

February 6, 2024

Daniel Stranahan Entelco Corporation PO Box 822 Clark, Colorado 80428

Re: On-Site Wastewater Treatment System Design Clark Store 54173 County Road 129 Routt County, Colorado Western Slope Geotech Project No. 23-1045

Dear Daniel,

Western Slope Geotech, Inc. (WSG) has completed the On-site Wastewater Treatment System (OWTS) design you requested for the Clark Store building located at 54173 County Road 129, Routt County, Colorado. The results of our site and soil evaluations, design calculations, system design drawings and other pertinent information are included with this report.

WSG previously prepared an OWTS Evaluation report (September 12, 2023) that outlined proposed changes to the store operations and an evaluation of the suitability of the system to accommodate potential increased usage. Portions of that evaluation report are used in this design report.

EXISTING AND PROPOSED CONSTRUCTION

Existing and past volume of wastewater from the building and the facilities have apparently been fairly consistent over the past nearly 30 years of operation and generally include two (2) public restrooms and a small restaurant facility providing paper-service breakfast and lunch service. Outdoor pizza and ice cream service also occur at the exterior south side of the building for limited days of the week during the summer season.

Indoor and outdoor seating for guests includes 11 indoor and 14 outdoor seats. The store and building are open for business year-round and services also include a post office and retail alcohol and convenience food store. Restaurant operations have historically operated only during peak building patronage, which is typically from late May through November.

Proposed expanded facility usage would include additional outdoor food and beverage service during May through October and including barbeque/smoked meats and beer and wine sales prepped and served in two outdoor Conex box or custom shed building facilities. Portable outdoor restroom facilities are also planned for the south side exterior area to provide additional wastewater disposal capacity.

Based on WSG's understanding of existing and proposed facility usage, WSG does not believe the wastewater volume directed to the existing OWTS will change significantly with the proposed increase in facility usage. Assuming a peak loading factor of 150 percent of average daily flow, WSG estimates a proposed facility wastewater design volume of 1,988 gpd. Wastewater volume calculations are presented in Appendix A.

WSG understands that potable water for the building is supplied by the same longtime source (Bush Spring & Pipeline Priority No. 15) and we understand the source is generally located several hundred feet east of County Road 129 and slightly south of the Clark Store building. Records provided to Four Points Surveying and Engineering indicate average water usage of between 1,000 to 2,000 gpd, depending on the season.

SITE CONDITIONS

A proposed Clark Store PUD would create a new 5.0-acre parcel that would include the existing Clark Store building, two existing single family residential buildings located to the south of the store, all existing driveway and parking areas, as well as a portion of the existing agricultural land to the west. The existing OWTS Soil Treatment Area (STA) is located within the agricultural area 450 feet southwest of the store building. The proposed new STA would be located in undisturbed land within the proposed new property boundary and approximately 300 feet southwest of the store building. The existing and proposed STA sites generally consist of dry, non-irrigated livestock pasture.

Site topography is relatively flat and appears to slope gently down to the southwest on the order of 2 percent. Existing and proposed site features are shown on Figure 1.

SOIL EVAULATION

At this time, no soil evaluation has been conducted. Based on WSG's knowledge and experience with the existing STA design and review of existing permit information, we

anticipate subsurface conditions at the proposed STA to be fairly consistent and generally consist of a layer of topsoil and organics overlying natural clay and gravel.

WSG anticipates that the gravel will be encountered within 5 feet of the existing ground surface and will generally be sandy, clean, non-plastic, medium dense, fine to coarse grained, moist and brown.

Groundwater is not anticipated to be encountered within the upper 6 feet of soil. However, groundwater levels will vary seasonally and over time based on water levels in the Elk River, weather conditions, site development, irrigation practices and other hydrologic conditions.

<u>Visual and Tactile Soil Evaluation:</u> Based on WSG's experience, WSG recommends the natural sandy gravel material be classified as **Soil Type 0** in accordance with the regulations (Table 10-1). A minimum 3-foot unlined sand filter using a Treatment Level 1 (TL-1) and Long-Term Acceptance Rate (LTAR) of 1.0 gpd/ft² are required by the regulations and has been selected for system design.

