LARAMIE ENERGY

CASCADE CREEK ANNEX CUTTINGS FACILITY TOPSOIL PROTECTION PLAN

Prepared for:

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I. INTRODUCTION

At the request of Laramie Energy, LLC (Laramie), WestWater Engineering (WestWater) has prepared this topsoil protection plan for the proposed Cascade Creek Annex Cuttings Facility. The proposed cuttings facility would be located in Garfield County, Colorado in Section 15, Township 6 South, Range 97 West, Sixth Principal Meridian (Figure 1). The proposed project would be approximately 2.95 acres located on an existing well pad. Project construction activities would re-disturb interim reclamation during initial clearing and grading. Site layout drawings of the well pad are attached in Appendix A. This topsoil protection plan applies to the areas where Laramie plans to cause surface disturbance associated with the proposed Annex Cuttings Facility and addresses the requirements of the Colorado Oil and Gas Conservation Commission's (COGCC) 304.c.(14), 1001.a, 1002.b and 1002.c rules for reclamation regulations. It should be noted that per the COGCC 304.c.(14) rule, in no case will topsoil be used for building the location, nor can it be left in place and covered by subsoil in a cut and fill situation.

II. PROJECT AREA DESCRIPTION

The proposed Cascade Creek Annex Cuttings Facility would be located on gently rolling hills of the Roan Plateau between Cascade Creek to the west and McKay Gulch to the east. Elevation in the project area is approximately 8,500 feet. The current primary uses of the land are natural gas development, rangeland, and wildlife habitat. The historical and current land use description at the site is Rangeland.

Soils

The Cascade Creek Annex Cuttings Facility would be located on the top of gently sloping ridge with slopes ranging from 3 to 10 percent with moderate (approximately 15-20 percent) shoulder slopes. No rock outcroppings or active springs or seeps were observed during the site survey. There are three main vegetation community types present surrounding the project area: mountain shrublands, sagebrush shrublands, and aspen woodlands. The current proposed project footprint would be located on two soil type as described in Table 1, and shown on Figure 2 (NRCS 2021).

Table 1. Soils occurring in the project area.

Map Unit Symbol	Soil Name	Description
52	Northwater-Adel complex	Occurs on mountain slopes and is derived from colluvium over residuum weathered from sandstone and shale.
56	Parachute-Irgual-Rhone Association, 25-50% slopes	Not prime farmland. Is well drained with high runoff rating. This soil occurs on mountains.

Vegetation

There are three main vegetation community types present surrounding the project area: mountain shrublands, sagebrush shrublands, and aspen woodlands. The mountain shrublands are composed primarily of Utah serviceberry (*Amelanchier utahensis*) intermixed with mountain snowberry (*Symphoricarpos oreophilus*), Gambel oak (*Quercus gambelii*), and mountain big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Sagebrush shrublands are composed primarily of mountain sagebrush and mountain snowberry with an understory of native perennial grasses and forbs. North-facing slopes in the surrounding area support patchy aspen woodlands composed of quaking aspen (*Populus tremuloides*), mountain snowberry, and chokecherry (*Prunus virginiana*). Common plants observed throughout the survey area are described in Table 2.

Table 2. Common plant species surrounding the project area.

Common Name	Scientific Name	**Abundance***	Habitat Type
Grasses and Grass-like plants			
Intermediate wheatgrass	*Thinopyrum intermedium*	xxx	Reclaimed/disturbed area
Kentucky bluegrass	*Poa pratensis*	xx	Mountain shrub, aspen woodland
Muttongrass	*Poa fendleriana*	xx	Mountain shrub, sagebrush shrubland, aspen woodland
Sandberg bluegrass	*Poa secunda*	xx	Mountain shrub, sagebrush shrubland, aspen woodland
Slender Wheatgrass	*Elymus trachycaulus*	xx	Reclaimed/disturbed area
Smooth Brome	*Bromus inermis*	xxx	Reclaimed/disturbed area
Tall Wheatgrass	*Thynopyrum ponticum*	xx	Reclaimed/disturbed area
Forbs			
American vetch	*Vicia americana*	xxx	Mountain shrub, sagebrush shrubland
Arrowleaf balsamroot	*Balsamorhiza sagitta*	x	Mountain shrub, sagebrush shrubland, aspen woodland
Badlands mule-ears	*Scabrethia scabra*	xxx	Mountain shrub, sagebrush shrublands
Bluntseed sweetroot	*Osmorhiza depauperata*	xxx	Mountain shrub, aspen woodland
Canadian white violet	*Viola canadensis*	xxx	Aspen woodland
Common dandelion	*Taraxacum officinale*	xx	Mountain shrub, sagebrush shrublands, aspen woodland
Common yarrow	*Achillea millefolium*	xxx	Reclaimed/disturbed area, mountain shrub, aspen woodland

Common Name	Scientific Name	**Abundance***	Habitat Type
Lambstongue ragwort	*Senecio integerrimus*	xxx	Mountain shrub, sagebrush shrublands
Larkspur	*Delphinium sp.*	xxx	Mountain shrub, aspen woodland
Silvery lupine	*Lupinus argenteus*	xxx	Mountain shrub, aspen woodland, sagebrush shrublands
Stinging nettle	*Urtica dioica*	xx	Mountain shrub, aspen woodland
Western valerian	*Valeriana occidentalis*	xxx	Mountain shrub
Woods' Rose	*Rosa woodsii*	xxx	Mountain shrub, aspen woodland
Shrubs/Trees			
Chokecherry	*Prunus virginiana*	xx	Mountain shrub, aspen woodland
Gambel's oak	*Quercus gambelii*	xx	Mountain shrub
Mountain mahogany	*Cercocarpus montanus*	xxx	Mountain shrub
Mountain snowberry	*Symphoricarpos oreophilus*	xxx	Mountain shrub, sagebrush shrublands
Quaking aspen	*Populus tremuloides*	xxx	Mountain shrub, aspen woodland
Rocky mountain maple	*Acer glabrum*	xx	Mountain shrub, aspen woodland
Rubber rabbitbrush	*Ericameria nauseosa*	x	Reclaimed/disturbed area, mountain shrub
Utah serviceberry	*Amelanchier utahensis*	xxx	Mountain shrub
Mountain sagebrush	*Artemisa tridentata* ssp. *vaseyana*	x	Mountain shrub, sagebrush shrublands
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*	x	Mountain shrub, sagebrush shrublands

* x= uncommon in project area.
xx= moderate frequency throughout project area.
xxx = common frequency throughout project area.

