Footnotes:
APP = MGWPCS Application and supplemental materials from applicant
bgs = below ground surface
CFU = Colony Forming Units
ND = Not detected at the Reporting Limit of 0.5 mg/L
s.u. = standard units
(1) Refer to Section 2 of the Fact Sheet for the existing or proposed location of the monitoring wells.
(2) Maximum value recorded of all monthly or quarterly reported values.

Based on the 300 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water.

3.0 WATER QUALITY STANDARDS

Part of DEQ's mission is to protect and sustain the quality of state waters. Water quality standards provide the basis for limitations that protect state waters. These include beneficial use maintenance, specific water quality standards, and the Nondegradation policy. DEQ protects all designated uses of state water by basing effluent limitations on the most restrictive water quality standards intended to protect the most sensitive uses.

3.1 BENEFICIAL USES

The receiving state water is Class I ground water which is a high-quality water of the state. The current and future beneficial uses of the aquifer will be protected. The beneficial uses and water quality standards are listed below.

Beneficial uses:

- Public and private water supplies
- Culinary and food processing purposes
- Irrigation
- Drinking water for livestock and wildlife
- Commercial and industrial purposes

Water quality standards are established to protect these beneficial uses. Standards are as follows:

- Ground water human health
- Harmful, detrimental, or injurious activity
- Nondegradation provisions

DEQ protects all designated uses of state water by basing effluent limitations on the most restrictive water quality standards intended to protect the most sensitive uses. The most restrictive standard will be used in formulating limitations (**Section 5**). The corresponding numeric and narrative standards are listed in **Table 6**.

Table 6: Water Quality Standards

Parameter[1]	Units	Ground Water Human Health Standards	Pollutant Category[2]	Nonsignificance Criteria[3]
Bacteria [*Escherichia coli*]	CFU/100 mL	< 1	-	-
Nitrogen, Nitrate + Nitrite [as N]	mg/L	10.0	T	7.5
Nitrogen, Total (TN)[4]	mg/L	10.0	-	7.5
Phosphorus, Total Inorganic			H	Surface water breakthrough time greater than 50 years[5]

Footnotes:
CFU = Colony Forming Unit
These standards establish the allowable changes in ground water quality and are the basis for limiting discharges to ground water.
(1) The list includes identified parameters of interest.
(2) Circular DEQ-7: Carcinogen (C), Harmful (H), and Toxic (T) parameter. Toxic pollutant with a Bioconcentrator (B) factor.
(3) Criteria indicates threshold for a significant activity that may lead to degradation.
(4) DEQ conservatively assumes all forms of nitrogen will convert to nitrates within the aquifer. DEQ recognizes that other nitrogen forms may be harmful to the beneficial uses therefore will use Total Nitrogen for projecting impacts and in formulation of compliance efforts (limitations).
(5) Changes in receiving ground water quality are not significant if water quality protection practices approved by the DEQ have been fully implemented and if the listed nonsignificance criteria is met.

3.2 NONDEGRADATION

Montana's Nondegradation policy is intended to preserve the existing condition of high-quality state waters. Any water whose existing condition is better than the water quality standards must be maintained in that high quality. Nondegradation policy allows discharges to cause only nonsignificant changes in water quality.

Activities that cause a significant change in water quality require an authorization to degrade. An authorization to degrade is not an authorization to pollute; the water quality standard may not be exceeded outside of a department-authorized mixing zone. This activity is not authorized to degrade. **Figure 7** illustrates the relationship between water quality standards, nondegradation, and nonsignificant changes in water quality.

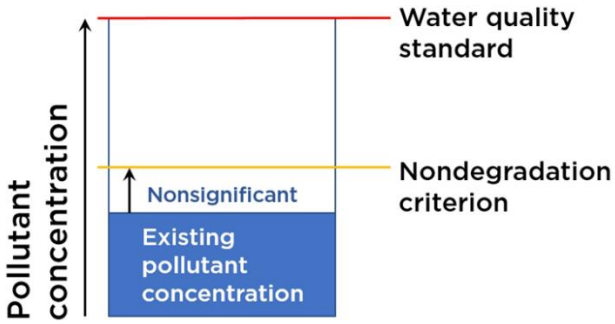

Figure 7. Pollutant Loading Effects on Nondegradation and Nonsignificance

The 2025 Significance Determination Analysis found that the discharge from the proposed facility was not a significant activity (**Appendices C and D**) and is summarized in the following sections.

3.3 SIGNIFICANCE CRITERIA AND DETERMINATION

Changes of nitrate as nitrogen in ground water are nonsignificant if the discharge will not cause degradation of surface water and the predicted concentration of nitrate as nitrogen at the boundary of the ground water mixing zone does not exceed 7.5 mg/L. Using the nonsignificance criterion of 7.5 mg/L, DEQ will establish effluent limitations and long-term monitoring requirements for compliance at the end of the mixing zone (**Section 5.0**).

In addition to WGM, DEQ also performed a significance determination in predicting nitrate values downgradient of the proposed discharge structure. The new wastewater system design along with on-site ground water characteristics (**Section 2**) and dilution estimates (**Section 4**) were used in these projections.

Due to a high volume of ground water and a decrease in the proposed nitrogen loading discharge; it is predicted that nitrates in the receiving aquifer will be 4.81 mg/L after dilution with the underlying mixing zone. This is less than the nitrate nonsignificance criteria of 7.5 mg/L and is therefore nonsignificant.

For phosphorus, a surface water breakthrough time of greater than 50 years is a nonsignificant change in water quality. The phosphorus criterion requires an analysis to determine a breakthrough time based on the adsorption capacity of the soil. Breakthrough occurs when the subsurface soils lose their capability to adsorb any more phosphorus, and it has a potential to reach surface water. DEQ's phosphorus breakthrough analysis estimates that phosphorus discharged to ground water from Outfall 001 may reach surface water in 197 years. This is assuming a distance to surface water of 11,500 ft, which, as discussed in **Section 2**, is a conservative estimate; the effluent flow path is likely much longer. The predicted phosphorus breakthrough is greater than 50 years, and therefore is not considered to be significant and phosphorus permit limits are not required.

