

Preliminary Project Discussion for Eagle Rock Sewage Works Construction Project  
Background Information

Michael Hines, M.S., P.E./ Fellowship of Christians in Action DBA Eagle Rock

Project Name: [Eagle Rock Retreat](#)

NPDES or SOP Number (if existing): [None. This is a new treatment system.](#)

- A. Identification of parties
  - a. Applicant. [Fellowship of Christians in Action DBA Eagle Rock](#)
  - b. Permittee. [Fellowship of Christians in Action DBA Eagle Rock](#)
  - c. Consulting Engineer. [Michael Hines, P.E.](#)
  - d. Funding Agencies (if applicable). [Fellowship of Christians in Action DBA Eagle Rock](#)
  - e. Entity to sign off on compliance with local codes (i.e. building inspector)
- B. Project Purpose and Objectives [Provide wastewater management for a new 80 unit lodge to serve outdoor retreat campers and conferences.](#)
- C. Map of general service area ([Attached](#))
  - a. Probable site and construction area
  - b. Adjacent properties
  - c. Significant waters of the State
  - d. Geological features
  - e. Property boundaries
- D. Existing Inflow and Infiltration [There are currently a dining hall, a bunkhouse, and a lodge within the complex. These are served by a combination of individual conventional systems and a common septic tank system. Effluent from all of the septic tanks go to a four way splitter valve. Each leg discharges to a 1004 sq.ft. conventional drainfield.](#)
- E. Influent characteristics. [Combined toilet, shower, and dining hall domestic wastewater.](#)
  - a. Last 12 MORs (if applicable). [N/A](#)
  - b. Industrial dischargers. [None](#)
- F. System capacity ([Proposed](#)). [35 gpd for 80 PE plus 1,000 gpd diverted from existing conventional systems for total design capacity of 3,800 gpd. 35 gpd/PE based on one year of water use data.](#)
  - a. Hydraulic
    - i. Average Daily Dry Weather Flow – ADDWF. [Much less than 3,800 gpd](#)
    - ii. Average Daily Flow – ADF. [Much less than 3,800 gpd](#)
    - iii. Peak Flow. [<3,800 gpd](#)
    - iv. Design Flow. [<3,800 gpd](#)
  - b. Nutrient
    - i. Influent loads
      - 1. Average Daily Dry Weather Flow – ADDWF. [~0.5 lb. TN/day](#)
      - 2. Average Daily Flow – ADF. [~0.5 lb. TN/day](#)

3. Design Flow. ~1.3 lb. TN/day

- c. Treatment/ Conveyance. ~10,000 gallons of new septic tanks will be installed to serve the new lodge. Effluent from the new septic tanks will gravity flow to a new AdvanTex AX 100 fixed film unit to be installed near the lodge. One leg of the existing four-way splitter valve will be diverted to the new AdvanTex as one of the existing drain fields will be taken to provide parking space for the new lodge. Effluent surface drip dispersal will be installed on soils downslope of the new lodge. These soils have been mapped by Soils Scientist Grant Dunn as loam and sandy loam. (Soils map attached.)
  - i. Accommodation of variability of loads. Most camp/retreat events occur during warm weather months with maximum density occurring only a couple of times each year. The fixed film systems naturally attenuates and acclimates to varying loads.
- G. Procurement methodology Project will be built by C.R. Barger and Sons with preselected process of Orenco fixed film reactors followed by effluent drip dispersal.
  - a. Design-bid-build
  - b. Design build
  - c. Preselection of equipment/processes
  - d. Relationships of various agencies involved
  - e. How and when ownership/access/easements will be transferred to wastewater operational entity. Upon completion, the system will be owned and operated by the Fellowship of Christians in Action DBA Eagle Rock, which will contract with C.R. Barger licensed operation personnel at least until they can get a staff member licensed as a Tennessee operator.
- H. Reliability class of components and electrical service
  - a. Operator certification level. B&NS Wastewater Treatment Operator and Class 1 Collection System Operator
  - b. Manpower requirements
- I. Proposed project schedule Construction to be completed by fall of 2022.
- J. Provide copy of PER if already prepared. Attached