III. SOIL ASSESSMENT

The Annex Cuttings Facility is an existing location that will be expanded to accommodate the cuttings management facility. Because the majority of the location is existing and topsoil has already been stripped and stockpiled, soil samples for analysis were collected adjacent to the project disturbance area as shown on Figure 2.

Methods

Soil survey and baseline soils information were obtained from the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA) (NRCS 2021). On-site visual and tactile soil investigations were conducted on hand-dug soil pits to evaluate macroscopic characteristics of disturbed soils from four locations for fertility testing within the proposed disturbance area as shown on Figure 2.

The soil samples were collected from within the proposed disturbance area at depths ranging from 7 inches to 9 inches. All soil samples were analyzed for soil chemical and physical properties to determine topsoil quality and recommendations for nutrient amendments.

Results

The proposed well pad would occur within two mapped soil types according to NRCS (NRCS 2021) (Figure 2). Soil samples were collected from each mapped soil type and results of the laboratory analysis are provided in Appendix B. Field observations, including photographs, of the topsoil including color, texture, and other information is provided in Appendix B for each soil sample and pit location.

Based on field observations the soils within the pad disturbance area appear to provide suitable topsoil to a minimum depth of 6 inches. In some areas topsoil availability is present to a depth of 9 inches. Moderate to high organic matter was present at all sample sites. Soil texture varied from sandy clay loam to clay loam. Topsoil depths were determined based on root structure, organic content, and soil color/texture changes.

Topsoil Stripping Notes– The entire area is suitable to be stripped for topsoil to a minimum depth of 6-inches for topsoil. It is estimated that 5,050 cubic yards of topsoil is available to be salvaged on the location. A site plan depicting the topsoil storage areas is attached in Appendix A. In areas where topsoil depth is greater than 6 inches, Laramie will strip topsoil to the appropriate depth to the extent feasible. Laramie will preserve all available topsoil, and will prepare as-built drawings, which will then be provided to COGCC.

IV. TOPSOIL MANAGEMENT

Working Surface Preparation/Construction Activities

During construction of the Annex Cuttings Facility, it is recommended that areas of bare soil are minimized as much as possible within the work zone. Topsoil management considerations will be applied to the storage of topsoil to ensure erosion and sediment transportation is minimized, in addition to ensuring that potential contamination and compaction is also mitigated per COGCC Regulation 1002.c and e.

Topsoil Handling

Proper handling and storage of topsoil is critical to successful revegetation, especially in the case of reestablishing important native plant species on disturbed areas. The topsoil contains soil microbes (i.e., bacteria, mycorrhiza, invertebrates), and seed banks of viable seed for the native plants present on the site. Many native plant species depend upon the activity of soil microbes for germination in some instances and for establishment and survival of most seedlings.

Per COGCC Regulation 1002.b(2) and (3), the top 6-inches or the topsoil horizon (whichever is deeper) of soil should be stockpiled and separated to prevent mixing with any other trench material. If the topsoil horizons are too rocky, or too thick, the topsoil shall be segregated to the greatest extent possible and stored. Soils that are comprised of 35% or more rock, or have soil horizons that are less than 6-inches in thickness, fit this classification. It is estimated that there are 5,050 cubic yards of topsoil available at this location which will be will be segregated and stockpiled separately from other soils as shown on the site layout drawings attached in Appendix A.

Topsoil will be protected from erosion and weed invasion. Topsoil will be stockpiled in separate piles from other soil horizons on stable slopes and will be positioned to minimize exposure to wind and water erosion. Topsoil piles stored for longer than 30 days will be seeded with the following seed mix:

Upper Cascade Creek Seed Mix:
20% - Streambank Wheatgrass, *Sodar*
20% - Bluebunch Wheatgrass, Secar
20% - Western Wheatgrass, *Arriba*
20% - Crested Wheatgrass, *Hycrest*
10% - Russian Wildrye, *Bozoisky II*
10% - Indian Ricegrass, *Paloma*

Drill Seed Rate: 15 pounds PLS per acre
Broadcast Seed Rate: 30 pounds PLS per acre

Using the recommended seed mixes on long-term storage piles will help maintain biological activity and provide a seed bank of viable seed. If long-term stockpiling or deep stockpiling cannot be avoided, application of mycorrhizal inoculants (see section below) may also be beneficial to help ensure the topsoil maintains optimal condition for reclamation purposes.

The stockpiled topsoil will be spread out along the facility's surface after construction has been completed. Re-contouring of the pad surface to its original or near-original grade will occur after soils have been re-spread.

A Storm Water Management Plan (SWMP) will be prepared in accordance with COGCC Regulation 1002.f for this project which will include additional descriptions of soil stabilization methods and Best Management Practices (BMPs) that should be used during and post-construction.

Soil Preparation

Before seeding begins, the soil needs to be prepared. The objective is to have the top 12-inches of soil decompacted to allow for root growth and still be firm enough on the surface to allow for good seed to soil contact (Whisenant 2003). Compaction can reduce water infiltration and also hinder the penetration of the sprouting seed. During interim reclamation, it is recommended that the following practices are implemented to help reduce compaction and prepare the seedbed: scarification, tillage, disking, chisel plowing, cultipacking, or harrowing (Colorado Natural Areas Program et al. 1998). In the event there is significant compaction, ripping with heavy equipment should be implemented when soil moisture levels are below 35% of field capacity, to a depth of 18-inches as recommended by COGCC Regulation 1003.c.