These analyses show that the discharge activity is not significant, and the discharge permit requires that the permittee complies with these established limitations on a long-term basis.

3.4 CUMULATIVE EFFECTS

The proposed project is designed to treat the nitrogen in the wastewater to 5mg/L prior to discharge. DEQ performed a projection of nitrate levels at the end of the mixing zone. Upon dilution, nitrate concentration is reduced to 4.81 mg/L which is less than the nitrate nonsignificance criteria of 7.5 mg/L (**Table 7**). This maintains assimilative capacity for potential future development elsewhere while still protecting the aquifer's beneficial uses. This projection does not take nitrate attenuation into account; while the effluent travels in the subsurface, nitrate naturally decays from biogeochemical processes that occur in the aquifer. These projections are conservative because nitrogen attenuation is likely to take place in the vadose, phreatic, and hyporheic zones.

DEQ considered the direct, secondary, and cumulative environmental impacts of the construction and operation of the facility and found no significant adverse effects on water quality, the human environment, and the physical environment. The DEQ analysis included the cumulative impact from other past and present actions.

All major discharge permitting actions, including the current action and any future actions, will include any substantive information derived from public input relating to potential impacts on the human environment and on water quality. All future actions related to this current action will be addressed by DEQ through additional discharge permitting process procedures. Any actions that are outside the prevue of the discharge permit may not be addressed by DEQ until the next permitting action takes place.

To protect beneficial uses, there shall be no increase of a pollutant to a level that renders the waters harmful, detrimental, or injurious. Therefore, no wastewaters may be discharged such that the wastewater either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard.

The allowable discharge will be derived from a mass-balance equation that determines the assimilative capacity of the receiving aquifer **(Section 5)**. This factors into the cumulative impacts of all existing upgradient discharges in the receiving aquifer.

A ground water monitoring network has been established that will provide for long-term monitoring of the aquifer. The ground water data collected will provide continual monitoring of the health of the aquifer including the impacts of any upgradient dischargers. This data is made available to the public for their viewing and will be used by DEQ to update future permit limitations. In addition, any update to limitations, including cumulative effect analyses, will be noticed to the public and will undergo public comment.

Long-term monitoring and reporting, continual analysis and updates of permit conditions, and public notice and comment procedures is a benefit to having a system that is covered under a discharge permit.

4.0 MIXING ZONE

A mixing zone is an area of the receiving shallow ground water where the aquifer can assimilate wastewater pollutants. It is a specifically defined area of the receiving aquifer where water quality standards may be exceeded. The availability of dilution is based on the site-specific aquifer characteristics and the drainfield dimensions. The allowable level of dilution is limited by the permit to ensure that water quality standards are met at the end of the mixing zone.

The applicant requested a standard mixing zone for this combined discharge. A standard mixing zone extends 500 feet downgradient from the source. The upgradient boundary is equal to the width of the source (measured perpendicular to the ground water flow direction). The mixing zone widens in the downgradient direction by 5° on either side. The width of the downgradient boundary is calculated by adding the increased width for each side (the tangent of 5° (0.0875) times the mixing zone length) to the width of the upgradient boundary (**Figure 8**). Standard mixing zones extend 15 feet below the top contact of the ground water table. A map of the proposed mixing zone is provided in **Figure 9**.

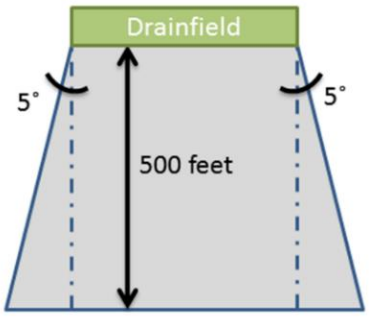

Figure 8: Mixing Zone Schematic

Figure 9. Proposed Mixing Zone

Information below provides details on how DEQ calculates the available dilution of the receiving aquifer. A summary is provided in **Table 7.**

Based on the dimensions of the mixing zone, and the hydrogeologic characteristics (**Section 2.5**), the volume of ground water (Q_{gw}) available to mix with the wastewater is calculated using Darcy's Equation:
$Q_{gw} = KIA$

Where Q_{gw} = ground water flow volume (ft^3/day); K = hydraulic conductivity (ft/day); I = hydraulic gradient (ft/ft); and A = cross-sectional area (ft^2) of flow at the downgradient boundary of the mixing zone.

Modern drainfield systems are designed to minimize the likelihood of the subsurface transport of pathogenic bacteria. Pathogens are a direct existential threat to public and environmental health. In general, DEQ recognizes that replacement of older drainfields with a newly designed one may have environmental benefits.

Table 7: Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	2.38
Ground Water Flow Direction	azimuth/bearing	S 78° W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	174
Width of Mixing Zone at Down Gradient Boundary	feet	261.5
Cross Sectional Area of Mixing Zone (A)	ft^2	3922.5
Hydraulic Conductivity (K)	feet/day	50
Hydraulic Gradient (I)	ft/ft	0.0062
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	1,221

5.0 LIMITATIONS

Discharge permits include conditions that ensure compliance with the Montana Water Quality Act and the regulations used to implement it. These conditions include effluent limits as well as any special conditions that DEQ deems necessary to protect the quality of the receiving water.

5.1 NITROGEN

To protect beneficial uses, there shall be no increase of a pollutant to a level that renders the waters harmful, detrimental, or injurious. Therefore, no wastewaters may be discharged such that the wastewater either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ will establish an effluent limitation for nitrogen within this permit. The limit will conservatively be based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate.

The allowable discharge will be derived from a mass-balance equation which is a simple steady-state model that determines the assimilative capacity of the receiving aquifer. The equation factors in cumulative impacts of existing upgradient discharges in the receiving aquifer and any available dilution within the mixing zone. The mass-balance equation derived for ground water is as follows:

$$Q_{gw}C_{gw} + Q_{eff}C_{eff} = Q_{comb}C_{proj}$$

Where Q_{gw} = ground water available for mixing; C_{gw} = ambient receiving ground water concentration; Q_{eff} = design capacity of wastewater system; C_{eff} = effluent pollutant concentration; Q_{comb} = combined ground water and effluent volume; and, C_{proj} = projected pollutant concentration (after available dilution).