Eagle Rock Camp and Retreat Wastewater System  
7143 Flats Road, Tallassee, Blount County, Tennessee  
Preliminary Engineering Report

December 5, 2021

## GENERAL

Eagle Rock Camp is a retreat center owned and operated by Fellowship of Christians in Action DBA Eagle Rock, a Christian ministry. The camp is located on 26 acres at the top of Chilhowee Mountain south of Maryville. The entire site is heavily forested and contains significant topographical relief. Currently, existing facilities consist of a 20 bed lodge, a 75 bed bunkhouse, a 1 bed barn and a dining hall. Guests are generally individual groups coming at different times. The largest guest population to date was 140 people who stayed for three days. Most groups are small with heavier use in summer and fall with youth groups.

The camp is provided with potable water from **xx Utility District**. The existing buildings are served by their own septic tanks, all of which drain to three 2,000 gallon tanks connected in series. A dosing siphon in the third tank discharges to a four-way splitter in a 24" riser down-slope. Each discharge line from the splitter doses 620 linear feet of drainfield designed at 1,005 gpd in 30 MPI soils. In descending elevation, these are labeled C1, C2, B1, and B2. Existing drain fields and reserve areas are shown on the 1996 Sterling Engineering topo that is Sheet 2 of the plans.

The camp is to be expanded by adding a new lodge consisting of 20 double-bed rooms to serve a maximum of 80 guests. The rooms will mimic typical motel rooms and no additional food service will be added. Maximum camp occupancy will likely occur only a few times a year during warm seasons. It is likely that a new parking area for the new lodge will take all or part of drainfield C1. The 1005 gpd capacity provided by that system will be diverted to the new system.

Existing drainfield and reserve areas are shown on Sheet 2 of the plans. Total drainfield capacity is 4,021 gpd based on 2,682 linear feet of field at 0.667 ft/gpd. Total reserve are is 6,559 gpd based on 4,375 linear feet of field at 0.667 ft/gpd. When drainfield C1 is taken, 1,004 gpd will be diverted to the new system.

## PROPOSAL

A new wastewater collection, treatment, and effluent drip dispersal system will be constructed to serve both the new lodge and one-quarter of the existing capacity that will be lost to construction. New septic tanks will provide primary treatment with an AdvanTex AX 100 providing secondary treatment. AdvanTex effluent will go to a drip dose tank and be pumped through an Arkal spinfilter to a drip dispersal field located at the bottom of the property.

## DESIGN FLOW

During 2019-2020, Eagle Rock tracked guest populations, days stayed, and water usage. 24 groups used the facilities for periods of 2-6 days. Guest populations ranged from 26-140 with an average of 46 guests. Daily water usage ranged from 16 gpd/guests with two guests to 39 gpd/guests with six guests. During the maximum guest load of 140, water usage was 22 gpd/guest. 30% of the guest load came in May through June and were teenagers there every day and who took few showers. August through April were primarily adult retreats running on weekends. Only staff are at the camp Monday through Thursday. The December – February period is the slowest period and has the smallest group sizes.

The new lodge will house a maximum of 80 guests at four per room. Realistically, it is unlikely that all rooms will have four guests at any one time. Appendix 2-A of Chapter 2 of TDEC's Design Criteria suggest 50 gpd/guest of wastewater flow as a design number for hotels and 15 gpd/guest for day camps with meals. The guests in the new lodge will have showers in the room but food service will be in the existing dining hall. TDEC's 50 gpd/guest number apparently assumes an onsite restaurant, suggesting that 40 gpd/guest is more realistic. Factoring in Eagle Rock's actual water use numbers I will use 80 guests and 35 gpd/guest for 2,800 gpd as the design flow from the new lodge. Parking for the new lodge will take one-quarter of the existing capacity or 1,005 gpd. Diverting that flow to the new system brings the total design flow to 3,800 gpd.

## DESIGN SUMMARY

The new wastewater system will consist of new septic tanks at the new lodge, an AdvanTex AX 100 unit, recirculation tank, drip dose tank, and drip zones. The AdvanTex unit will be designed for the 2,800 gpd flow from the new lodge plus the 1005 gpd of diverted flow. Drip zones will be designed to be surface dosed in light of the large amount of floating boulders on the surface. Laterals will be on five-foot centers with orifices on one-foot centers. The laterals will be secured on the surface by landscape staples installed every 20' of length. Drip loading rate will be 0.2 gpd/sq.ft. based on the soils map.

