NorthWest Colorado Consultants, Inc.
Geotechnical / Environmental Engineering • Materials Testing

April 4, 2023

Ryan & Rebecca Nowosielski
31255 Redtail Lane
Steamboat Springs, CO 80487

Job Number: 21-12460

Subject: On-Site Wastewater Treatment System Design, Proposed Nowosielski Residence, 34620 Country Green Road, Routt County, Colorado.

Ryan & Rebecca,

This report presents the results of an On-site Wastewater Treatment System (OWTS) design for your proposed residence to be constructed at 34620 Country Green Road in Routt County, Colorado. This design was completed in accordance with Colorado Department of Public Health and Environment-Water Quality Commission On-site Wastewater Treatment System Regulation #43 (Regulation), as adopted by the Routt County Department of Environmental Health (RCDEH).

NWCC previously completed a Subsoil and Foundation Investigation for this project prepared under the above Job Number and dated November 4, 2021.

Proposed Construction: It is our understanding, based on our conversations with you that the proposed residence will have a total of four bedrooms with one bedroom on the main level and three bedrooms on the walkout level. Therefore, the OWTS has been designed for a total of four bedrooms.

A potable water well will be constructed to the east-northeast of the residence and at least 100 feet northwest and uphill of the proposed soil treatment area (STA) for the OWTS.

Based on the subsurface conditions encountered at the site and our understanding of the site development, NWCC recommends the proposed STA for the OWTS be located to the south and downhill of the proposed residence and Country Green Road.

Site Conditions: The property is situated south of Country Green Road and at the west side of the Country Green Subdivision and Country Green Road in Routt County, Colorado. The lot is a vacant parcel of land consisting of approximately 2.47 acres.

Vegetation in the area of the proposed STA consists of grasses and weeds, with sage brush and other deciduous brush and occasional aspen trees. The topography in the area of the proposed STA is fairly uniform and generally slopes moderately to strongly down to the south-southeast on the order of 15 to 25 percent. Steeper slopes, on the order of 30 to 40 percent, are located above the proposed STA and below the proposed residence.

A site plan showing the overall site and approximate locations of the existing features and proposed structures and OWTS is provided in Figure #1. A detailed site plan showing the proposed structures along with the proposed OWTS is shown in Figure #2.

Subsurface Conditions: Three profile pits were excavated in the area of the proposed STA on October 8, 2021. The subsurface conditions encountered in the profile pits were somewhat variable and consisted of approximately 24 to 30 inches of topsoil and organic materials overlying natural clays to the maximum depth investigated, 6 feet below the existing ground surface (bgs). The clays were sandy to sand and clay, fine to coarse grained with occasional gravels, moderately plastic, very stiff, slightly moist to moist and tan to brown in color. The clays classified as CL soils in accordance with the Unified Soil Classification System.

Groundwater was not encountered the profile pits at the time of excavation and no signs of a seasonal high groundwater table was observed.

Percolation testing was not conducted in the area of the soil treatment area for the OWTS. Based on our experience in this area, the topsoil and organic materials will likely exhibit percolation rates of 20 to 40 minutes per inch. Based on the assumed percolation rate of the near surface soils and visual soil classification of the soils encountered in the profile pits, NWCC has classified the natural topsoil and organic materials (Sandy Loam to Silty Loam) as Soil Type 2A in accordance with Table 10-1 of the Regulations.

OWTS Design: Based on the subsurface conditions encountered at the site, sloping topography and our understanding of the proposed construction, NWCC recommends the OWTS design consist of a trench soil treatment system utilizing Standard Infiltrator or ADS ARC 36 Chambers placed in the upper 2 to 12 inches of natural topsoil and organic materials.

The OWTS design presented below is based on the total anticipated number of bedrooms (4) for the proposed residence, as well as the classification for the natural near surface soils. Considering the anticipated construction, NWCC has determined, using Table 6-1 of the Regulations, an effluent design flow of 525 gallons per day (gpd) for a four bedroom system.

Based on the soil type, design effluent flow, a Long Term Acceptance Rate (LTAR) of 0.5 gpd/ft^2 (Treatment Level 1) and size adjustment factors of 1.0 for a gravity trench system (Table 10-2) and 0.7 for chambers (Table 10-3), a minimum trench absorption area of 735 square feet is required for OWTS.