OWTS DESIGN ANALYSIS AND RECOMMENDATIONS

Based on WSG's experience with this and other nearby sites, we anticipate that suitable conditions for wastewater disposal will be present within the upper 6 feet of natural gravel. Based on assumed facility usage, site and assumed soil conditions and regulations, WSG recommends the OWTS consist of a septic tank and pressure dosed absorption bed (unlined sand filter) sized using TL-1 treatment levels.

Due to the assumed Soil Type 0 classification for natural gravel, a minimum 3-foot deep unlined sand filter system placed beneath the absorption bed is required to provide effective wastewater filtration and treatment and protect groundwater resources. WSG recommends the absorption bed inlet elevation be placed near existing site grade.

Pertinent system components are summarized below, and associated design calculations are provided in Appendix A. Regulatory, inspection and system component specifications are provided in Appendix B. Pressure dosing system design and operational specifications are provided in Appendix C.

- <u>Septic Tanks</u>: Required minimum capacity 4,000 gallons. Existing two (2) 1,250-gallon concrete tanks in series (2,500-gallons total) to remain; Add one (1) new 1,500-gallon 1-compartment concrete tank with effluent filter downstream of existing tanks to achieve 4,000-gallon capacity. Or install one (1) new 2-compartment 2,000-gallon tank with effluent filter and pumping system.
- <u>Dosing Tank:</u> 400-gallon concrete and effluent pumping system; not required if 3compartment new septic tank is used.
- <u>Effluent Pump</u>: Design Flow = 26.1 gpm; TDH = 30.7 ft.; Recommended Pump System - Orenco (OSI) PFEF 50 Effluent Pump (0.5 hp, 115/230V). Duplex (two) pumps with alternating cycle operation recommended.
- Effluent Pumping System: Duplex (two) pumps recommended. Float activated, ondemand with high water alarm; Recommended dosing volume 100 gallons.
- <u>Automatic Diversion Valve (ADV):</u> Orenco Systems Inc (OSI) Model V6402A with 30-inch min. enclosure.
- Soil Treatment Areas (STA): Two (2) Absorption Beds over Unlined Sand Filter $-83' \times 12'$ plan dimensions each.
- Gravity Sewer Piping: 4-inch solid PVC, gravity discharge, 2% min. grade.

Pressure Transmission Piping: 1.5-inch Sch40 PVC.

Header Piping: 1.5-inch Sch40 PVC.

Distribution Piping: 1.5-inch Sch40 PVC. 1/8" Orifices @ 4' O.C. spacing.

Sand Filter Material: Well graded, washed sand (ACI - C33 specifications).

- <u>Topsoil Cover & Revegetation:</u> Provide all absorption field areas with minimum 12 to 18 inches topsoil cover and revegetation as appropriate.
- <u>Marking and Protection:</u> Septic and dosing tank locations marked with metal T posts. Absorption field fenced off to prevent machinery and livestock damage.

Schematic OWTS site plan, seepage bed plan and typical absorption field cross section and details are shown on Figures 2, 3 and 4, respectively.

OWTS OPERATION AND MAINENANCE

Proper OWTS operation and maintenance is crucial for satisfactory long-term system performance. WSG recommends the following operation and maintenance criteria be observed by the owner/operator.

- 1. Regular inspection and pumping of the septic tank and effluent filter (if applicable) located at the tank outlet should be conducted by a qualified service provider. A recommended frequency of 3 to 5 years is typical for normal usage. More frequent pumping may be required based on higher usage.
- 2. Effluent pumping system operation should be observed at approximate 6-month intervals. If high water alarm sounds or irregular operation is observed, a qualified system maintenance provider should be contacted immediately for servicing.
- 3. Inspection of absorption field area for signs of surfacing effluent should be conducted on a yearly basis.
- 4. The installation of water conserving plumbing fixtures, judicious use of water and minimization of solid waste directed to the OWTS is strongly recommended to extend system life.
- 5. Leaking plumbing fixtures should be repaired immediately. The additional hydraulic loading can permanently damage pumping components and the absorption field.
- 6. Discharge from spas, pools and water treatment systems should not be directed to the OWTS. The chemical and hydraulic loading from these features can permanently damage the absorption field.
- 7. The OWTS process is based on naturally occurring biological processes. Discharge of various harsh chemicals, solvents, excessive oil and grease and nonorganic wastes to the system can damage or limit biological treatment processes, reducing system performance and life. These materials should not be directed to the OWTS.