## PRIMARY TREATMENT

Two 5,000 gallon baffled septic tanks will receive flow from the new lodge. The tanks will be from C.R. Barger & Sons and will be equipped with sealed, booted inlets and outlets. The outlet end of each will be equipped with an Orenco 15" effluent filter. 24" risers with lids will be placed over the inlet and out inspection openings.

## SECONDARY TREATMENT

Discharge from the second septic tank will flow into a 5,000 gallon unbaffled recirculation tank. Pipe entry into the tank will be through an integrated rubber boot sealed with a stainless steel clamp. Two 84" screened pump vaults in the effluent end of the tank will each house an

Orenco PF 501512 STEP pump that will dose the AdvanTex unit. The unit is designed for 2,500 gpd average flow and 5,000 gpd peak flow. The recirculation pumps will be set to pump 2.1 minutes on/7.9 minutes off (six doses per hour) based on full load. Adjustments to pumping cycles will be made after sufficient operating history has been evaluated. Discharge from the bottom of the AdvanTex unit will flow through an Orenco recirculating splitter valve where a portion of effluent roughly equal to incoming flow will be diverted to the drip dose tank. At design flow, the AdvanTex unit will achieve a 4:1 recirculation rate of final effluent compared to incoming flow. All openings in the recirculation tank lid will be covered with 24" risers with lids.

## EFFLUENT DISPERSAL

A 5,000 gallon un baffled tank will serve as the drip dose tank. Discharge pipe from the recirculation splitter will enter the tank through the side of the 24" riser over the inlet end of the tank. Two 84" screened pump vaults in the effluent end of the tank will each house an Orenco PF 500515 STEP pump that will dose drip zones. The pumps will be controlled to transfer to the drip zones over 18 hours the treated effluent from the entire daily design flow.

An area of soils downslope of the site of the new lodge was evaluated by Licensed Soil Scientist Grant Dunn. He identified approximately 2.5 acres of drippable soils and mapped eight pits. His report is attached as Attachment 1. The soils mapped as predominantly McCamy and North Cove with an area of Ditney along Happy Valley Road. The upper 24" were all mapped as sandy loam, loam, or silt loam. Confining layers were absent in all pits at depths of 32" to 40".

All soils had predominantly moderate granular structure in the upper 10" - 22" grading into weak to moderate subangular blocky down to pit bottom. Within the 2.5 acre area mapped, approximately 30,000 sq.ft. east and south of the existing drainfields is suitable to serve as the system drip area. The area is covered with heavy forest and undergrowth and is covered by a large number of surface floaters consisting rocks and boulders of 6" to 24" in dimension. In order to install subsurface drip laterals, it would require extensive clearing and grubbing as well as excavating the surface to eliminate the surface floaters. Instead, the drip laterals will be installed on the surface by hand. The laterals will follow the contours and be secured by landscape staples installed every 20' of lateral length.

The soils will be loaded at 0.2 gpd/sq.ft. For 3,800 gpd, 19,000 sq.ft. of drip area is required (3,800 gpd/0.2 gpd/sq.ft.). Using five-foot line spacing and one-foot orifice spacing 19,000 sq.ft./5 sq.ft./orifice gives 3,800 orifices required or 3,800 linear feet of drip tube. Drip dosing rate is 3,800 orifices at 0.61 gph/orifice or 39 gpm. Elevation drop from the drip dose tank to the lowest point in the drip field is approximately 210'. The drip dose header will go to the lowest point and then feed the drip laterals from the bottom up. A pressure reducer will be installed to mitigate the excessive pressures expected. Drip lateral flushes will occur approximately quarterly and will be directed into a gravel filled pit at the bottom of the field.