Using information provided by Infiltrator System, Inc., an absorption area of 12ft²/Quick-4 Standard Infiltrator chamber and 15ft²/ADS ARC 36 chamber was used in the design. This results in a minimum of **sixty-two (62) Quick-4 Standard Infiltrator** chambers or **forty-nine (49) ADS ARC 36 chambers**. NWCC recommends the chambers be installed with at least four runs of chambers.

The soils exposed at the base of the trenches must be scarified a minimum of 4 inches prior to placement of the chambers. A distribution box, with flow equalizers, must be used to ensure equal flow to all of the trenches. The distribution box lid must be exposed at final grades. Extensions or an access manhole should be used as needed to reach final grades. Insulated lids are required to prevent freezing. A minimum of 18 inches of soil cover must be placed over the chambers in accordance with the manufacturer's recommendations. All finished surfaces should have a minimum of 3 inches of topsoil materials and seeded to prevent erosion.

The bases and sides of the chambers must be wrapped with a ¼-inch galvanized steel, stainless steel or synthetic mesh to help prevent rodent intrusion. NWCC also recommends that the system be fenced off to livestock. If the system is not activated within 30 days of installation or if extended periods of inactivity occur at the residence, the Infiltrator chambers must be periodically flooded with water, every 30 days, to prevent rodents from nesting and burrowing in the chambers, which could result in another premature failure of the system.

Septic Tank: A septic tank with a minimum capacity of 1,250-gallons is required for a four bedroom system. NWCC strongly recommends the client consider using a larger tank, such as 1,500 or 2,000 gallons for future building expansion. Due to the subsurface conditions encountered at the site and our experience with similar projects, NWCC also recommends a concrete septic tank be used.

If a dosing system is used, a size adjustment can be used in the sizing of the STA. NWCC must be contacted to determine the decreased field sizing and septic/dosing tank requirements, if a dosing system is used.

A Biotube effluent filter (Orenco FT W0444-36) must be installed in the outlet 'T' of the septic tank. NWCC recommends a filter monitor system be installed in the downstream compartment of the septic tank to warn the owner in the event of a filter clog. The manhole lids must be exposed at final grades. Manhole ring extensions should be used as needed to reach final grades. The tank must be placed to allow access for pumping. Generally a septic tank can be pumped from 100 feet away with a maximum lift of 10 feet; however, a local sewage pumping contractor should be consulted in regards to the tank maintenance access. The construction of an access road to allow for pumping the septic tank may be required.

The system design is presented in Figures #2 and #3. Typical septic tank details are presented in Figure #4. The design calculations are shown in Appendix A and the specifications for the system are given in Appendix B. **Any variance of equipment/materials specified in this design must be approved by NWCC prior to construction.**

Operation and Maintenance: Observing the operation and performing routine maintenance of the OWTS is essential to allow proper, long term functioning of the system. NWCC recommends the operation be monitored and a qualified, licensed maintenance contractor provide maintenance of the system.

1) *Septic Tank*: The scum and sludge accumulation in the septic tank should be monitored yearly. Once the scum or sludge thickness reaches 25% of the chamber depth, the septic tank should be pumped. A pumping frequency of 1 to 3 years is likely at the design flows used for this system; however, depending on use, pumping may only be required every 3 to 5 years.

2) *Effluent Filter*: The effluent filter at the septic tank outlet should be cleaned when the septic tank is inspected or as required.

3) *Soil Treatment Area*: Soil treatment area should be fenced off to livestock. The surface area around the soil treatment area should be observed monthly for signs of failure, such as lush vegetation growth or ponding. Liquid levels within the chambers should be observed through the observation pipes.

4) *Treated Water*: NWCC does not recommend water softeners or water treatment systems be connected to the OWTS. The chemical and hydraulic loading from the backwash of these treatment systems may be detrimental to the OWTS. If a treatment system is used, a separate dry well should be constructed for the backwash waste. In addition, chemically treated water from a swimming pool or spa must not be discharged into the OWTS.

5) *Floor Drains*: NWCC does not recommend garage floor drain systems be connected to the OWTS. Oils, grease and chemicals from vehicles may be detrimental to the OWTS. NWCC recommends garage floor slab be sloped to drain to the garage door. If a garage floor drain is constructed, NWCC recommends the drain be connected to a separate sand/oil interceptor tank, which can be pumped as required, or be properly daylighted in accordance with current regulations.