The mass-balance equation has been arranged to calculate the maximum amount of nitrogen that can be added to the aquifer without causing or contributing to an exceedance of the water quality standard:

$$C_{limit} = C_{std} + \frac{Q_{gw}}{Q_{eff}}\left(C_{std} - C_{gw}\right)$$

Where C_{limit} = concentration-based effluent limit; C_{std} = water quality standard concentration of 7.5 mg/L; Q_{gw} = ground water available for mixing of 1,221 ft^3/d; Q_{eff} = design capacity of wastewater system of 16,042 ft^3/d; and, C_{gw} = ambient receiving ground water concentration of 2.38 mg/L. The resulting C_{limit} is 11.76 mg/L.

Numeric effluent limits are often expressed as loads which inherently regulates both volume and strength of the discharge. The load limit ensures compliance with the ground water standard at the end of the mixing zone.

$$L_{limit} = C_{limit} Q_{eff} f_{con}$$

Where L_{limit} = load-based effluent limit (lb/day); C_{limit} = concentration-based effluent limit (mg/L) of 11.76 mg/L; Q_{eff} = design capacity of wastewater system of 120,000 gpd; and, f_{con} = conversion factor of 8.34×10^{-6}. The resulting concentration and load limits are:

C_{limit} = 11.76 mg/L
L_{limit} = **11.77 lbs/day**

DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing impacts to the receiving water.

5.2 PHOSPHORUS

As discussed in **Section 3.3**, the phosphorus breakthrough analysis estimated the phosphorus breakthrough to occur in 197 years. Predicted phosphorus breakthrough within 50 years is considered significant. Therefore, a limit has not been developed.

5.3 FINAL EFFLUENT LIMITS

The effluent limitations for this permit are summarized in **Table 8**.

Table 8: Effluent Limitations – Outfall 001

Parameter	Units	Monthly Average
Nitrogen, Total [as N]	lbs/day	11.77

Monthly load calculation: The monthly average of all individual daily concentrations and the monthly flow total must be used in the load calculations. Calculation rules are provided within the Wastewater Monitoring Tables.

6.0 MONITORING AND REPORTING

Long-term monitoring and reporting of wastewater and ground water will be established as a condition of the permit. Monitoring of the wastewater characteristics before and after treatment will help ensure operation, maintenance, and compliance with the permit limitations. Wastewater monitoring and reporting requirements are provided in **Table 9**. The permittee must develop and implement a Wastewater Sampling, Analysis, and Reporting Operation Manual. This manual is further discussed in **Section 7**.

Ground water monitoring will provide DEQ with ongoing information on the current and future health of the aquifer. Ground water monitoring and reporting requirements are provided in **Table 10**. The permittee must develop and implement a Ground Water Monitoring, Analysis, and Reporting Operational Manual. This manual is further discussed in **Section 7**.

Reporting must be completed in use of Discharge Monitoring Reports (DMRs). The permittee or operator will file DMRs electronically in use of the online NetDMR program. Information and contacts for this program can be found here: https://deq.mt.gov/water/assistance.

Table 9: Influent and Effluent Monitoring and Reporting Requirements

Analyte/Measurement	Monitor Location	Units	Sample Type(1)	Minimum Sample Frequency	Reporting Requirements(1)(2)	Report Frequency
Biochemical Oxygen Demand, 5 Day (BOD_5)	EFF-001	mg/L	Grab	1/Week*	Monthly Average	Monthly
Flow Rate, Influent and Effluent(3)	FM-001 FM-002	gal/day	Contin-uous	Contin-uous	Monthly Average(4)	Monthly
Nitrogen, Nitrite+Nitrate [as N]	INF-001 EFF-001	mg/L	Grab	1/Week*	Monthly Average	Monthly
Nitrogen, Total Ammonia [as N]	INF-001 EFF-001	mg/L	Grab	1/Week*	Monthly Average	Monthly
Nitrogen, Total Kjeldahl (TKN)[as N]	INF-001 EFF-001	mg/L	Grab	1/Week*	Monthly Average	Monthly
Nitrogen, Total [as N](5)	INF-001 EFF-001	mg/L lbs/day(6)	Calculate Calculate	1/Week* 1/Month	Monthly Average Monthly Average	Monthly Monthly
Phosphorus, Total [as P]	INF-001 EFF-001	mg/L	Grab	1/Week*	Monthly Average	Monthly
Total Suspended Solids (TSS)	EFF-001	mg/L	Grab	1/Week*	Monthly Average	Monthly

Footnotes:
EFF-001: Description provided in Table 1 of the Fact Sheet document.
INF-001: Description provided in Table 1 of the Fact Sheet document.
FM-001: Description provided in Table 1 of the Fact Sheet document.
If no discharge occurs through out the reporting period, "no discharge" shall be recorded on the wastewater Discharge Monitoring Report (DMR) report forms.
Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above or within a deviation authorized by DEQ.
(1) See definitions in Part V of the permit unless defined within this table or by a permit condition.
(2) Monthly Average: The average of all individual daily concentrations (mg/L) analyzed during the reporting period.
(3) Requires recording device and/or totalizing meter. Equipment must be capable of recording daily, quarterly, and annual effluent volumes.
(4) Monthly Average Flows: Determine total flows that occurred during the reporting period. Divide total flow by the number of calendar days in the reporting period to get a unit of daily flow (gal/day).
(5) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.
(6) Load Calculation. Determine concentration (mg/L): Use the average of all individual daily concentrations (mg/L) analyzed during the reporting period. Determine totalized flows: Total flow that occurred during the reporting period. Convert to a daily flow average (gal/day): Divide the total monthly flow by the total calendar days (days) of the reporting period. Calculate load (lbs/day): Concentration (mg/L) x Flows (gal/day) x [8.34×10^{-6}].