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TEST PIT EXHIBIT  
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SHEET  
**EX**

DESIGNED:  
DRAWN: **CEG**  
CHECKED: **CMR**  
DATE: **4/8/21**  
SCALE: **1" = 100'**  
DRAWING: **3563A-EX**  
PROJECT NO.: **SEI#3563**

| Horizon | Depth  | Color    | Texture    | Mottles | Structure                   | Fragment |
|---------|--------|----------|------------|---------|-----------------------------|----------|
| A       | 0-2"   | 10YR4/4  | Sandy Loam |         | Moderate Granular           |          |
| B11     | 2-5"   | 10YR5/6  | Sandy loam |         | Moderate Granular           |          |
| B12     | 5-8"   | 10YR6/6  | Loam       |         | Moderate Sub Angular Blocky |          |
| B13     | 8-24"  | 7.5YR6/6 | Silt Loam  |         | Moderate Sub Angular Blocky |          |
| B14     | 24-35" | 7.5YR6/6 | Silt Loam  |         | Moderate Sub Angular Blocky |          |
| B       | 35"+   |          |            |         |                             |          |

Notes:  
Series: McCamy

| Horizon | Depth  | Color    | Texture    | Mottles | Structure                   | Fragment |
|---------|--------|----------|------------|---------|-----------------------------|----------|
| A       | 0-4"   | 10YR5/4  | Sandy Loam |         | Moderate Granular           | 5%       |
| B11     | 4-14"  | 10YR6/6  | Loam       |         | Weak Sub Angular Blocky     |          |
| B12     | 14-26" | 7.5YR6/6 | Silt Loam  |         | Moderate Sub Angular Blocky |          |
| B13     | 26-37" | 7.5YR6/8 | Loam       |         |                             | 10%      |
| B       | 37"+   |          |            |         |                             |          |

Notes:  
Series: McCamy

| Horizon | Depth  | Color   | Texture    | Mottles | Structure               | Fragment |
|---------|--------|---------|------------|---------|-------------------------|----------|
| A       | 0-2"   | 10YR5/4 | Sandy Loam |         | Moderate Granular       |          |
| Bw1     | 2-15"  | 10YR6/6 | Sandy Loam |         | Weak Sub Angular Blocky |          |
| Bw2     | 15-28" | 10YR5/8 | Sandy Loam |         | Weak Sub Angular Blocky | 40%      |
| Bw3     | 28-40" | 10YR5/8 | Sandy Loam |         | Weak Sub Angular Blocky |          |

Notes:  
Series: North Cove

| Horizon | Depth  | Color   | Texture    | Mottles | Structure               | Fragment |
|---------|--------|---------|------------|---------|-------------------------|----------|
| A       | 0-3"   | 10YR3/2 | Loam       |         | Moderate Granular       |          |
| Bw1     | 3-10"  | 10YR5/4 | Sandy loam |         | Weak Sub Angular Blocky |          |
| Bw2     | 10-32" | 10YR6/4 | Sandy Loam |         | Weak Sub Angular Blocky | 50%      |
| Bw3     | 32-40" | 10YR6/4 | Sandy Loam |         | Weak Sub Angular Blocky |          |

Notes: Bw3 Structure parting to Granular  
Series: North Cove

| Horizon | Depth  | Color   | Texture    | Mottles | Structure               | Fragment |
|---------|--------|---------|------------|---------|-------------------------|----------|
| A       | 0-4"   | 10YR4/3 | Sandy Loam |         | Moderate Granular       |          |
| A2      | 4-9"   | 10YR4/2 | Sandy Loam |         | Moderate Granular       |          |
| Bw1     | 9-28"  | 10YR6/4 | Sandy Loam |         | Weak Sub Angular Blocky |          |
| Bw2     | 28-36" | 10YR6/6 | Loam       |         | Weak Sub Angular Blocky |          |

Notes:  
Series: North Cove

| Horizon | Depth  | Color   | Texture    | Mottles | Structure                   | Fragment |
|---------|--------|---------|------------|---------|-----------------------------|----------|
| A       | 0-4"   | 10YR4/3 | Sandy Loam |         | Moderate Granular           |          |
| Bw1     | 4-14"  | 10YR6/4 | Sandy Loam |         | Weak Sub Angular Blocky     |          |
| Bw2     | 14-27" | 10YR6/6 | Sandy Loam |         | Weak Sub Angular Blocky     | 35%      |
| Bw3     | 27-40" | 10YR5/6 | Loam       |         | Moderate Sub Angular Blocky |          |