6) *General Notes*: The owner should be aware that the operation of the OWTS is different from a public sewer service. Plastic and other non-biodegradable materials should not be placed into the system. Water use should be monitored so fixtures are not allowed to run if a seal malfunctions. Allowing fixtures to flow continuously to prevent water lines from freezing or a malfunctioning faucet or toilet can consume in excess of 1,000 gallons per day. Excessive flows could continually flood and cause premature failure of the system. No plastic or landscaping that requires additional irrigation should be placed over the absorption field.

Limitations: The procedures and design criteria used in this design were obtained from the EPA "Design Manual - On-site Wastewater Treatment and Disposal Systems", 1980, as well as the Colorado Department of Public Health and Environment-Water Quality Control Commission, On-site Wastewater Treatment System Regulation, Regulation #43, effective June 30, 2017. The OWTS design presented is based on currently accepted design procedures, the proposed structures and usage of the facilities. If the usage of the

structures or addition of new facilities to those currently planned in the building changes, the OWTS design will also most likely change. It should also be noted that all on-site wastewater treatment systems require periodic maintenance as noted above. The failure of the owner to provide periodic inspection and maintenance of the system can lead to premature system failure.

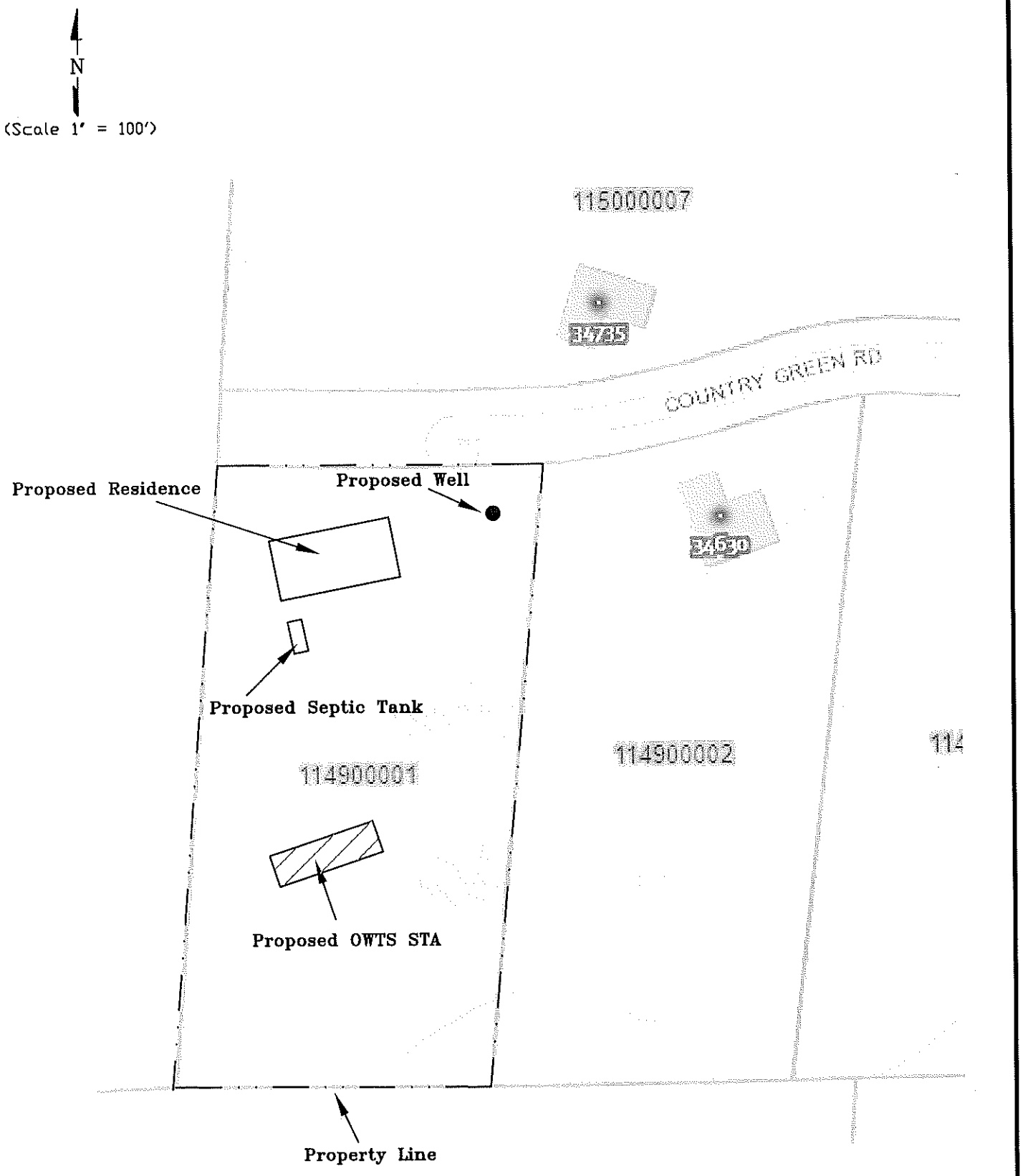
Please be advised that Colorado law requires that a permit must be obtained prior to construction, alteration or use of an on-site wastewater treatment system. In addition, this office must be retained by the client to observe the construction/installation of the OWTS and to provide an as-built report to the RCDEH when the construction is completed.