LIMITATIONS

Site and soil evaluations and design report were conducted and prepared by Harold Schlicht (Colorado P.E. No. 30299). This report and design are based on the evaluations and were completed in accordance with the Routt County On-Site Wastewater Treatment System Regulations (2018) and using currently accepted OWTS design procedures and standard of care for the profession at the time of service.

This report has been prepared for the exclusive use of WSG's client for the specific application indicated. No warranties, express or implied, are made. Changes to the stated proposed construction and usage or addition of wastewater generating features may require changes to the OWTS.

Please be advised that construction or alteration of an OWTS requires a valid permit from the Routt County Department of Environmental Health ((970) 870-5588).

WSG appreciates the opportunity to be of service to you on this project. If you have any questions concerning the enclosed information or if we can be of further service to you in any way, please do not hesitate to contact us.

Very Truly Yours, Western Slope Geotech, Inc.



Harold Schlicht, P.E. Principal Engineer









APPENDIX A

DESIGN CALCULATIONS & SETBACK REQUIREMENTS

- A. Sewage Volume Calculations
 - 1. Public Toilets: 350 gpd/fixture x 2 fixtures= 700 gpd
 - 2. Restaurant (Paper Service): 25 gpd/seat x 25 seats = 625 gpd
 - 3. Average Daily Flow = 1,325 gpd
 - 4. Peak Factor = 1.5
 - 5. Design Flow = 1,988 gpd

B. . System Sizing

- 1. Septic Tank Sizing: 1,688 gpd x 2 days (detention time) = 3,376-gallons
- 2. Use existing two (2) 1,250 gallon tanks in series. Install one (1) 1,500-

gallon 1-compartment concrete tank downstream of existing tanks.

- 3 Soil Treatment Area (STA) Sizing
 - a. Soil Type: 0
 - b. LTAR: 1.0 gpd/ft² (per Section 11.C.2.a(4)(i)¹)
 - c. STA = Q/LTAR = 1,988/1.0 = 1,988 ft²
 - d. Adjustment Factor Appl. Method (Bed Pressure Dosed) = 1.0
 - e. Adjustment Factor Distribution/Storage Media (Rock) = 1.0
 - f. STA (Adjusted) = $1,988 \text{ ft}^2 \text{ x } 1.0 \text{ x } 1.0 = 1,988 \text{ ft}^2$
 - g. Install two (2) Beds STA (Adjusted) = $1,988 \text{ ft}^2 \ge 0.5 = 944 \text{ ft}^2$
 - h. Bed Sizing (Each): 944 $ft^2/12$ ft = 83 ft; Use two (2) 83' x 12' Beds.
- 2. STA Setback Requirements
 - a. Unlined Irrigation Ditch: 50 ft.
 - b. Piped or Lined Irrigation Ditch: 10 ft.
 - c. Well: 100 ft.
 - d. Potable Water Supply Line: 25 ft.
- 3. Pressure Dosing Requirements
 - a. Dosing Frequency/Volume: 100 gals, on demand.
 - b. Distal Head Pressure: 3-5 feet.