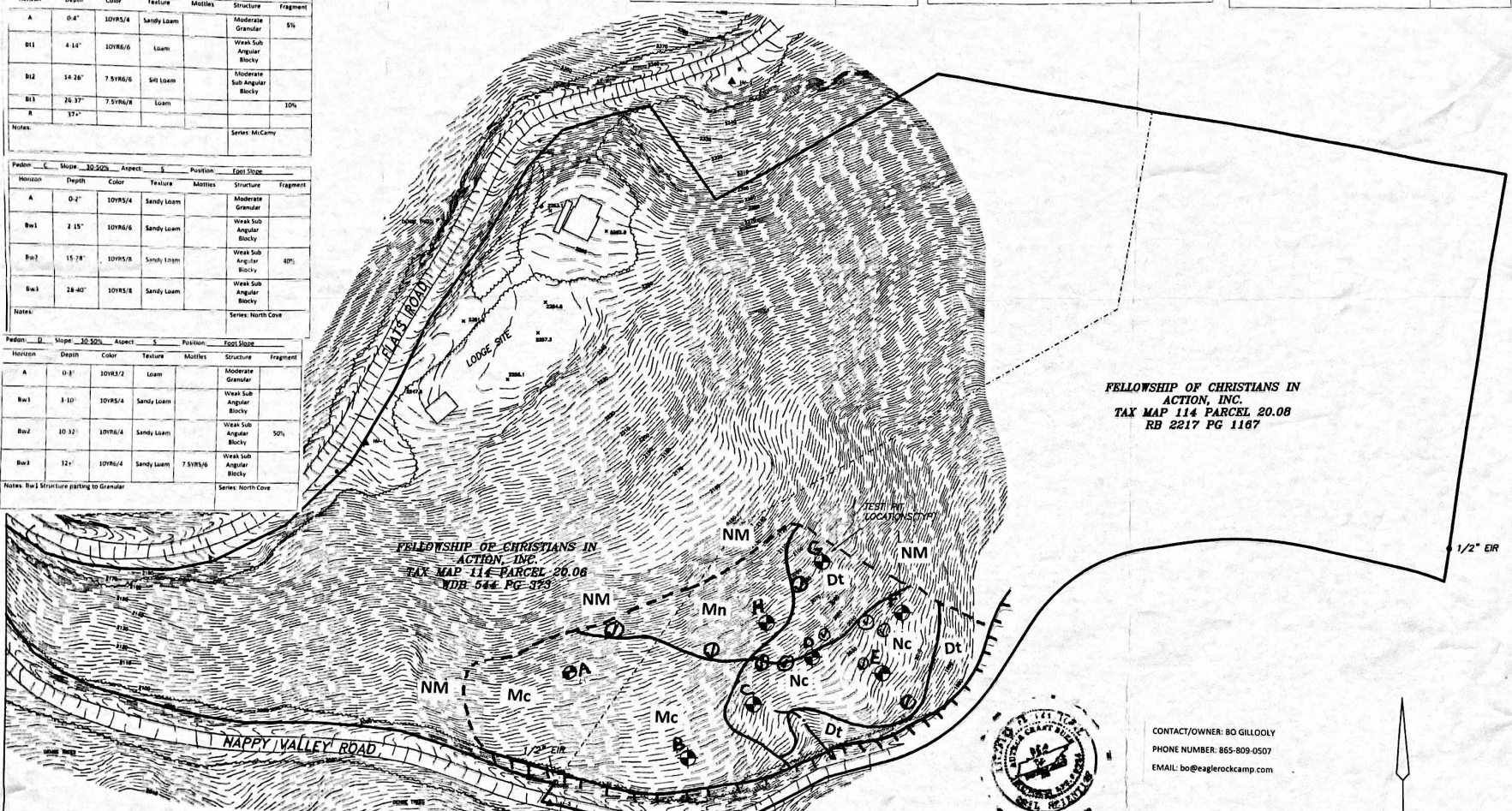
Notes:  
Series: North Cove

| Horizon | Depth  | Color   | Texture    | Mottles | Structure               | Fragment |
|---------|--------|---------|------------|---------|-------------------------|----------|
| A       | 0-3"   | 10YR3/3 | Sandy Loam |         | Moderate Granular       |          |
| Bw1     | 3-10"  | 10YR3/4 | Sandy Loam |         | Moderate Granular       |          |
| Bw2     | 10-24" | 10YR6/6 | Sandy Loam |         | Weak Sub Angular Blocky |          |
| Bw3     | 24-40" | 10YR5/6 | Sandy Loam |         | Weak Sub Angular Blocky |          |