The proposed project will be located on relatively flat slopes (0-10% slope) which should facilitate reseeding success due to minimization of potential erosion from runoff (Figure 1). Imprinting the soil is recommended to help reduce soil runoff. Imprinting can be done in the form of dozer tracks or furrows perpendicular to the direction of slope. When utilizing hydro-seeding followed by mulching, imprinting should be done prior to seeding unless the mulch is to be crimped into the soil surface. If broadcast seeding and harrowing, imprinting should be done as part of the harrowing. Other simple imprinting methods include deep hand raking and harrowing, always perpendicular to the direction of slope. The effectiveness of the imprinting should be reviewed during standard storm water inspections. If needed, the imprinting will undergo maintenance to ensure the topsoil conditions facilitate revegetation efforts and minimize erosion.

Soil Amendments

The addition of soil amendments in rangeland reclamation projects can create more optimal growing conditions for non-native or invasive plant species, with which native plants compete poorly. There is potential that the use of soil amendments (fertilizer) containing nitrogen will disproportionately benefit undesirable annual plants (Perry et al. 2010). If the company determines the use of soil amendments to be beneficial, the type and rate should be based on results from lab analysis of soil samples collected at the site. The bioavailability of the nutrients found in the soil is an important consideration when assessing whether or not to add particular amendments.

A potentially beneficial alternative method to enhance reclamation success, particularly where there is poor or destroyed topsoil, is the application of vesicular-arbuscular mycorrhizal fungi (AMF). These fungi, mostly of the genus *Glomus*, are symbiotic with about 80 percent of all vegetation. Endo-mycorrhizal fungi are associated mostly with grasses and forbs and could be helpful in reclamation. In symbiosis, the fungi can increase water and nutrient transfer capacity of the host root system (Barrow and McCaslin 1995). Over-the-counter commercial products are available, and the best products should contain more than one fungus species.

Compacted soils respond well to fossilized humic substances and by-products called humates. These humates, including humic and fulvic acids and humin were formed from pre-historic plant and animal deposits and can benefit reclamation efforts on compacted soils when applied as directed. The use of these humic products will also help facilitate an environment in which the beneficial microbial activity is increased while also improving the soil structure and making the nutrients in the native soils more bioavailable for plant uptake (Khaled and Fawy 2011).

Seed Mixture

Upon final reclamation, the recommended seed mix below (Table 3) should be used. This seed mix is adapted from the Bureau of Land Management's Colorado River Valley Field Office seed menu recommendations (BLM 2017). The seed mix is well suited for the vegetation communities that occupied the site prior to disturbance. The mixes include perennial native grasses and forbs that should establish well, protect topsoil, and provide a basis for rehabilitation of the site upon reclamation. The seed mix was included to meet the requirements of the COGCC Regulation 1003.e.(2).

Table 3. Recommended seed menu for mixed mountain shrubland, including oakbrush.

Common Name	Scientific Name	Variety	Season	Form	PLS lbs/acre*
Plant Both of the Following (20% Each, 40% Total)					
Bottlebrush Squirreltail	*Elymus elymoides, Sitanion hystrix*	VNS	Cool	Bunch	2.7
Bluebunch Wheatgrass	*Pseudoroegneria spicata, Agropyron spicatum*	Secar, P-7, Anatone, Goldar	Cool	Bunch	3.7
and Two of the Following (15% Each, 30% Total)					
Thickspike Wheatgrass	*Elymus lanceolatus ssp. lanceolatus, Agropyron dasystachyum*	Critana, Bannock, Schwendimar	Cool	Sod-forming	2.5
Slender Wheatgrass	*Elymus trachycaulus, Agropyron trachycaulum*	San Luis	Cool	Bunch	2.5
Western Wheatgrass	*Pascopyrum [Agropyron] smithii*	Arriba, Rosana	Cool	Sod-forming	3.6
and One of the Following (10% Total)					
Big Bluegrass	*Poa ampla*	Sherman	Cool	Bunch	0.3
Canby Bluegrass	*Poa canbyi, P. secunda*	Canbar	Cool	Bunch	0.3
Muttongrass	*Poa fendleriana*	VNS	Cool	Bunch	0.3
and One of the Following (10% Total)					
Letterman Needlegrass	*Achnatherum [Stipa] lettermanii*	VNS	Cool	Bunch	1.7
Columbia Needlegrass	*Achnatherum [Stipa] nelsonii, Stipa columbiana*	VNS	Cool	Bunch	1.7
Green Needlegrass	*Nassella [Stipa] viridula*	Lodorm, Cucharas	Cool	Bunch	1.4
and One of the Following (10% Total)					
Indian Ricegrass	*Achnatherum [Oryzopsis] hymenoides*	Nezpar, Paloma, Rimrock	Cool	Bunch	1.9
Junegrass	*Koeleria macrantha, K. cristata*	VNS (North American origin)	Cool	Bunch	0.1
OPTIONAL: Any combination from the following species may be substituted for up to 10% of the above grasses.					
Silvery Lupine	*Lupinus argenteus*	VNS			
Arrowleaf Balsamroot	*Balsamorhize sagittata*	VNS			
Sulfur Flower	*Eriogonum umbellatum*	VNS			
Yarrow	*Achillea millifolium*	VNS			
Utah Sweetvetch	*Hedysarum boreale*	VNS			
Rocky Mountain Beeplant	*Cleome serrulata*	VNS			
Utah Serviceberry	*Amelanchior utahensis*	VNS			
Mountain Snowberry	*Symphoricarpus oreophilus*	VNS			

Table 3. Recommended seed menu for mixed mountain shrubland, including oakbrush.