If you have any questions concerning this report, or if we may be of further service, please contact this office.

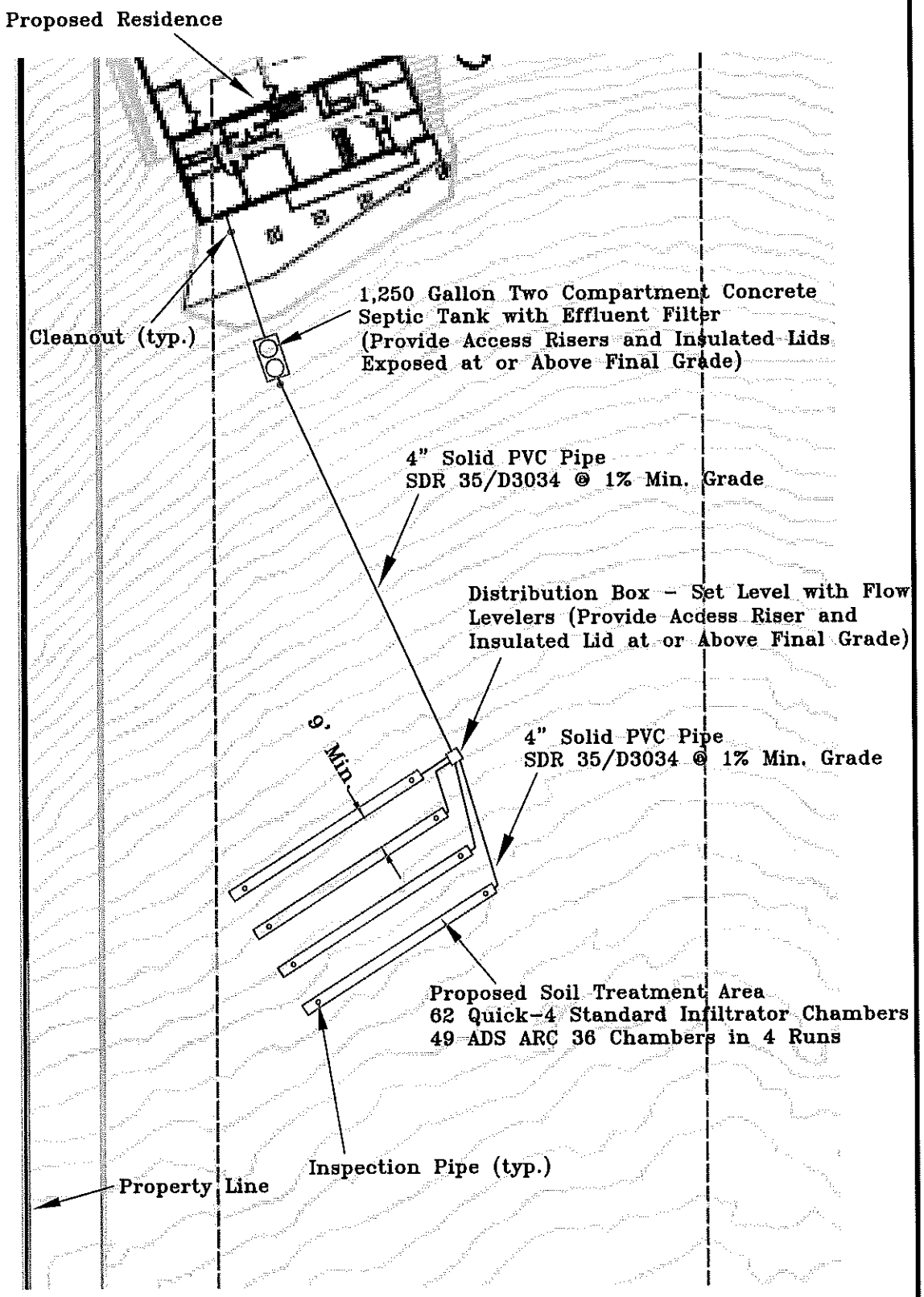
Sincerely,
NWCC, INC.

