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

October 5, 2016

David Turcotte
1415 Avery Road
Canton, GA 30115

Job Number: 16-10477

Subject: On-Site Wastewater System
Design, Proposed Turcotte Residence,
Lot 1D North, 480 Ranch Subdivision,
Routt County, Colorado.

Dear David,

This report presents the results of an On-site Wastewater System (OWS) design for the proposed Turcotte Residence to be constructed within Lot 1D North of the 480 Ranch Subdivision 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 Board of Health. NWCC previously completed a Subsoil and Foundation Investigation for the residence under this job number and dated August 20, 2016.

Proposed Construction: It is our understanding, based on our conversations with you, that the residence will be constructed with a total of four bedrooms when completed. The OWS soil treatment area (STA) for the OWS will be placed to the southwest of the proposed residence. It should be noted that plans for the residence have not yet been provided to NWCC.

Site Conditions: The physical address of the property is 17255 Grouse Ridge Lane. The subject property is a 45 acre parcel of vacant land located south and east of Grouse Ridge Lane in the 480 Ranch Subdivision in Routt County, Colorado. Potable water will be supplied to the lot by the water supply system for the 480 Ranch Subdivision, which is located north of the property. A water well will not be constructed at the site.

The proposed STA will be located approximately 200 to 270 feet southwest of the proposed residence. The vegetation in this area consists of grasses, weeds, deciduous brush and scrub oaks. The topography in the area of the STA is variable and generally slopes moderately to strongly down to the east on the order of 15 to 20 percent. Considerably steeper slopes with bedrock outcroppings are located to the east of the residence and STA.

A site plan showing the overall site and approximate locations of the existing features and proposed residence and OWS is shown in Figure #1. A detailed site plan of the proposed residence and OWS is shown in Figure #2.

Subsurface Conditions: Two profile pits were excavated in the area of the STA on August 3, 2016. The subsurface conditions encountered in the profile pits excavated near the proposed STA consisted of approximately 4 to 5 feet of topsoil and organic materials overlying natural sands to the maximum depths investigated. Natural sands were encountered below the layer of topsoil and organic materials and extended to depths of 6 and 7 feet below the existing ground surface (bgs). The sands were slightly silty to silty, fine to medium grained with bedrock fragments, low to non-plastic, medium dense, dry to moist and light brown in color.

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

Percolation testing was not completed in the area of the STA. Based on our experience with similar soils, the upper 4 to 5 feet of topsoil and organics and underlying natural sands will likely exhibit percolation rates ranging from 16 to 25 minutes per inch (mpi). Based on the assumed percolation rate and visual soil classification, NWCC has classified the topsoil and organic materials and sands as soil type 2 in accordance with Table 10-1 of the Regulations.

OWS Design: Based on the soils and topography encountered at the site, and our understanding of the proposed construction, NWCC recommends the OWS design consist of a modified trench soil absorption system utilizing Infiltrator chambers constructed in the upper 12 to 24 inches of natural topsoil and organic materials.

The OWS design presented below is based on the total anticipated number of bedrooms (4) for the proposed residence, as well as the assumed percolation rate and classification for the natural 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.

Trench/Chamber System: Due to the moderate to strong slopes, NWCC recommends a trench absorption system utilizing Quick-4 Standard Infiltrator Chambers be used. Based on the soil type, design effluent flow, a Long Term Acceptance Rate (LTAR) of 0.6 gpd/ft^2 (Treatment Level 1) and size adjustment factors of 0.9 for a dosed trench system (Table 10-2) and 0.7 for chambers (Table 10-3), a minimum trench absorption area of 552 square feet is required for this system.

Using information provided by Infiltrator System, Inc., an absorption area of 12ft^2 for Quick-4 Standard Infiltrator chambers was used in the design. This results in a minimum of forty-six (46) Quick-4 Standard Infiltrator chambers. If a dosing system is not used, the number of chambers required will increase. NWCC must be contacted to determine the number of additional chambers required. The trenches for the chambers should be placed a maximum of 24 inches below the natural ground surface. A distribution box, with flow levelers, must be used to ensure equal flow to all of the trenches. The distribution box lid must be exposed or accessible at or above final grades. Extensions should be used as needed to reach final grades. Insulated lids are recommended.

The bases and sides of the chambers must be wrapped with a ¼-inch galvanized 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 premature failure of the system.

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.

Septic Tank and Dosing System: A septic tank with a minimum capacity of 1,250-gallons is required for a four bedroom residence. Due to the subsurface conditions encountered at the site, we recommend that a concrete septic tank be used.