Common Name	Scientific Name	Variety	Season	Form	PLS lbs/acre*
Wood's Rose	*Rosa woodsii*	VNS			
White Sage	*Artemisia ludoviciana*	VNS			

***Based on 60 pure live seeds (PLS) per square foot, drill-seeded. Double this rate (120 PLS per square foot) if broadcast or hydroseeded**

For areas where the overburden from the cuttings management facility will be buried during final reclamation, the following seed mix is recommended (Table 4). This seed mix was developed using salt tolerant species that would be able to successfully germinate if the soils are more saline due to the buried cuttings material. It is recommended that the water-based bentonite drill cuttings overburden is buried at a minimum depth of 4-feet.

Table 4. Recommended Seed Mix for Final Reclamation of Drill Cuttings Overburden.

Common Name	Scientific Name	Variety	Form	PLS lbs/acre*
Plant 15% Each of the Following for 60% of the Total				
Slender Wheatgrass	*Elymus trachycaulus*	San Luis	Bunch	4.0
Thickspike Wheatgrass	*Elymus lanceolatus ssp. lanceolatus*	Critana,	Sod-forming	3.0
Mountain Brome	Bromus marginatus	Bromar	Bunch	4.0
Bluebunch Wheatgrass	*Pseudoroegneria spicata ssp. inermis*	Whitmar	Bunch	3.0
and Three of the Following (5% Each, 15% Total)				
Western Wheatgrass	*Pascopyrum smithii*	Arriba	Sod-forming	1.5
Sandberg Bluegrass	*Poa secunda ssp. sandbergii*	UP Plateau	Sod-forming	0.25
Indian Ricegrass	*Achnatherum hymenoides*	Rimrock	Bunch	1.5
Big Bluegrass	*Poa secunda ssp. ampla*	Sherman	Sod-forming	0.25
and Two of the Following (10% Each, 20% Total)				
Northern sweetvetch	*Hedysarum boreale*	Timp	Forb	1.0
Rocky Mountain Penstemon	*Penstemon strictus*	Bandera	Forb	0.5
Lewis flax	*Linum lewisii*	VNS	Forb	0.5
Scarlet Globemallow	Sphaeralcea coccinea	VNS	Forb	0.25

Common Name	Scientific Name	Variety	Form	PLS lbs/acre*
and One of the Following (5% Total)				
Fourwing Saltbush	*Atriplex canescens*	VNS	Shrub	2.0
antelope bitterbrush	*Purshia tridentata*	VNS	Shrub	4.0
*Based on 50 pure live seeds (PLS) per square foot, drill-seeded. Double this rate (100 PLS per square foot) if broadcast or hydroseeded.				

Seeding Methods

Seeding should be conducted no more than 24 hours following completion of final seedbed preparation (BLM 2019). For best results and success, reseeding should be done in late autumn. If seeding is completed in the late autumn, it is recommended that a hydromulch is applied post-construction to stabilize the soils until seeding is completed. However, if Laramie determines it is more beneficial and cost-effective to seed immediately following project construction, it is recommended that hydroseeding and/or hand broadcast seeding is completed.

It is recommended that the seed application rate be doubled if using broadest, or hydroseed methods. If the site is hydroseeded it is recommended that a soil amendment and erosion control mulch is applied to help with vegetation establishment such as the ProFlex System by Profile or a similar commercial product. For broadcast seeding, the following two seeding methods can also be implemented to improve germination success.

- harrow with just enough soil moisture to create a rough surface, broadcast seed and re-harrow, preferably at a 90-degree angle to the first harrow; or
- hand raking and broadcast followed by re-raking at a 90-degree angle to the first raking.

These are not the only means of replanting the site. However, these methods have been observed to be effective in similar landscapes.

After two years of controlling weeds (with herbicides) and allowing the grasses to become established, woody species should be inter-seeded or hand-planted to increase the diversity and value of the reclamation plantings. Regular surveys for noxious weeds should be completed to help ensure the seedbank of undesirable species is not inadvertently increased during reclamation processes in accordance with COGCC Regulation 1003.f.

Mulching

If areas are broadcast seeded it is recommended that an application of certified weed-free straw, mulch, erosion control netting (i.e., Jute, wood excelsior, etc.), or erosion control blankets are installed within 24 hours of seeding to help protect soil from erosion and increase soil moisture content. Potential detrimental effects of mulching include the introduction of weed species and the establishment of non-native cereal grains. Use of a certified weed-free sterile wheat hybrid straw mulch would limit these effects. Straw mulch is most effective on gentle to moderate slopes and can be hand broadcast in a uniform depth across the project site of 2-3 inches. The application rate of straw mulch is approximately 2 tons per acre (NRCS 2002). If straw mulch is

used it should be crimped into the soil surface. Erosion control blankets and netting are typically used in applications where there is a steep slope, but can also be used to help maintain soil stability while seedlings establish in areas where the slope is not considered moderate to steep. The material is often biodegradable and does not need to be removed once it has been installed.

BMPs

A Storm Water Management Plan will be prepared for this project which will provide additional details for the appropriate Best Management Practices (BMPs) to be utilized during and post-construction activities. For more specific details, please refer to the respective document. BMPs such as hydromulching, installation of small earthen berms, diversion ditches, and straw wattles are common BMPs with regards to storage and reclamation of stockpiled topsoil. A summary of topsoil protection BMPs are provided in Appendix C.

Noxious Weeds

Increased traffic and activities in the project area may promote conditions that facilitate the spread of invasive noxious weeds from outside the project area. The application of a weed management plan for this project site is recommended to: 1) prevent the invasion and expanded range of noxious weeds; and 2) promote the establishment of desirable plant life upon rehabilitation of the proposed well pad during interim and final reclamation.