APPENDIX B

SPECIFICATIONS

- A. Installer and owner must comply with all requirements contained in the Routt County On-Site Wastewater Treatment System Regulations (2018).
- B. OWTS components shall be installed at the approximate locations, depths and grades as indicated on the plans. Variations from the plans may be required due to variations in topography, final building site location and elevation. If variations are necessary, WSG must be contacted for approval. A preconstruction meeting is strongly recommended to discuss system layout, construction and inspection requirements and to reduce potential changes to OWTS plans.
- C. Engineer (WSG) must be contacted at least 24 hours in advance for necessary inspections/observations of installed OWTS components including:
 - 1. Building sewer, tank discharge and distribution piping;
 - 2. Septic tank, inlet and outlet Ts and effluent filter;
 - 3. Distribution piping, chambers and/or washed rock;
 - 4. Pressurized piping shall be pressure tested as directed by engineer;
 - 5. Approved sand filter material gradation (C33), depth and dimensions;
 - 6. Approved pumping system components;
 - 7. Approved mechanical filter units, automatic distribution valves and other mechanical components (when applicable);
 - 8. Contractor shall assist engineer in compiling as-constructed system information including product information and 2-point ties to permanent site features.
- D. All system gravity piping shall consist of 4-inch solid or perforated PVC meeting or exceeding ASTM 3034/SDR35 requirements. Joints shall be watertight, cemented/bonded or gasketed.
 - 1. All piping shall be bedded and shaded with fine grained on-site or imported material. Bedding and shading will be installed such that it shall provide uniform support and protection to piping.
 - 2. Trenching and component backfill shall be uniformly compacted to at least 95% of the standard Proctor density near optimum moisture content, unless otherwise noted.
 - 3. Provide minimum 24 inches soil cover over all piping and components, unless otherwise noted. Provide cleanouts at min. 100' intervals.
- E. Inspection pipes shall be provided two per bed at approximate locations on drawings.
- F. Septic tank inlet and outlet piping shall be supported by compacted (Min. 80% Relative density (ASTM D4253/4254)) screened or washed rock fill where piping enters and leaves the tank excavation limits. Lids, risers and securable access ports shall be watertight and extend to or be exposed at final grades.
- G. Absorption areas shall be fenced off from construction or other activity that contributes to disturbance or soil compaction. Absorption field construction shall not be commenced during periods of high soil moisture content to minimize disturbance and smearing of infiltrative surfaces.
- H. Finished grading shall be sloped to provide positive drainage away from all absorption field surfaces. Surface and subsurface runoff, foundation drains and other sources of water located upslope of the absorption field shall be directed away from absorption field areas by grading, ditching, piping or use of subsurface drainage collection and discharge systems.
- I. All pressurized piping shall be Sch40 PVC or higher rating, or other material approved for wastewater applications. All joints shall be cemented, mechanically or chemically bonded to provide an airtight fit. Pressure testing shall be conducted as directed by the engineer.
- J. Pumping, mechanical systems and electrical systems and controls shall be installed by qualified installers and shall meet all applicable local plumbing and electrical code requirements.
- K. Imported fill materials used for storage and distribution media, sand filter material or mound fill shall be approved by WSG prior to transportation to the site.
- L. It is the responsibility of the installer and owner to comply with and maintain all setback requirements throughout the life of the system.

Western Slope Geotech, Inc.

APPENDIX C

PRESSURE DOSING SYSTEM DESIGN & DETAILS

- A. Pumping System: Minimum Pump Requirements Design Flow Rate = 26.1 gpm; TDH = 30.7 ft.
- B. Recommended Pumping System: One (1) Orenco (OSI) PFEF 50 (0.5 hp, 30 gpm, 115/230V Effluent Pump). Duplex Pumping System also recommended; See attached recommended component data sheets.
- C. Automatic Diversion Valve (ADV): OSI Model No. V6402A with enclosure.
- D. Piping:
 - Transport & Transmission: 1.5" Sch40 PVC
 Manifold: 1.5" Sch40 PVC

 - 3. Distribution Lines: 1.5" Sch40 PVC; 1/8" Orifices at 4' O.C.
 - 4. Cleanouts: 1 per each distribution lateral.
- E. Dose Size: 100 gallons, on demand
- F. Distal Pressure Head: 3 5 feet

Pump Selection for a Pressurized System - Single Family Residence Project

Clark Store

Parameters

Discharge Assembly Size	200	inches
TransportLength Before Valve	5	feet
TransportPipeClass	40	
TransportLineSize	1.50	inches
Distributing ValveModel	6402	
TransportLengthAfter Valve	200	feet
TransportPipeClass	40	
TransportPipeSize	1.50	inches
Max Elevation Lift	10	feet
ManifoldLength	8	feet
Manifold Pipe Class	40	
Manifold Pipe Size	1.50	inches
Number of Laterals per Cell	6	
Lateral Length	79	feet
Lateral Pipe Class	40	
Lateral Pipe Size	1.50	inches
Orifice Size	1/8	inches
Orifice Spacing	4	feet
Residual Head	5	feet
FlowMeter	None	inches
'Add-on' Friction Losses	0	feet
Colouistions		
Calculations		-
Minimum Flow Rate per Orifice	0.43	gpm
Number of Orifices per Zone	60	
Total FlowRate per Zone	26.1	gpm
Number of Laterals per Zone	3	
% Flow Differential 1st/LastOnfice	1.4	%
Transport Velocity Before Valve	4.1	tps
Transport Velocity After Valve	4.1	tps
Frictional Head Losses	100	1.11
Loss through Discharge	14	feet
Loss in Transport Before Valve	02	feet
Lossthrough Valve	5.8	feet
Loss in Transportatier Valve	81	feet
Lossin Manifold	0.1	feet
LossinLaterals	02	feet
Loss through Flowmeter	0.0	feet
'Add-on' Friction Losses	0.0	feet
Pipe Volumes	- S. H	
Vol of Transport Line Before Valve	0.5	gals
VolofTransportLineAller Valve	212	galis
VolofManifold	0.8	gals
Vol of Laterals per Zone	25.1	gals
Total Vol Before Valve	0.5	gais
Total Vol Attar Valve	47.1	gals
Minimum Pump Requirer	nents	