Table 10: Ground Water Monitoring and Reporting Requirements

Analyte/Measurement	Monitor Location	Units	Sample Type[1]	Minimum Sampling	Reporting[2] Requirements	Report Frequency
Chloride [as Cl]	MW-1 MW-2	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Nitrite+Nitrate [as N]	MW-1 MW-2	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total Ammonia [as N]	MW-1 MW-2	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)[as N]	MW-1 MW-2	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrogen, Total [as N][3]	MW-1 MW-2	mg/L	Calculate	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1 MW-2	µS/cm	Grab or Instantaneous	1/Quarter	Quarterly Average	Quarterly
Temperature	MW-1 MW-2	°C	Instantaneous	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)[4]	MW-1 MW-2	ft-bmp	Instantaneous	1/Quarter	Quarterly Average	Quarterly
Well Depth[4]	MW-1 MW-2	ft-bmp	Instantaneous	1/Quarter	Quarterly Average	Quarterly

Footnotes:
CFU = Colony Forming Units
ft-bmp = feet below measuring point
A description of each monitoring well can be found in Table 3 of the Fact Sheet document.
At no time shall the permittee mark or state "no discharge" on any monitoring well DMR form.
Each monitor well to be individually monitored and sampled for the analyte and measurements respectively listed.

If any monitoring well(s) are abandoned, destroyed or decommissioned, or are no longer able to be sampled due to fluctuations in the ground water table; the permittee shall install a new well to replace the abandoned, destroyed, decommissioned, or non-viable well(s).

Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.
Samples must not be collected until after the well casing is properly purged as determined by the DEQ approved Ground Water Monitoring Operational Manual.

Submittal of discharge monitoring report forms (DMRs) will be required, regardless of the operational status of the facility or of each individual monitoring well.

(1) See definitions in Part V of the permit unless defined within this table or by a permit condition.

(2) Quarterly Average: The average of all individual daily concentrations (mg/L) analyzed during the quarterly reporting period.

(3) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.

(4) Measuring point (point of reference) for SWL measurements shall be from top of inner casing or as established by the Operational Manual and measured to within 1/100th of one foot.

7.0 SPECIAL CONDITIONS

7.1 MONITORING WELL INSTALLATION PLAN

Submit for approval an installation plan for Monitoring Well MW-2. MW-2 will be built on or near the downgradient boundary of the proposed mixing zone. The well must be constructed to be representative of ground water occurring in the top twenty (20) feet of the shallow aquifer or as otherwise approved.

The plan needs to be approved prior to installation of the monitoring well(s). All monitoring wells must be secured, maintained, labeled, and monitored for long-term viability. In any permit renewal, DEQ will consider concentrations from the previous permit cycle to determine appropriate sampling requirements and necessary modifications to the monitoring plan. The completion and submittal date of the plan is listed in **Section 8**.

The installation date for Monitoring Well MW-2 is also provided in **Section 8**. A post construction report documenting lithology, drilling and construction techniques, well construction information and diagram, surveyed spatial location and measuring point is due two months after installation. All new wells must be reported to the Montana Bureau of Mining and Geology's Ground Water Information Center.

Installation and post construction reports are required for all subsequent well installation and modification actions.

DEQ recognizes the challenges faced with well installation efforts in the field. Upon approval, modification to the plan can be made when challenging field conditions occur.

7.2 WASTEWATER SAMPLING, ANALYSIS, AND REPORTING OPERATION MANUAL

The permittee shall use BMPs in developing SOPs for sampling, analyzing, and reporting wastewater characteristics from the wastewater system. The manual needs to be site-specific and result in monitoring and reporting that is representative of the nature of the wastewater streams. The manual must be used as a guide in:

- Equipment calibration.
- Preparing and collecting wastewater influent (INF-001) and effluent (EFF-001) wastewater samples.
- Analyte calculations (**Table 9**).
- Recording and reporting wastewater characteristics.
- Recording and reporting wastewater flows.

The completion and submittal date for the manual is listed in **Section 7.** The manual must be reviewed and approved by DEQ prior to implementation. The permittee shall maintain a copy of the operational manual, sampling, and calibration records at the facility at all times. Wastewater monitoring requirements are discussed in **Section 6**. All subsequent amended manuals must be reported to DEQ within 30 calendar days.

7.3 GROUND WATER MONITORING, ANALYSIS, AND REPORTING OPERATIONAL MANUAL

The permittee shall use Best Management Practices (BMPs) in developing SOPs (Standard Operating Procedures) for sampling, analyzing, and reporting ground water characteristics. The SOP manual must be site-specific and result in monitoring and reporting that is representative of the nature of the shallow ground water bearing zone. The manual must provide for consistent identification, development, monitoring, sampling, calculating, recording, and reporting of the monitoring wells. The manual must provide for guidance on determining and documenting dry-well occurrences; and determining future well viability. DEQ recommends using the Montana Bureau of Mines and Geology Open-File Report 746 titled Standard Procedures and Guidelines for Field Activities (MBMG, 2022) as a reference in developing a site-specific operational manual.

The completion and submittal date of the manual is listed in **Section 8**. The manual must be reviewed and approved by DEQ prior to implementation. The permittee shall maintain a copy of the manual, monitoring well development records, dry well occurrence records, sampling records, and calibration records at the facility always. Ground water monitoring requirements are discussed in **Section 6**. All subsequent amended manuals must be reported to DEQ within 30 calendar days.

7.4 MONITORING WELL VIABILITY

The permittee shall monitor and collect representative ground water samples from the receiving ground water aquifer. If any of the wells are abandoned, destroyed, decommissioned, or non-viable; or are no longer able to be

monitored due to obstructions or fluctuations in the ground water table; the permittee shall rehab the non-viable well or replace with the installation of a new well.

7.5 Monitoring Well Replacement, Rehabilitation, and Abandonment

If for any reason a monitoring well needs to be replaced, rehabilitated, or abandoned, the permittee shall submit a plan to DEQ for approval prior to the action taking place. The plan must document existing site-specifics and the reasoning behind the proposed action. The plan must detail the specific steps to take place during deconstruction, drilling, workover, and/or construction of the respective wells.

Written permission from DEQ is needed prior to the abandonment of any monitoring well. At minimum, monitoring well abandonment activities must be done in accordance with ARM 36.21.810(2-5). If the monitoring well is located in or around any collection, storage, treatment, disposal, land application, and/or mixing zone workings (or similar) additional actions may be required to prevent preferential subsurface flows, cross contamination, and to mitigate against any unauthorized wastewater releases. All new well installations must have detailed drilling, lithology, geospatial, and well construction information. A follow-up report summarizing all actions and details must be submitted to DEQ within 30 calendar days.