COLORADO LICENSED
BRIAN D. LEN
25750
PROFESSIONAL ENGINEER
4/4/2023

Brian D. Len, P.E.
Principal Engineer

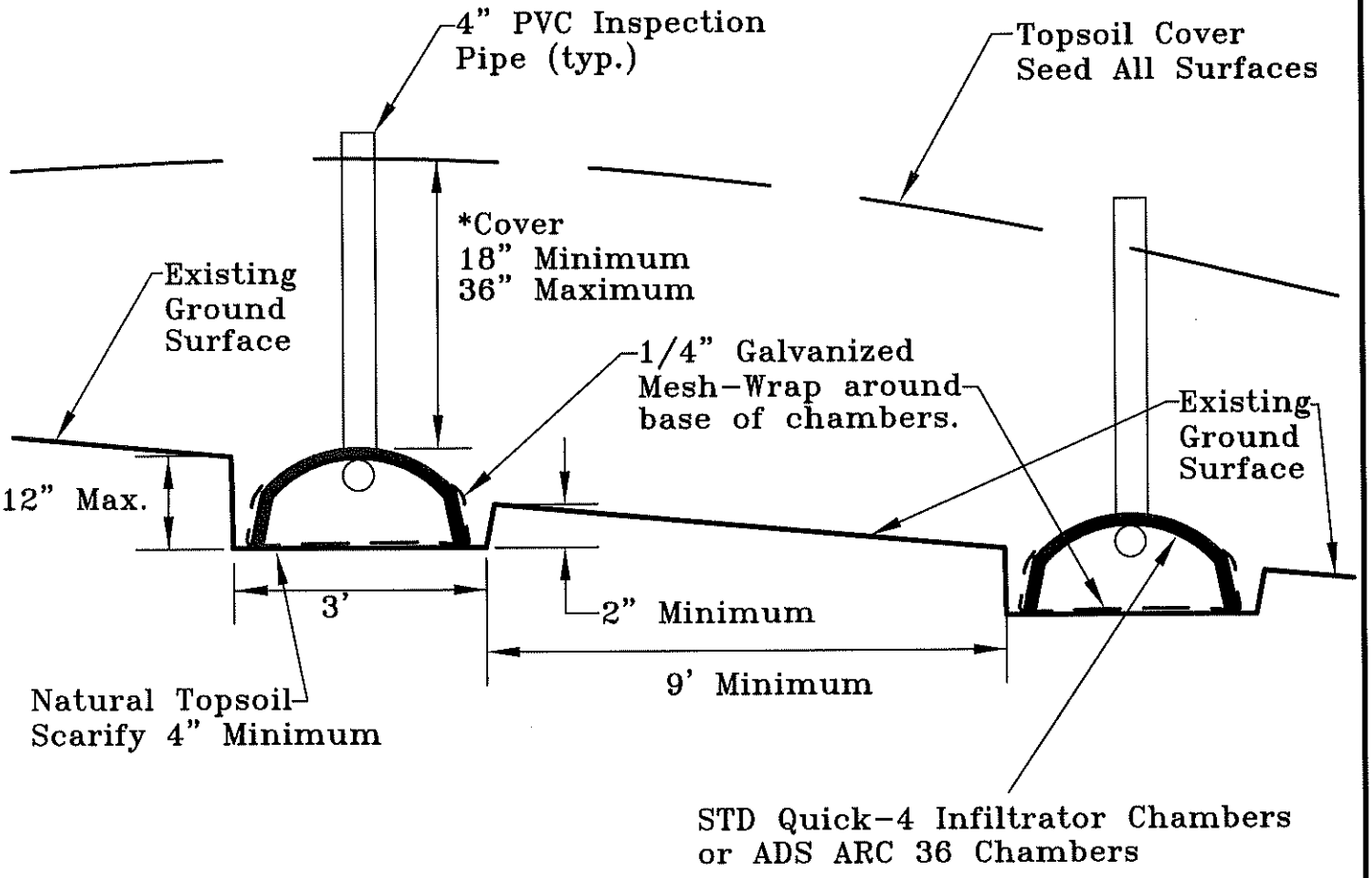


Title: OWTS – OVERALL SITE PLAN	Date: 4/3/2023	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7888 - Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: Proposed Nowosielski Residence OWTS	Job No. 21-12460	
Location: 34620 County Green Road, Routt County, Colorado	Figure #1	