NWCC has designed the OWS using a dosing system to distribute effluent to the STA. Therefore, NWCC recommends the system be constructed with a 2,000-gallon three-compartment septic tank with a pump or siphon installed in the downstream compartment. NWCC recommends a Fluid Dynamics FD417 automatic dosing siphon. A size adjustment for a dosed system was used in the sizing of the absorption field. If a dosing system is not used in the system that the size of the absorption field will need to be increased as noted previously in this report.

A Biotube effluent filter (Orenco FT W0444-36) must be installed in the outlet 'T' between the 2nd and 3rd compartments of the septic tank. NWCC also recommends a filter monitor system be installed in the 2nd compartment of the septic tank to warn the owner in the event of a filter clog. The manhole lids must be insulated and exposed at or above 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 for the Infiltrator trench system is presented in Figures #2 through #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 OWS 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 and Dosing System*: The effluent filter at the septic tank outlet should be cleaned when the septic tank is inspected or as required. The siphon should be checked semi-annually to ensure the siphon is functioning properly. If the high water alarm sounds, the system should be inspected and serviced immediately.

3) *Soil Treatment Area*: Soil Treatment Area should be fenced off to livestock. The surface area around the STA should be observed regularly for signs of failure, such as lush vegetation growth or ponding. Liquid levels within the Infiltrator 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 OWS. The chemical and hydraulic loading from the backwash of these treatment systems may be detrimental to the OWS. 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 OWS.

5) *General Notes*: The owner should be aware that the operation of the OWS 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, 2013. The OWS design presented is based on currently accepted design procedures, the proposed structures and usage of the facilities. If the usage of the structure or addition of new facilities to those currently planned in the building changes, the OWS design will also most likely change. It should also be noted that all on-site wastewater 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 system. In addition, this office must be retained by the client to observe the construction/installation of the OWS and to provide an as-built report to the Routt County Department of Environmental Health 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.