8.0 COMPLIANCE SCHEDULE

The actions listed in **Table 11** must be completed on or before the respective scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date. Unless otherwise stated, completion of all actions or deliverables must be reported to DEQ in accordance with Part II and Part IV.G of the permit.

Table 11: Compliance Schedule

Action	Frequency	Completion Date of Action	Reporting Due Date
Develop and implement a Wastewater Sampling, Analysis, and Reporting Operation Manual.	Single event	*Within 180 days of the effective date of the permit.*	Due on or before the 28th day of the month following the completion date.
Develop and implement a Ground Water Monitoring, Analysis, and Reporting Operational Manual.	Single event	*Within 180 days of the effective date of the permit.*	Due on or before the 28th day of the month following the completion date.
Complete a **Monitoring Well Installation Plan**.	Single event	*Within 180 days of the effective date of the permit.*	Due on or before the 28th day of the month following the completion date.
Complete the installation of the monitoring well(s).	Single event	*Within one (1) year of the effective date of the permit.*	Due on or before the 28th day of the month following the completion date.
Commence monitoring and reporting of the newly installed monitoring well(s).	Single event	*Within one (1) year of the effective date of the permit.*	Due on or before the 28th day of the month following the completion date.
Complete a **Monitoring Well Installation Report**.	Single event	*Within one (1) year and two (2) months of the effective date of the permit.*	Due on or before the 28th day of the month following the completion date.

PUBLIC NOTICE

Legal notice information for water quality discharge permits is listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on **May 21, 2025**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or to:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice are mailed to the applicant, state and federal agencies, and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: http://deq.mt.gov/Public/notices/wqnotices.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-5546 or email DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number (MTX000331), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

REFERENCES

Administrative Rules of Montana, Title 17, Chapter 30, Water Quality:

Subchapter 2 - Water Quality Permit Fees.

Subchapter 5 – Mixing Zones in Surface and Ground Water.

Subchapter 7 – Nondegradation of Water Quality.

Subchapter 10 – Montana Ground Water Pollution Control System.

Subchapter 13 – Montana Pollutant Discharge Elimination System.

Department of Environmental Quality, Water Quality Circulars:

Circular DEQ-2 – Design Standards for Wastewater Facilities.

Circular DEQ-4 – Montana Standards for On-Site Subsurface Sewage Treatment Systems.

Circular DEQ-7 – Montana Numeric Water Quality Standards, Required Reporting Values, and Trigger Values.

Department of Environmental Quality, Administrative Record for permit MTX000331

2024 MGWPCS Application and Supporting Materials

Montana Bureau of Mines and Geology, Ground-Water Information Center, GWIC state well database, Online at: http://mbmggwic.mtech.edu.

Montana Code Annotated, Title 75, Chapter 5, *Montana Water Quality Act*, 2011.

WGM Group. 2024. Groundwater Discharge Permit Report: Grass Valley Gardens Subdivision, Missoula County, Montana. WGM Project No. 230109. August 15, 2024.

U.S. Environmental Protection Agency, 2010. NPDES Permit Writers' Manual, 833-K-10-001.

APPENDIX A – WASTEWATER TEST PIT SUMMARY BY WGM

TEST PIT	DEPTH (FT)	TEXTURE SUMMARY OF SOIL CONDITIONS	STANDARD APPLICATION RATE (GPD/FT2)
TP-1	11.0	0 – 1.0 Silt Loam 1.0– 4.6 Silt Loam 4.6 - 11.0 Loamy Sand	0.4 0.4 0.8
TP-2	11.0	0 – 0.5 Silt Loam 0.5 – 3.0 Loamy Sand 3.0 – 6.0 Silty Clay Loam 6.0 – 11.0 Sand	0.4 0.8 0.3 0.8
TP-3	14.0	0 – 1.0 Silt Loam 1.0– 4.5 Silty Clay Loam 4.5 – 14.0 Loamy Sand	0.4 0.3 0.8
TP-4	10.0	0 – 0.75 Silt Loam 0.75 – 10.0 Clay	0.4 0.15
TP-5	10.0	0 – 0.75 Silt Loam 0.75 – 10.0 Sand	0.4 0.6
TP-6	12.0	0 – 0.5 Silt Loam 0.5 – 5.0 Loamy Sand 5.0 – 5.7 Clay 5.7 – 12.0 Loamy Sand	0.4 0.8 0.15 0.8
TP-7	10.0	0 – 0.5 Silt Loam 0.5 – 10.0 Silty Clay	0.4 0.15
TP-8	13.0	0 – 0.66 Silt Loam 0.66 – 3.0 Sandy Clay Loam 3.0 – 13.0 Loamy Sand	0.4 0.4 0.8
TP-9	11.0	0 – 0.33 Silt Loam 0.33 – 11.0 Sandy Loam	0.4 0.6
TP-10	12.0	48”- Sandy Clay Loam 70”- Sandy Clay Loam Unknown- Sandy Loam	0.4 0.4 0.6
TP-11	12.0	0 – 1.0 Silt Loam 1.0– 2.75 Silty Clay Loam 2.75 – 6.5 Sandy Clay Loam 6.5 – 12 Sandy Clay Loam	0.4 0.3 0.4 0.4
TP-12	12.0	0 – 1.0 Silt Loam 1.0– 2.7 Silty Clay Loam 2.7 – 6.3 Clay Loam 6.3 – 12 Sandy Loam	0.4 0.3 0.3 0.6
TP-13	12.0	0 – 1.3 Silt Loam 1.3 – 2.25 Clay Loam 2.25 – 7.3 Clay 7.3 – 9 Sandy Clay Loam 9 – 12 Sandy Clay Loam	0.4 0.3 0.15 0.4 0.4

APPENDIX B – WELL LOGS

GVG #1

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (6/20/2023 8:48:08 AM)