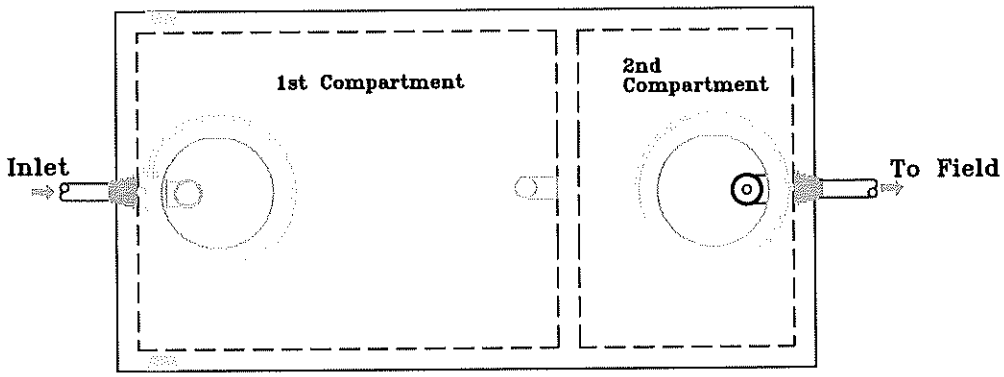


Title: OWTS–CHAMBER/TRENCH SITE PLAN		**Date:** 4/3/2023	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering · Materials Testing (970)879-7888 · Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: Proposed Nowosielski Residence OWTS		**Job No.** 21-12460	
Location: 34620 Country Green Road, Routt County, Colorado		**Figure** #2	

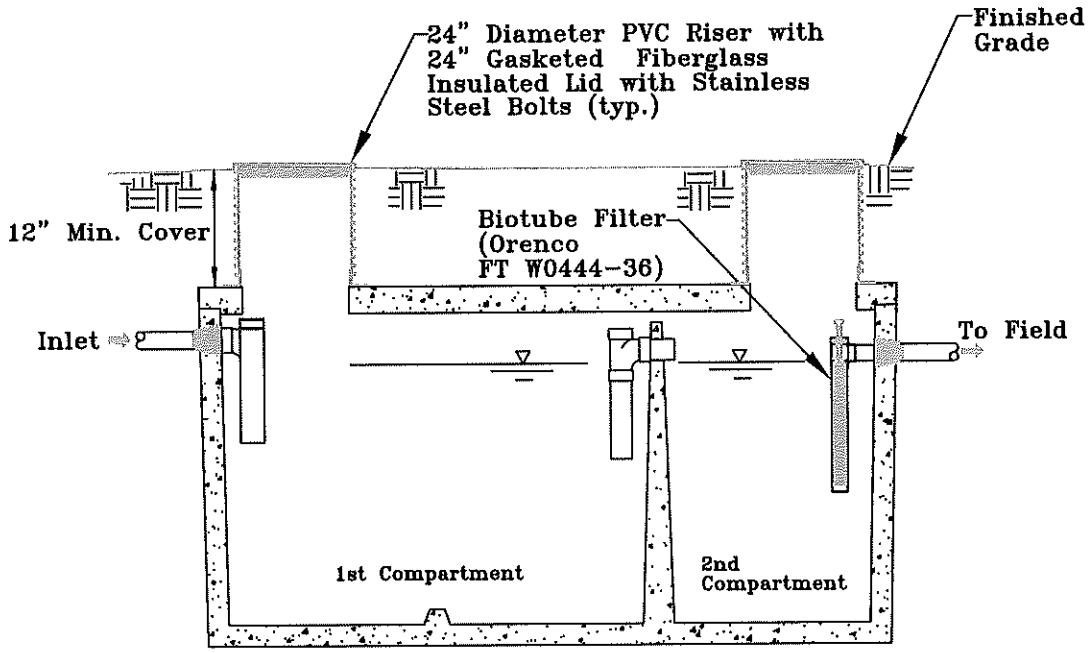
* The chambers should be backfilled in accordance with the manufacturer's recommendations.