Laramie will implement the protocol specified in their Cascade Creek Noxious Weeds Field Plan. This Noxious Weed and Vegetation Management Plan was written with respect to the COGCC Regulations 1003.F, and the Colorado Noxious Weed Act, C.R.S 35-5.5-115. Subsequent to soil disturbances, vegetation communities can be susceptible to infestations of invasive or exotic weed species. Vegetation removal and soil disturbance during construction can create optimal conditions for the establishment of invasive, non-native species. Construction equipment traveling from weed-infested areas into weed-free areas could disperse noxious or invasive weed seeds and propagates, resulting in the establishment of these weeds in previously weed-free areas.

Several simple practices should be employed to prevent most weed infestations. The following practices should be adopted for any activity to reduce the costs of noxious weed control through prevention. The practices include:

- Prior to delivery to the site, equipment should be thoroughly cleaned of soils remaining from previous construction sites which may be contaminated with noxious weeds.
- If working in sites with weed-seed contaminated soil, equipment should be cleaned of potentially seed-bearing soils and vegetative debris at the infested area prior to moving to uncontaminated terrain.
- All maintenance vehicles should be regularly cleaned of soil.
- Avoid driving vehicles through areas where weed infestations exist.

V. REFERENCES

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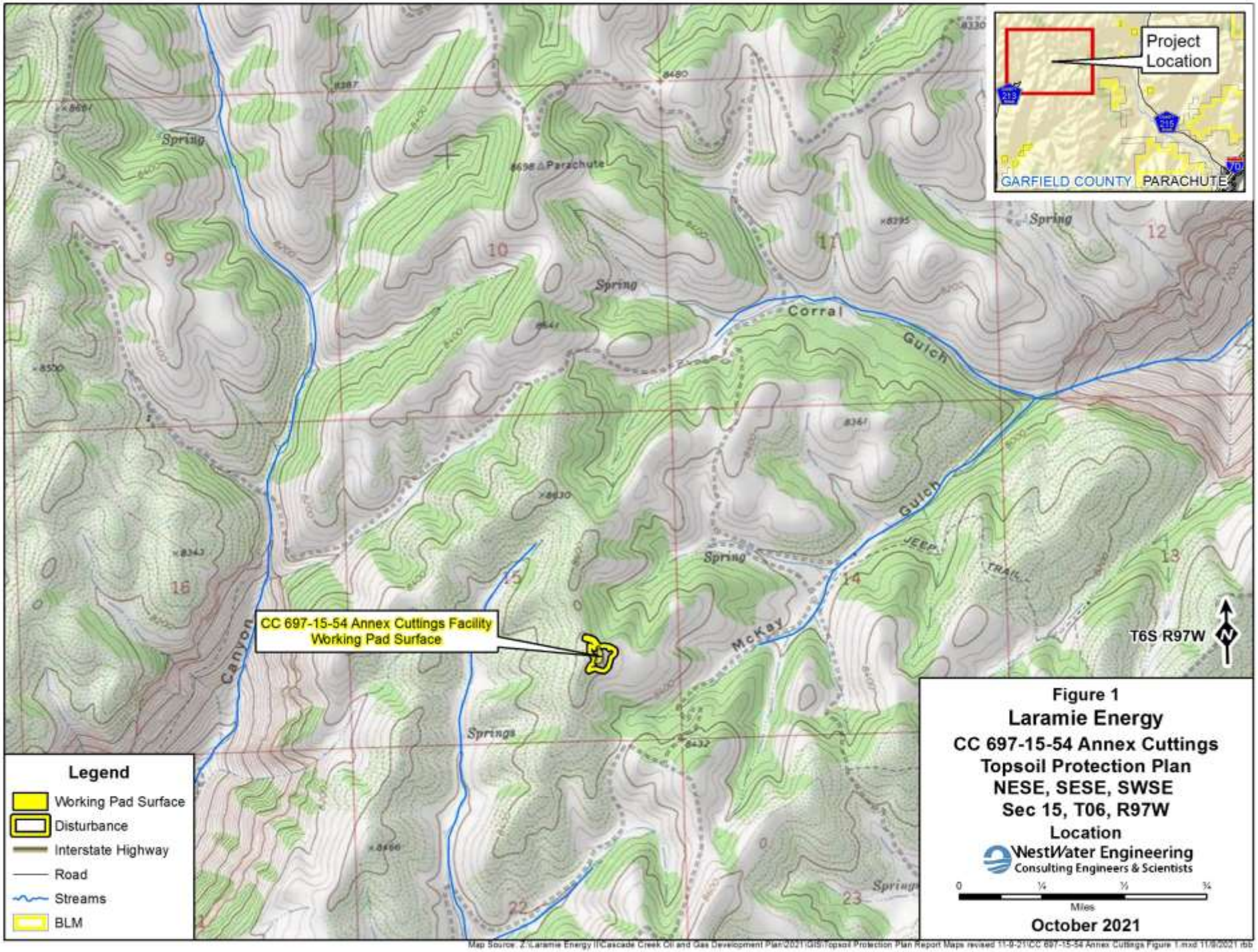
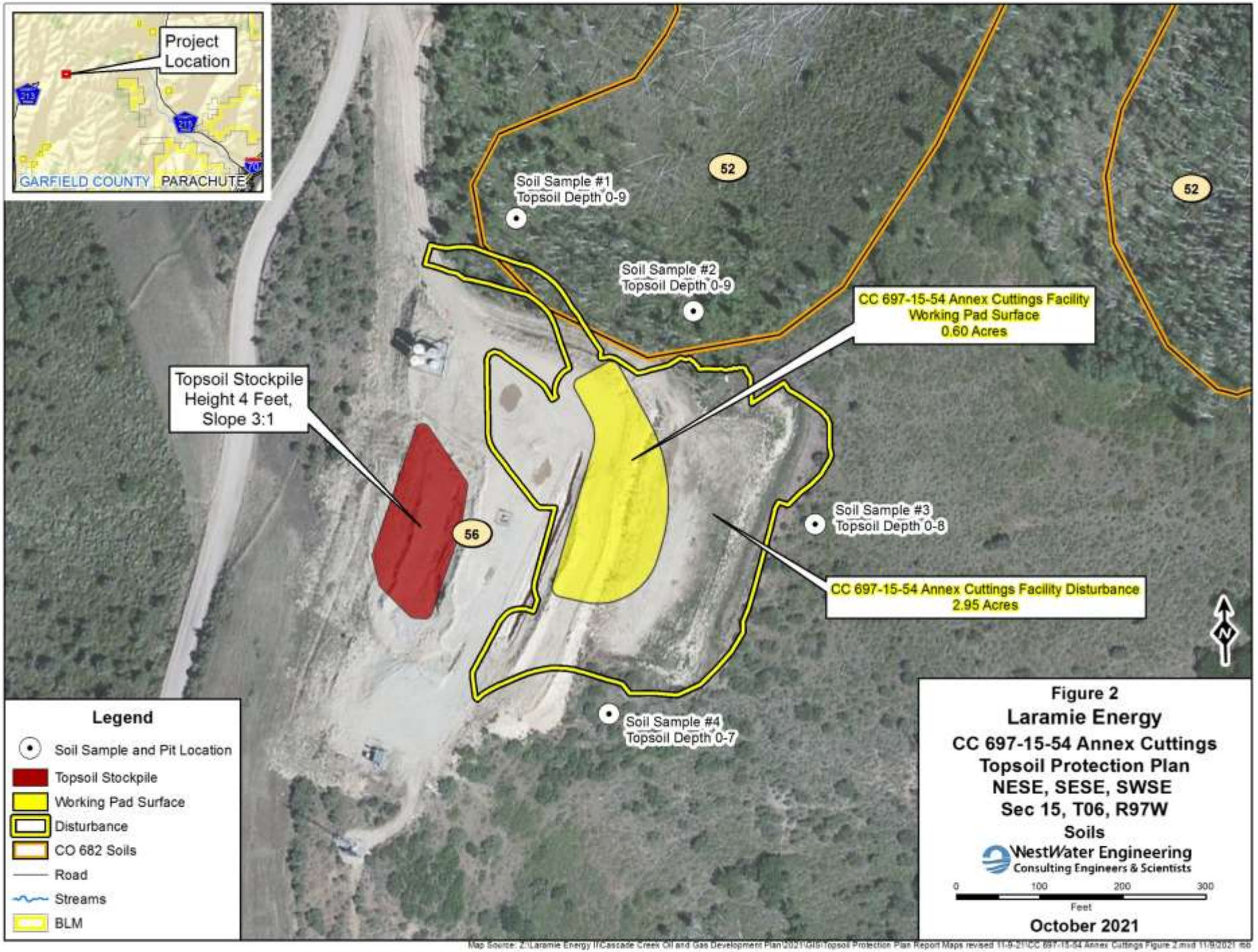