Site Name: GRUTSCH, GEORGE
GWIC Id: 326745

Section 1: Well Owner(s)
1) GRUTSCH, GEORGE (MAIL)
6455 S MEADOWWOOD LANE
MISSOULA MT 59803 [03/23/2023]
2) GRUTSCH, GEORGE (WELL)
8263 DESCHAMPS LANE
MISSOULA MT 59803 [03/23/2023]

Section 2: Location

Township	Range	Section	Quarter Sections
14N	20W	20	SE¼ SE¼

County	Geocode
MISSOULA	04-2325-20-2-02-07-0000

Latitude	Longitude	Geomethod	Datum
46.95221255565	-114.148641142	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
TEST WELL (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, March 23, 2023

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	418	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	418	6			WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
227	371	6	864	1 1/4 X 1/4	HOLTE PERFORATOR SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	80	BENTONITE SURFACE SEAL	Y

Section 7: Well Test Data

Total Depth: 418
Static Water Level: 152
Water Temperature:

NOTE: NOT USED FOR SHALLOW AQUIFER ANALYSIS - PERFORATIONS ONLY IN DEEPER AQUIFER

Air Test *

140 gpm with drill stem set at 380 feet for 6 hours.
Time of recovery 0.25 hours.
Recovery water level 152 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	1	SOIL
1	10	BROWN CLAY, SOME GRAVEL
10	20	MOIST BROWN CLAY
20	150	HARD GRAY AND BROWN CLAY TIGHTLY PACKED SILT SAND, GRAVEL AND COBBLE LAYERS
150	223	MOIST ORANGE SILTY GRAVEL WITH SOME SEEPAGE, TIGHTLY PACKED DRY LAYERS, MOIST BROWN AND GRAY CLAY LAYERS
223	371	SAND AND GRAVEL WITH WATER, SILTY VERY SANDY AND CLAY BOUND LAYERS
371	400	GRAY SAND, GREEN AND PURPLE GRAVEL WITH WATER CEMENTED LAYERS
400	420	TIGHTLY PACKED FINE GRAY SAND AND MULTI COLORED ROCK AND GRAVEL COAL SEAMS

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: DANIELLE NORCROSS
Company: CAMP WELL DRILLING AND PUMP SERVICE
License No: WWC-795
Date Completed: 3/23/2023

APPENDIX B – WELL LOGS

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: CUMMINGS, ROBERT AND LINDA
GWIC Id: 328213

Section 1: Well Owner(s)
1) CUMMINGS, ROBERT AND LINDA (MAIL)
2029 US HWY 10 WEST
MISSOULA MT 59808 [09/07/2023]
2) CUMMINGS, ROBERT AND LINDA (WELL)
2029 US HWY 10 WEST
MISSOULA MT 59808 [09/07/2023]

Section 2: Location

Township	Range	Section	Quarter Sections
14N	20W	20	SW¼ SW¼

County: MISSOULA
Geocode:

Latitude	Longitude	Geomethod	Datum
46.952213	-114.16453	TRS-SEC	NAD83

Ground Surface Altitude: Ground Surface Method: Datum: Date:

Addition: Block: Lot:

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, September 7, 2023

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	280	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	280	6	0.25		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
91	99	6		1" X 1/4"	SAW SLOTS
119	125	6		1" X 1/4"	SAW SLOTS
130	138	6		1" X 1/4"	SAW SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	0	BENTONITE	Y

Section 7: Well Test Data

Total Depth: 280
Static Water Level: 61
Water Temperature:

Air Test *

80 gpm with drill stem set at 280 feet for 2 hours.
Time of recovery 0.15 hours.
Recovery water level 61 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	2	SOIL
2	61	BROWN CLAY
61	91	YELLOW CLAY, GRAVEL
91	164	GRAVEL, CLAY W/WATER
164	179	GRAVEL, SAND W/WATER
179	191	GRAVEL, YELLOW CLAY
191	227	GRAY CLAY, GRAVEL W/WATER
227	241	GRAVEL, SAND W/WATER
241	280	GRAY CLAY

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: BRADLEY MCKAY
Company: WESTERN MONTANA DRILLING COMPANY
License No: WWC-754
Date Completed: 9/7/2023

APPENDIX B – WELL LOGS

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report was completed online by the driller. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Site Name: GRASS VALLEY HOLDINGS LLC
GWIC Id: 330384

WELL GVG#3

Section 1: Well Owner(s)
1) **TEST WELL, GRASS VALLEY GARDENS** 8 (MAIL)
2829 GREAT NORTHERN LP SUITE 1
MISSOULA MT 59808

Section 2: Location

Township	Range	Section	Quarter Sections
14N	20W	20	NE¼ SW¼ SE¼

County: MISSOULA — Geocode:

Latitude	Longitude	Geomethod	Datum
46.953556	-114.152306	NAV-GPS	WGS84

Addition: — Block: — Lot:

Section 3: Proposed Use of Water
TEST WELL (1)

Section 4: Type of Work
Drilling Method: DUAL ROTARTY

Section 5: Well Completion Date
Date well completed: Tuesday, January 23, 2024

Section 6: Well Construction Details
Meta Data Fields

1. Was borehole completed as a well? YES
2. Was well abandoned?

Borehole dimensions

From	To	Diameter
0	25	12.8
25	400	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	400	8.6	0.250		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
175	183	8	4 ROWS	1/8" X 1"	HOLTE PERFORATOR SLOTS
188	210	8	4 ROWS	1/8" X 1"	HOLTE PERFORATOR SLOTS
247	250	8	4 ROWS	1/8X1"	HOLTE PERFORATOR SLOTS
265	295	8	4 ROWS	1/8X1"	HOLTE PERFORATOR SLOTS
310	315	8	4 ROWS	1/8X1"	HOLTE PERFORATOR SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	25	3/8" BENTONITE CHIPS	

Section 7: Well Test Data

Total Depth: 400
Static Water Level: 106
Water Temperature:

Air Test *

240 gpm with drill stem set at 320 feet for 8 hours.
Time of recovery _ hours.
Recovery water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
GRASS VALLEY GARDENS

Section 9: Well Log

From	To	Description
0	3	BROWN CLAY
3	15	BROWN CLAY AND GRAVEL
15	60	GRAVEL
60	70	CEMENTED GRAVELS
70	110	TAN SAND AND GRAVEL WITH CLAY
110	135	BROWN CLAY
135	140	BROWN CLAY AND GRAVEL
140	142	SAND SOME WATER
142	150	SAND GRAVEL AND WATER
150	160	BROW CLAY SANDY GRAVEL
160	175	SAND GRAVEL AND WATER
175	183	LARGE SAND GRAVEL AND WATER
183	188	GRAY CLAY
188	200	GRAVEL SOME SAND AND WATER
200	210	GRAVEL

Driller Certification is Missing

This well log is considered to be in DRAFT form. It has not been certified and is not an official copy.