Brian D. Len, P.E.
Principal Engineer

Reviewed by Timothy S. Travis, P.E.
Senior Project Engineer

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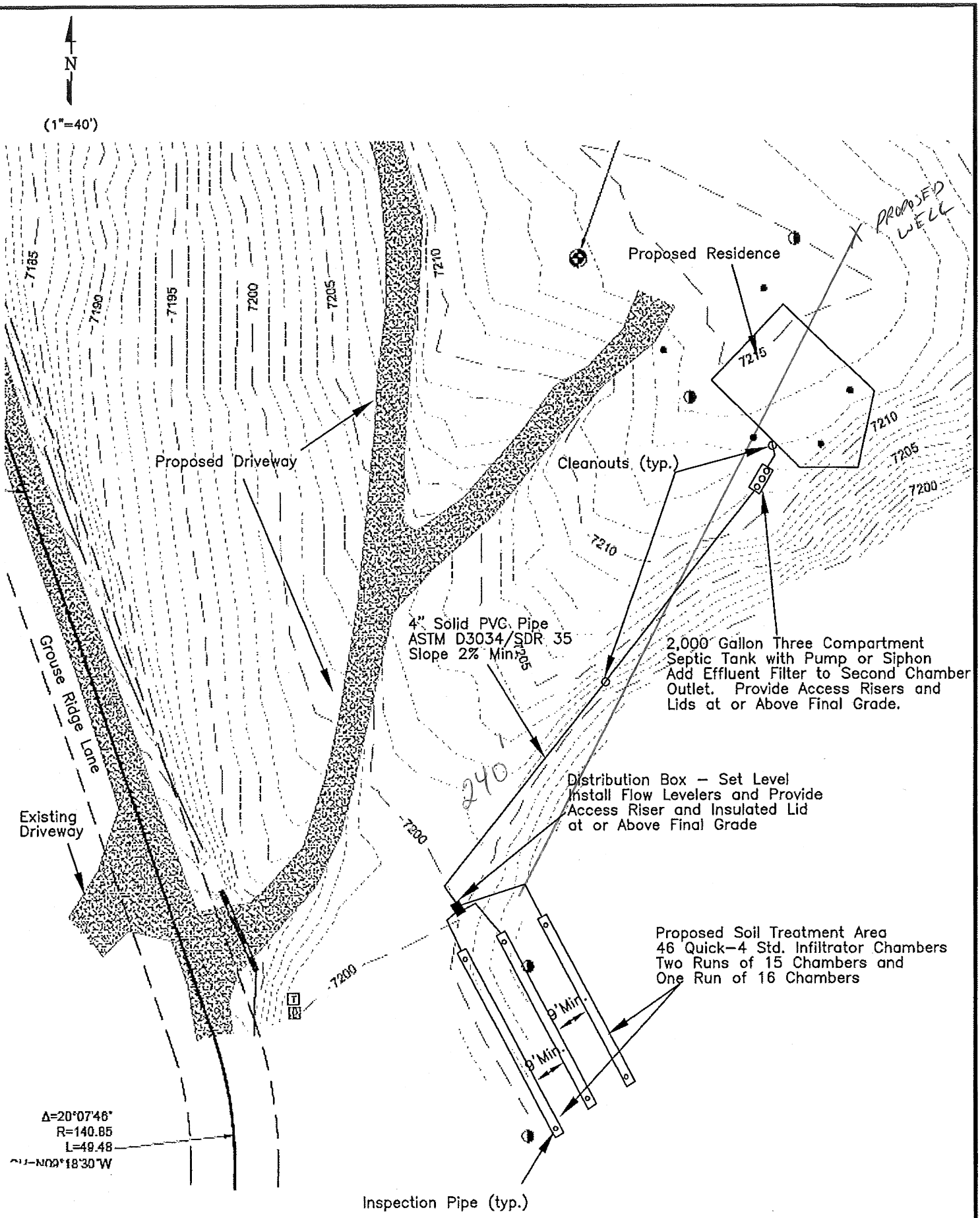
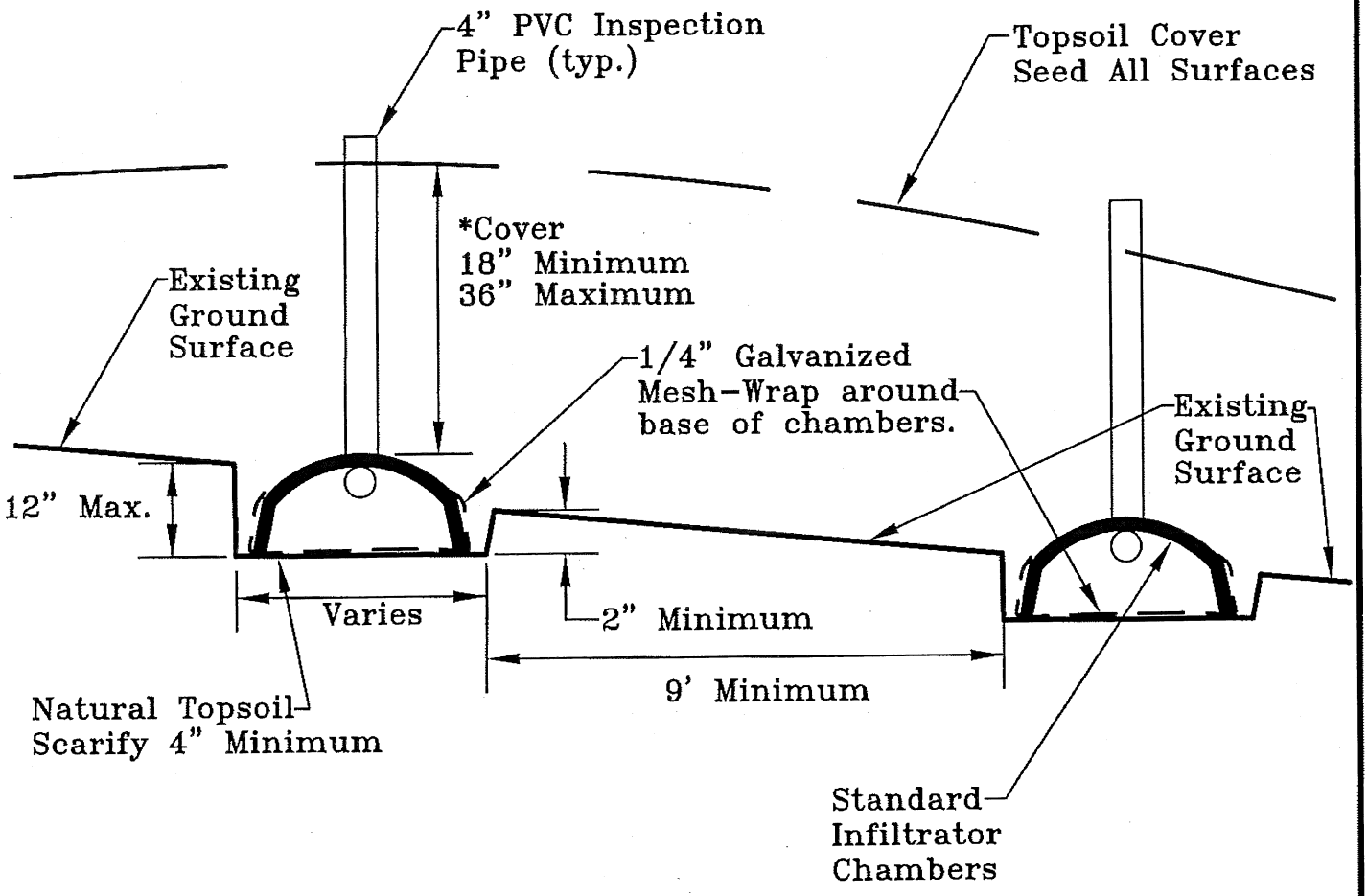
(1"=250')