Project Location
GARFIELD COUNTY
PARACHUTE
CC 697-15-54 Annex Cuttings Facility
Working Pad Surface
T6S R97W
Corral Gulch
McKay Gulch
Canyon
JEEP TRAIL
Legend
Working Pad Surface
Disturbance
Interstate Highway
Road
Streams
BLM
Figure 1
Laramie Energy
CC 697-15-54 Annex Cuttings
Topsoil Protection Plan
NESE, SESE, SWSE
Sec 15, T06, R97W
Location
WestWater Engineering
Consulting Engineers & Scientists
0
¼
½
¾
Miles
October 2021
Map Source: Z:\Laramie Energy II\Cascade Creek Oil and Gas Development Plan\2021\GIS\Topsoil Protection Plan Report Maps revised 11-9-21\CC 697-15-54 Annex Cuttings Figure 1.mxd 11/8/2021 rbb

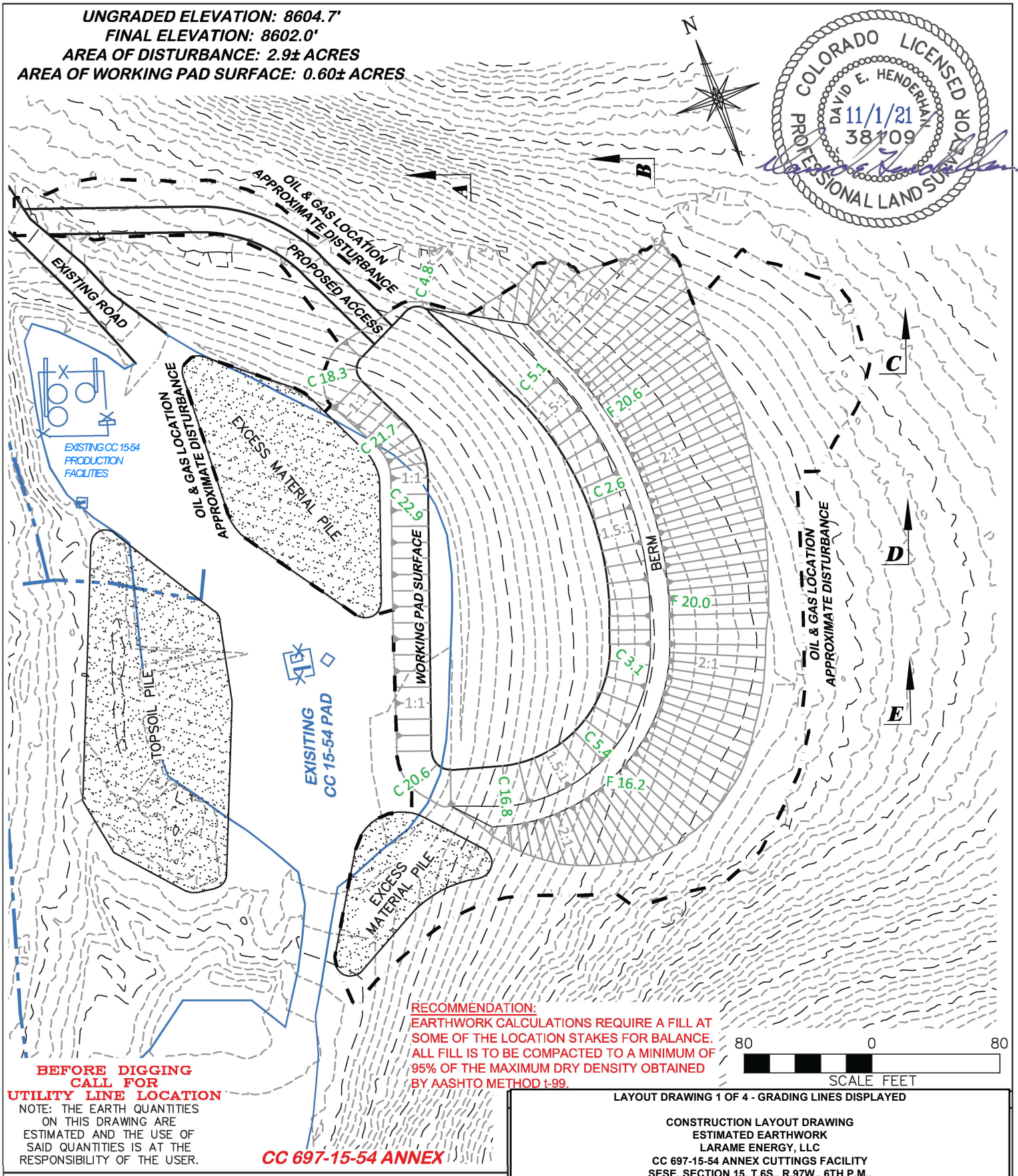


Map Source: Z:\Laramie Energy II\Cascade Creek Oil and Gas Development Plan\2021\GIS\Topsoil Protection Plan Report Maps revised 11-9-21\CC 697-15-54 Annex Cuttings Figure 2.mxd 11/9/2021 tbb

APPENDIX A

SITE LAYOUT DRAWINGS

UNGRADED ELEVATION: 8604.7'
FINAL ELEVATION: 8602.0'