APPENDIX B – WELL LOGS

MONTANA WELL LOG REPORT

This well log reports the activites of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report was completed online by the driller. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Site Name: 8" SCREENED GRASS VALLEY GARDENS WELL 2
GWIC Id: 332088

WELL GVG#4

Section 1: Well Owner(s)
1) 8" SCREENED GRASS VALLEY GARDENS WELL 2 (MAIL)
2829 GREAT NORTHERN LP SUITE 1
MISSOULA MT 59808

Section 2: Location

Township	Range	Section	Quarter Sections
14N	20W	20	NE¼ SW¼ SE¼

County: MISSOULA
Geocode:

Latitude	Longitude	Geomethod	Datum
46.953308	-114.153111	NAV-GPS	WGS84

Addition: Block: Lot:

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: DUAL ROTARTY

Section 5: Well Completion Date
Date well completed: Friday, July 12, 2024

Section 6: Well Construction Details
Meta Data Fields

1. Was borehole completed as a well? YES
2. Was well abandoned?

Borehole dimensions

From	To	Diameter
0	25	12.8
25	340	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	293	8.6	0.250		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
290	295	7.5			SCREEN-TIGHT WIND STAINLESS STEEL
295	300	7.5		90 SLOT	SCREEN-CONTINUOUS-STEEL
300	320	7.5		25 SLOT	SCREEN-CONTINUOUS-STAINLESS
320	325	7.5		50 SLOT	SCREEN-CONTINUOUS-STAINLESS
325	330	7.5			SCREEN-TIGHT WIND STAINLESS STEEL
330	340	7.5		40 SLOT	SCREEN-CONTINUOUS-STAINLESS

Section 7: Well Test Data

Total Depth: 340
Static Water Level: 104
Water Temperature:

Air Test *

_ gpm with drill stem set at _ feet for 20 hours.
Time of recovery _ hours.
Recovery water level _ feet.

Pump Test *

Depth pump set for test 285 feet.
375 gpm pump rate with 117 feet of drawdown after 72 hours of pumping.
Time of recovery 1.6 hours.
Recovery water level 104 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

From	To	Description
0	15	CEMENTED CLAYEY GRAVEL
15	83	CEMENTED GRAVEL
83	90	TAN CLAY AND GRAVEL
90	110	TAN CLAY
110	155	TAN SANDY CLAY AND GRAVEL
155	163	SAND GRAVEL WATER
163	167	TAN CLAY AND GRAVEL
167	177	SAND AND GRAVEL
177	182	SAND GRAVEL AND WATER
182	188	CLAYEY SAND GRAVEL GRAY
188	196	SAND GRAVEL AND WATER
196	204	GRAY CLAYEY GRAVEL
204	208	TAN CLAYEY GRAVEL
208	215	LARGE SAND AND GRAVEL GRAY CLAY
215	229	SAND GRAVEL WATER

Driller Certification is Missing

This well log is considered to be in DRAFT form. It has not been certified and is not an official copy.

APPENDIX B – WELL LOGS

Form No. 603 R2-99 GVG MW

MONTANA WELL LOG REPORT

Well ID # 24-021

This log reports the activities of a licensed Montana well driller and serves as the official record of work done within the borehole and casing and describes the amount of water encountered. **This form is to be completed by the driller and filed with DNRC within 60 days of completion of the work. Acquiring Water Rights is the well owner's responsibility and is not accomplished by the filing of this report.** Well log information is stored in the Groundwater Information Center at the Montana Bureau of Mines and Geology (Butte) and water right information is stored in the Water Rights Bureau records (Helena). For fields that are not applicable, enter NA. ***Optional fields are in italics.*** Record additional information in the REMARKS section.

1. **WELL OWNER:**
   Name Robert & Linda Cummings / Grass Valley Holdings
   Mailing address 9500 Hwy 10 W
   Missoula, MT 59808
2. **WELL LOCATION:** List ¼ from smallest to largest
   ___ ¼ ___ ¼ ___ ¼ SW ¼, Section 20
   Township 14 N Range 20 W County Missoula
   Lot# 2 COS 3917 Subdivision Name
   GPS X Yes No
   Well Address 9029 Highway 10 West U, Missoula MT 59808
   Latitude N 46° 57' 6" Longitude W 114° 9' 36"
   Error as reported by GPS locator (± feet) Elev 3186'
   Horizontal datum X NAD27 ☐ WGS84
3. **PROPOSED USE:** ☐ Domestic ☐ Stock ☐ Irrigation
   ☐ Public water supply X Other:Ground Source Supply Sample /Monitor
4. **TYPE OF WORK:**
   New Well X ☐ Deepen existing well ☐ Abandon existing well
   Method: ☐ Cable X Rotary ☐ Other
5. **WELL CONSTRUCTION DETAILS:**
   Borehole:
   Dia. 6 in. from GL ft. to 138 ft.
   Dia. ___ in. from ___ ft. to ___ ft.
   Dia. ___ in. from ___ ft. to ___ ft.
   Casing:
   Steel: Wall thickness ☐ Threaded X Welded
   Dia. 6 in. from +2 ft. to 138 ft.
   Dia. ___ in. from ___ ft. to ___ ft.
   Plastic: Pressure Rating ___ lbs.☐ Threaded X Click- Certalock
   Dia. ___ in. from ___ ft. to ___ ft.
   Perforations/Slotted Pipe:
   Type of perforator used Holte
   Size of perforations/slots 1-1/4 in. by 1/4 in.
   90 no. of perforations/slots from 108 ft. to 113 ft.
   ___ no. of perforations/slots from ___ ft. to ___ ft.
   Screens: Yes X No
   Material ___
   Dia. ___ Slot size ___ from ___ ft. to ___ ft.
   Dia. ___ Slot size ___ from ___ ft. to ___ ft.
   Gravel Packed: ☐ Yes X No
   Size of gravel ___
   Gravel placed from ___ ft. to ___ ft.
   Packer: Yes X No
   Type ___ Depth(s) ___
   Grout: Material used Bentonite Surface Seal
   Depth from GL ft. to 50 ft. OR X Continuous feed
6. **WELL TEST DATA:**
   A well test is required for all wells. *(See details on well log report cover.)*
   Static water level 99'
   ft. below top of casing or
   ☐ Closed-in artesian pressure ___ psi.
   How was test flow measured:
   bucket/stopwatch, weir, flume, flowmeter, etc ___
   Yellowstone groundwater closure area only - Water Temperature ___ °F
   ☐AQUIFER TEST DATA FORM ATTACHED