DesignFlowRate	26.1
Total Dynamic Head	30.7

gpm feet







Technical Data Sheet

Distributing Valves

Applications

Automatic Distributing Valve Assemblies are used to pressurize multiple zone distribution systems including textile filters, sand filters and drainfields.



Bottom View

General

Orenco's Automatic Distributing Valve Assemblies are mechanically operated and sequentially redirect the pump's flow to multiple zones or cells in a distribution field. Valve actuation is accomplished by a combination of pressure and flow. They allow the use of smaller horsepower pumps on large sand filters and drainfields. For example, a large community drainfield requiring 300 gpm (18.90L/sec) can use a six-line valve assembly to reduce the pump flow rate requirement to only 50 gpm (3.14L/sec).

Orenco only warrants Automatic Distributing Valves when used in conjunction with High-Head Effluent Pumps with Biotube[®] pump vaults to provide pressure and flow requirements, and to prevent debris from fouling valve operation. An inlet ball valve, a section of clear pipe, and a union for each outlet are provided for a complete assembly that is easy to maintain and monitor. Ideal valve location is at the high point in the system. Refer to Automatic Distributing Valve Assemblies (NTP-VA-1) for more information.

Standard Models

V4402A, V4403A, V4404A, V4605A, V4606A, V6402A, V6403A, V6404A, V6605A, V6606A.

Product Code Diagram



Materials of Construction

All Fittings	Sch. 40 PVC per ASTM specification
Unions	Sch. 80 PVC per ASTM specification
Ball Valve	Sch. 40 PVC per ASTM specification
Clear Pipe	Sch. 40 PVC per ASTM specification

Specifications

Model	Inlet Size, in. (mm)	Outlets Size, in. (mm)	Flow Range, gpm (L/sec)	Max Head, ft (m)	Min. Enclosure*
V4402A	1.25 (32)	1.25 (32)	10 - 40 (0.63 - 2.52)	170 (51.816)	VB1217
V4403A	1.25 (32)	1.25 (32)	10 - 40 (0.63 - 2.52)	170 (51.816)	VB1217
V4404A	1.25 (32)	1.25 (32)	10 - 40 (0.63 - 2.52)	170 (51.816)	VB1217
V4605A	1.25 (32)	1.25 (32)	10 - 40 (0.63 - 2.52)	170 (51.816)	RR2418
V4606A	1.25 (32)	1.25 (32)	10 - 40 (0.63 - 2.52)	170 (51.816)	RR2418
V6402A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6403A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6404A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6605A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418
V6606A	1.50 (38)	1.50 (38)	15 – 100 (0.95 – 6.31)	345 (105.16)	RR2418

* When using an enclosed basin, choose the next larger-sized diameter.

Table 1. Automatic Distributing Valve Assembly Headloss Equations

Model Series Equation		Operating Range, gpm (L/sec)	
V4400A	H_ = 0.085 x Q ^{1.45}	10 - 40 (0.63 - 2.52)	
V4600A	$H_{L} = 0.085 \text{ x } Q^{1.58}$	10 - 25 (0.63 - 1.57)	
V6400A	$H_{\rm L} = 0.0045 {\rm x} {\rm Q}^2 + 3.5 {\rm x} (1 - {\rm e}^{-0.060})$	15 - 70 (0.95 - 4.42)	
V6600A	$H_1 = 0.0049 \times Q^2 + 5.5 \times (1 - e^{-0.10})$	15 - 70 (0.95 - 4.42)	