Title: VICINITY MAP	Date: 10/3/16	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing
Job Name: Proposed Turcotte Residence	Job No. 16-10477	(970)879-7659 - Fax (970)879-7681 2563 Copper Ridge Drive Steamboat Springs, Colorado 80487
Location: Lot 1D North, 480 Ranch Subdivision, Routt County, CO	Figure #1	

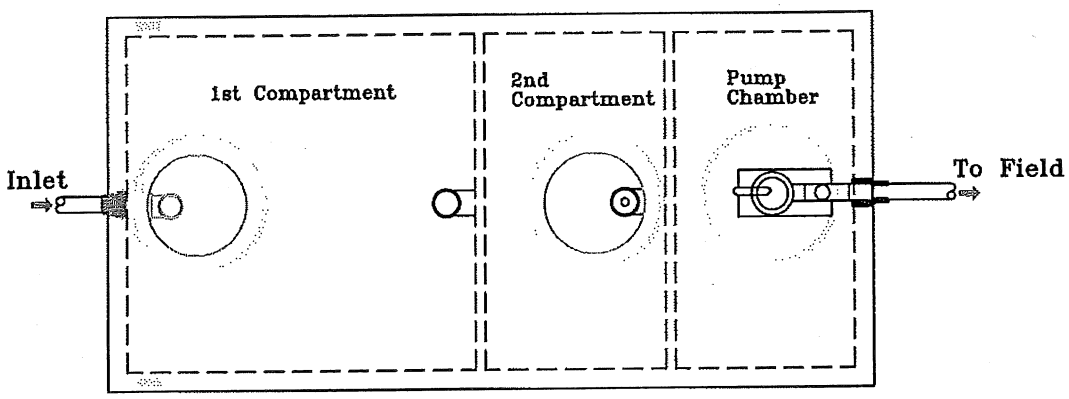


Title: INFILTRATOR SITE PLAN		**Date:** 10/4/16	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering · Materials Testing (970)879-7688 · Fax (970)879-7691 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: Proposed Turcotte Residence		**Job No.** 16-10477	
Location: Lot 1D North, 480 Ranch Subdivision, Routt County, CO		**Figure** #2	

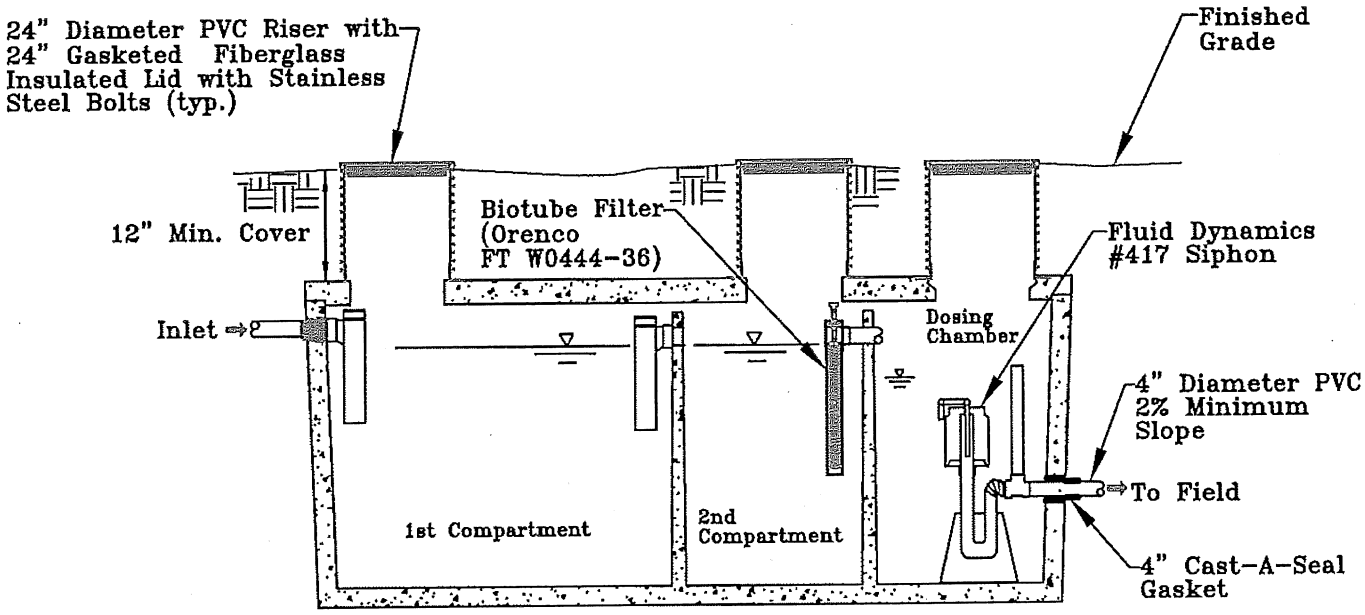
* The chambers should be backfilled in accordance with the manufacturer's recommendations.