Test - 1 hour minimum
Drawdown is the amount water level is lowered below static level.
All depth measurements shall be from the top of the well casing.
Time of recovery is hours/minutes since pumping stopped.

Air test*
1/2 gpm with drill stem set at 113 ft. for 2 hours
Time of recovery 45 min hrs/min. Recovery water level 99 ft.

OR Bailer test*
___ gpm with ___ ft. of drawdown after ___ hours
Time of recovery ___ hrs/min. Recovery water level ___ ft.

OR Pump test*
Depth pump set for test ___ ft.
___ gpm pump rate with ___ in. of drawdown after ___ hrs pumping
Time of recovery ___ min. Recovery water level ___ ft.

OR Flowing Artesian*
___ gpm for ___ hours
Flow controlled by ___

**During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

7. **WELL LOG:**

Depth, Feet		Material: Color/rock and type/descriptor (example: blue/shale/hard, or brown gravel/water, or brown/sand/heaving)
From	To	
0	1	Soil
1	4	Sand, Gravel & Clay
4	17	Sand, Gravel & Cobbles
17	56	Coarse Brown Sand & Gravel
56	76	Tan Clay
76	80	Dark Brown Clay
80	108	Coarse Sand
108	138	Sand & Gravel w/Water

☐ADDITIONAL SHEETS ATTACHED

8. **DATE WELL COMPLETED:** April 17, 2024
9. ***REMARKS:*** ___
   ** GEOCODE: 04-2325-20-2-02-09-0000

10. **DRILLER/CONTRACTOR'S CERTIFICATION:**
    All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.
    Name, firm, or corporation (print) Camp Well Drilling & Pump Service
    Address 10366 Moccasin Lane – Missoula, MT 59808
    Signature ___
    Date: April 17, 2024 License no. 795

MBMG ID # ___

Montana DNRC P.O. BOX 201601 HELENA, MT 59620-1601 444-6610

APPENDIX C – SIGNIFICANCE DETERMINATION AND REASONABLE POTENTIAL ANALYSES

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

Montana Ground Water Pollution Control System

Ground Water Dilution Projection (GWDP) - Nondegradation Significance Analysis

These projections estimate the parameter concentrations in the aquifer downgradient of the subsurface discharge. After dilution with ground water, the projected concentration is compared to the respective significance criteria in determining nonsignificant changes in water quality (ARM 17.30.715).

Site Name:	Grass Valley Gardens Residential Subdivision
Location:	Missoula County
Permit #:	MTX000331
Notes:	Design Capacity = 120,000 gpd; Design flow 16,042 ft³/d
	These calculations are for the following parameter of interest: Nitrate
	These calculations use the most restrictive ground water standard.
	These calculations do not credit potential losses due to chemical transformation.
	These calculations do not credit potential losses due to attenuation.

Projected Concentration Calculation

$$Cr = \frac{(Qd)(Cd) + (Qs)(Cs)}{Qd + Qs}$$

The Activity is Not Significant if Cr < Significance Criteria

GWDP(a) - Ground Water Nitrate Projection at the End of the Mixing Zone.

Qd =	**16042**	ft³/d	Design capacity - effluent flow rate
Cd =	**5.0**	mg/L	Concentration - effluent (treated wastewater)
	500	ft	Length of ground water dilution zone
	15	ft	Thickness of dilution zone
	174	ft	Outfall width, perpendicular to ground water flow direction
	262	ft	Projected width of downgradient dilution zone
	3923	ft²	Cross sectional area of dilution zone (A)
	50	ft/d	Hydraulic conductivity (K)
	0.00620	ft/ft	Hydraulic gradient (I)
Qs(Qgw) =	**1221**	ft³/d	Ground water volume (Qgw)
Cs =	**2.38**	mg/L	Ambient nitrate concentration in ground water
Cr =	**4.81**	mg/L	Projected concentration - end of the mixing zone
Sign. Criteria =	**7.5**	mg/L	Nonsignificance Criteria, ARM 17.30.715
Sign. Activity?	**<7.5**	mg/L	**The activity is not significant**

APPENDIX D – SIGNIFICANCE DETERMINATION AND REASONABLE POTENTIAL ANALYSES

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME:	Grass Valley Gardens Residential Subdivision
COUNTY:	Missoula
Permit #:	MTX000331
NOTES:	Variables used are based on conservative measurements
	Design Capacity = 120,000 gpd; Design flow 16,042 ft³/d

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	174	ft
L	Length of Primary Drainfield's Long Axis	387	ft
W	Width of Primary Drainfield's Short Axis	71	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	15	ft
D	Distance from Drainfield to Surface Water	11500	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils,	0.5	ft
Ne	1.0 ft for fine soils)**		
Sw	Soil Weight (usually constant)	100	lb/ft3
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200	ppm
#I	Design Flow Rate	120000	gpd
CONSTANTS			
Pl	Phosphorous Load per proposed wastewater treatment system	730	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	
EQUATIONS			
Pt	Total Phosphorous Load = (Pl)(#I)	732	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	40925250	lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	678643750	lbs
P1	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	143914	lbs
SOLUTION			
BT	**Breakthrough Time to Surface Water = P / Pt**	197	years