AREA OF DISTURBANCE: 2.9± ACRES
AREA OF WORKING PAD SURFACE: 0.60± ACRES



RECOMMENDATION:
EARTHWORK CALCULATIONS REQUIRE A FILL AT SOME OF THE LOCATION STAKES FOR BALANCE. ALL FILL IS TO BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY OBTAINED BY AASHTO METHOD t-99.

BEFORE DIGGING CALL FOR UTILITY LINE LOCATION

NOTE: THE EARTH QUANTITIES ON THIS DRAWING ARE ESTIMATED AND THE USE OF SAID QUANTITIES IS AT THE RESPONSIBILITY OF THE USER.

CC 697-15-54 ANNEX

LAYOUT DRAWING 1 OF 4 - GRADING LINES DISPLAYED

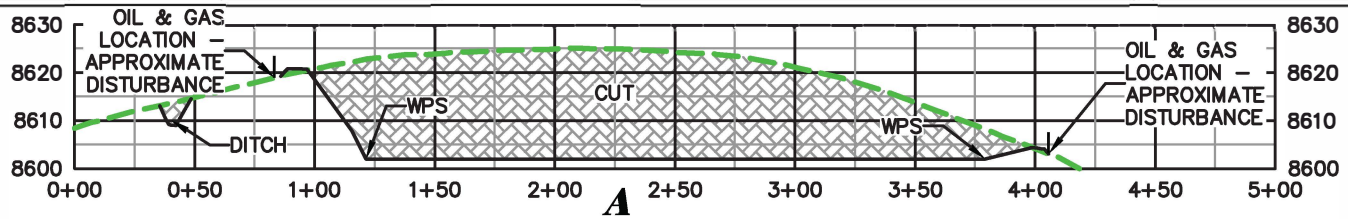
CONSTRUCTION LAYOUT DRAWING
ESTIMATED EARTHWORK
LARAME ENERGY, LLC
CC 697-15-54 ANNEX CUTTINGS FACILITY
SESE, SECTION 15, T.6S., R.97W., 6TH P.M.,
GARFIELD COUNTY, COLORADO

DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

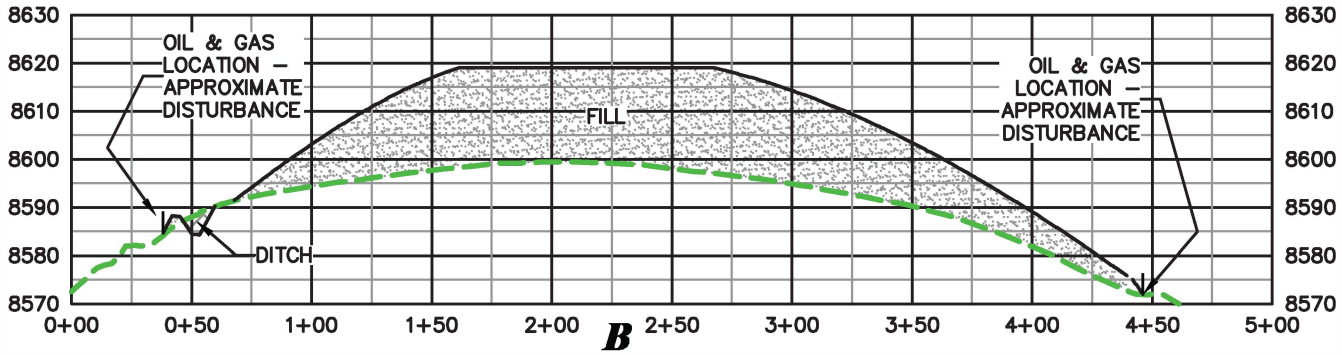
DRAWN: 10/29/2021 - DEH	SCALE: 1" = 80'
REVISED: N/A	DRG JOB No. 21379
	304B(7)BI CONST