Title: CHAMBER/TRENCH SYSTEM CROSS SECTION	Date: 4/3/2023	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing
Job Name: Proposed Nowosielski Residence OWTS	Job No. 21-12460	(970)879-7888 - Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Location: 34620 Country Green Road, Routt County, Colorado	Figure #3	



Top View



Section View

* Note: Septic tank shown is a typical 2-compartment septic tank configuration. Installer must submit detail from septic tank manufacturer, for approval by NWCC prior to construction.

Title: OWTS – SEPTIC TANK DETAILS	Date: 4/3/2023	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering · Materials Testing
Job Name: Proposed Nowosielski Residence OWTS	Job No. 21-12460	(970)879-7886 · Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Location: 34620 Country Green Road, Routt County, Colorado	Figure #4	

APPENDIX A

SUMMARY OF DESIGN CALCULATIONS

A. Sewage Volume Calculations

1) Number of Bedrooms:.....4 Bedrooms

2) Design Flow (Regulations Table 6-1).....Q = 525 gpd

B. System Sizing

1) Soil Type 2A (Table 10-1)

2) Minimum soil treatment area = Q/LTAR = 525 gpd/0.5 gpd/ ft^2 = 1,050 ft^2

3) Infiltrator Area = 1,050 ft^2 x 1.0 (Gravity Trench-Table 10-2) x 0.7 (Chambers-Table 10-3) = 735 ft^2.

4a) Number of Quick-4 Standard. Infiltrator Chambers: 735 ft^2/12.0 ft^2/chamber = 61.3 chambers => use **62 Standard Quick-4 chambers.**

4b) Number of ADS ARC 36 chambers: 735 ft^2/15.0 ft^2/chamber = 49.0 chambers => use **49 ADS ARC 36** chambers.

5) Septic Tank – Minimum 1,250-gallon septic tank for a four-bedroom residence (Table 9-1).

Minimum Horizontal Setbacks in Feet

	Spring, Well, Potable Water Supply Cistern	Potable Water Supply Line	Structure with basement, crawl space or footing drain	Property Line, Piped or Lined Irrigation Ditch	Waterbody (Lake, Water Course, Irrigation Ditch, Wetland)	Dry Gulch/Swale
Septic Tank/ Dosing Tank	50	10	5	10	50	10
Building Sewer or Effluent Line	50	5		10	50	10
Soil Treatment Area	100	25	20	10	50	25

APPENDIX B

1) The Rules and Regulations of the CDPHE and RCDEH must be complied with during the installation/construction of the system.

2) Periodic inspections must be made by NWCC at the following points during construction:

   a. After subgrade excavation and septic tank and solid PVC pipe installation.
   b. After placement of chambers and piping, prior to backfilling.
   c. Upon final completion of the project.

3) The 4-inch PVC pipe shall conform to ASTM 3034/SDR 35 or better quality.

4) Soils beneath the pipes entering and leaving a septic or aeration tank, which has been excavated, shall be backfilled in 6 inch lifts and mechanically compacted to a minimum of 95% of the maximum standard Proctor density.

5) Provide a minimum of 12 inches of soil cover over the septic tank, 18 inches of soil over the STA and 24 inches of soils cover over all pipes. Any piping placed under a driveway or other plowed areas should have a minimum of 48 inches of soil cover or be protected from freezing using insulation or other approved means. Manhole and distribution box lids must be exposed at final grades. Provide manhole ring or distribution box extensions as needed to reach final grades. Insulated lids are required.

6) Special care should be taken when backfilling the system to prevent disturbance/crushing of the distribution lines or chambers. In addition, the distribution lines must be carefully bedded to minimize the settlement in these lines.

7) Surface drainage shall be ditched and diverted away from the soil treatment area and all tanks.

8) Disturbed surfaces and berms shall be covered with topsoil and heavily seeded. Heavy farm equipment and livestock should be fenced or kept off of the absorption field.

9) Inspection pipes to be constructed of PVC pipe. Inspection pipes must allow observation of the infiltrative surface at the bottom of the chambers. Cleanouts must be placed in the solid distribution line upstream of the septic tank at maximum intervals of 100 feet or above any pipe bends 45 degrees or greater. Cleanouts must be placed in the solid distribution line between the buildings and septic tank at a maximum interval of 50 feet.

10) It is the responsibility of the owner and the installer to comply with all of the minimum setback requirements in the Regulations.