Notes:  
Series: Driveway

| Horizon | Depth  | Color    | Texture | Mottles | Structure                   | Fragment |
|---------|--------|----------|---------|---------|-----------------------------|----------|
| A       | 0-2"   | 10YR4/3  | Loam    |         | Moderate Granular           |          |
| B11     | 2-8"   | 7.5YR5/4 | Loam    |         | Weak Sub Angular Blocky     |          |
| B12     | 8-21"  | 7.5YR5/6 | Loam    |         | Moderate Sub Angular Blocky | 10%      |
| B13     | 21-32" | 7.5YR6/8 | Loam    |         | Moderate Sub Angular Blocky | 10%      |

Notes:  
Series: McCamy



**SURVEYOR'S NOTES:**

- Contour information shown hereon is based on photogrammetric data provided by others. 2 foot Contour interval shown. Elevations shown hereon are based on the NAVD of 1988.
- Boundary lines shown hereon were taken from property surveys by Greg Stroud, project No. 5005-C, dated March 10, 2003 and by Richard H. Everett, project No. 3531-G, dated November 9, 1992.
- No Instruments of Record reflecting easements, rights of way, and/or ownership were furnished to the Surveyor, except as shown hereon. The Surveyor has made no attempt to access the public records for any easements. Subject to any easements, regulations or restrictions in effect at the time of this survey. No title opinion is expressed or implied.
- The Surveyor has made no attempt to locate underground utilities, underground foundations, underground encroachments or underground improvements, except as shown hereon. Actual location of all underground utilities should be verified through Tennessee 1 Call (1-800-351-1111) or the utility provider prior to any excavation or construction.
- This exhibit is not intended to represent a Boundary or General Property Survey as defined in Chapter 0820-3-.07 as set forth by the Tennessee Board of Land Surveyors pursuant to T.C.A. Title 62-18-106(c), and was performed under the authority of T.C.A. Title 62-18-126.

Water Pollution Control Map:  
Soil Map Completed by: *Arthur Grant Dunn* 5/22/21  
Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Arthur Grant Dunn Soil Consultation

I, Arthur Grant Dunn, affirm that this soil map has been prepared in accordance with accepted standards of soil science practice and the standards and methodologies established in the NRSC Soil Survey Manual and USDA Soil Taxonomy. No other warranties are made or implied.

| Soil Series                 | Taxonomic Class                                            |
|-----------------------------|------------------------------------------------------------|
| Mc- McCamy slopes 5-30%     | Fine loamy, siliceous, semiclastic, mesic Typic Hapludults |
| Mn- McCamy slopes 30-50%    | Fine loamy, siliceous, semiclastic, mesic Typic Hapludults |
| Dt- Ditley slopes 30-50%    | Coarse loamy, mixed semiclastic, mesic Typic Dystrudepts   |
| Nc- North Cove slopes 5-30% | Fine loamy, mixed, semiclastic, mesic Typic Dystrudepts    |

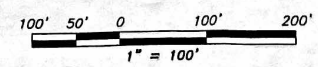
  

| Soil Legend    |  |
|----------------|--|
| Mc- McCamy     |  |
| Mn- McCamy     |  |
| Dt- Ditley     |  |
| Nc- North Cove |  |
| Boulder        |  |
| Cut Bank       |  |
| Drainage Way   |  |
| NM- Not Mapped |  |



**LEGEND:**

- EIR EXISTING IRON ROD
- WDB WARRANTY DEED BOOK
- RB RECORD BOOK
- PG PAGE
- TYP TYPICAL
- SPOT HEIGHT
- BOUNDARY LINE
- PARCEL LINE
- EDGE OF ROAD
- EXISTING INTERMEDIATE CONTOUR
- EXISTING INDEX CONTOUR
- TEST PIT



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