Title: INFILTRATOR SYSTEM CROSS SECTION	Date: 10/4/16	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 Turcotte Residence	Job No. 16-10477	
Location: Lot 1D North, 480 Ranch Subdivision, Routt County, CO	Figure #3	



Top View



Section View

* Note: Septic tank shown is a typical 3-compartment septic tank/siphon configuration. Installer must submit detail from septic tank manufacturer, for approval by NWCC prior to construction.

Title: O.W.S.-SEPTIC TANK DETAILS	Date: 10/3/16	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing
Job Name: Proposed Turcotte Residence	Job No. 16-10477	(970)879-7688 - Fax (970)879-7851 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Location: Lot 1D North, 480 Ranch Subdivision, Routt County, CO	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 2 (Table 10-1)-Long Term Acceptance Rate (LTAR) = 0.60 gpd/ ft^2

2) Minimum soil treatment area = Q/LTAR = 525 gpd/0.60gpd/ ft^2 = 875 ft^2

3) Infiltrator Area = 875 ft^2 x 0.9 (Dosed Trench-Table 10-2) x 0.7 (Chambers-Table 10-3) = 552 ft^2.

4) Number of Quick-4 Standard. Infiltrator Chambers: 552 ft^2/12.0 ft^2/chamber = 45.9 chambers => use 46 Standard chambers.

6) Septic Tank - 1,250-gallon septic tank minimum for a four-bedroom residence (Table 9-1). 2,000-gallon three compartment septic/dosing tank is recommended for the residence.

8) Minimum well or spring setback, per Table 7-2 = 100 feet

9) Minimum water body (Pond, Wetlands, Irrigation Ditch) setback, per Table 7-2 = 50 feet

10) Minimum cistern, water supply line, dry drainage setback, per Table 7-2 = 25 feet

APPENDIX B

1) The Rules and Regulations of the CDPHE and Routt County Department of Environmental Health 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 mesh, 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. Cast iron pipe or pvc pipe meeting ASTM 3034-SDR 35 or schedule 40 shall be used for 5 feet on the inlet and outlet sides of the tank.

5) Provide a minimum of 12 inches of soil cover over the septic tank, 18 inches of soil over the chambers 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 chambers and distribution lines. 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 absorption field and all tanks.

8) Disturbed surfaces, mounds 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 must be placed at the inlet and terminal ends of each trench. The infiltrative surface must be visible through the inspection pipe. Cleanouts must be placed in the solid distribution lines upstream and downstream of the septic tank at maximum intervals of 100' or above any pipe bends 45 degrees or greater.

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

Sharon Glover

From: Sharon Glover
Sent: Tuesday, September 20, 2016 3:02 PM
To: 'yvengr@yvengr.com'
Subject: ViewPermit, Permit No: TB-16-345

Turcott

Hi Jim
I have been asked to sign off on the above permit. I have not received an application for the on-site wastewater system. I will need a copy of the engineer design and a check for $300.00 to the Routt County Treasurer. The application for the septic system is on the Routt County website.

If you have any questions please give me a call.

Sharon Glover
Administrative Assistant
Routt County Department of Environmental Healht
970-870-5588