ESTIMATED EARTHWORK

ITEM	CUT	FILL	TOPSOIL	EXCESS
PAD	21,426 CY	16,376 CY	5,050 CY	0 CY
PIT	NONE			NONE
TOTALS	21,426 CY	16,376 CY	5,050 CY	0 CY



A



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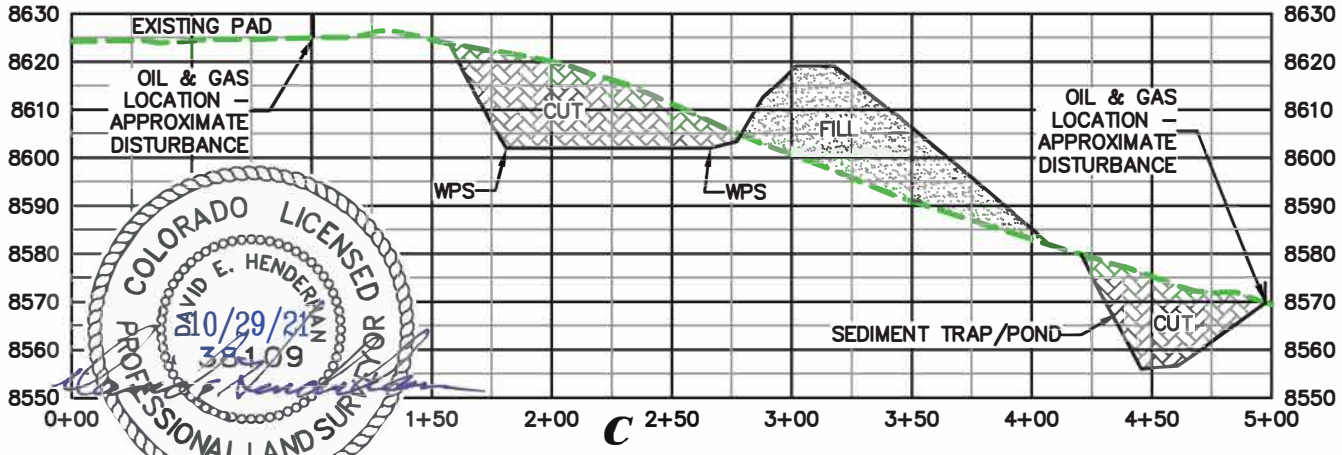

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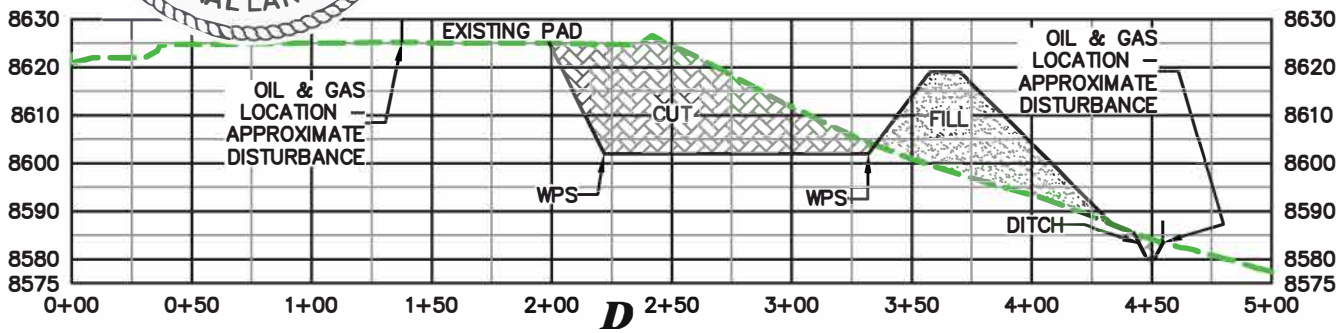
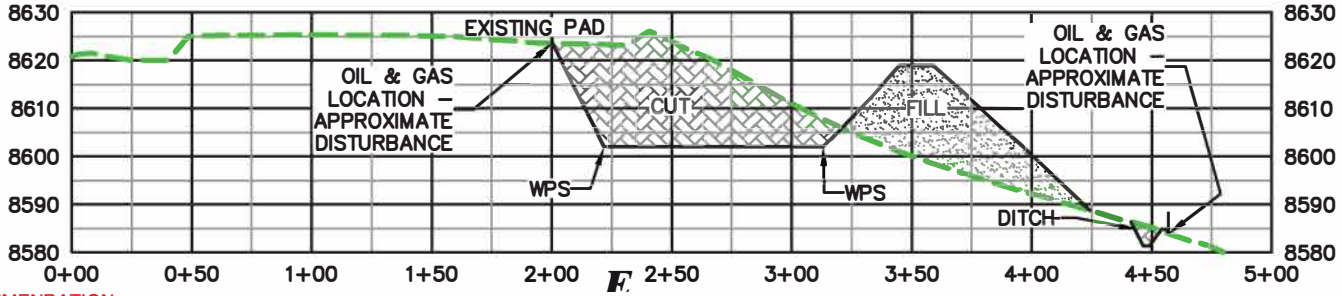


D



E

COLORADO LICENSED PROFESSIONAL LAND SURVEYOR
DAVID E. HENDERMAN
10/29/21
38109

RECOMMENDATION:
EARTHWORK CALCULATIONS REQUIRE A FILL AT SOME OF THE LOCATION STAKES FOR BALANCE. ALL FILL IS TO BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY OBTAINED BY AASHTO METHOD t-99.

CC 697-15-54 ANNEX

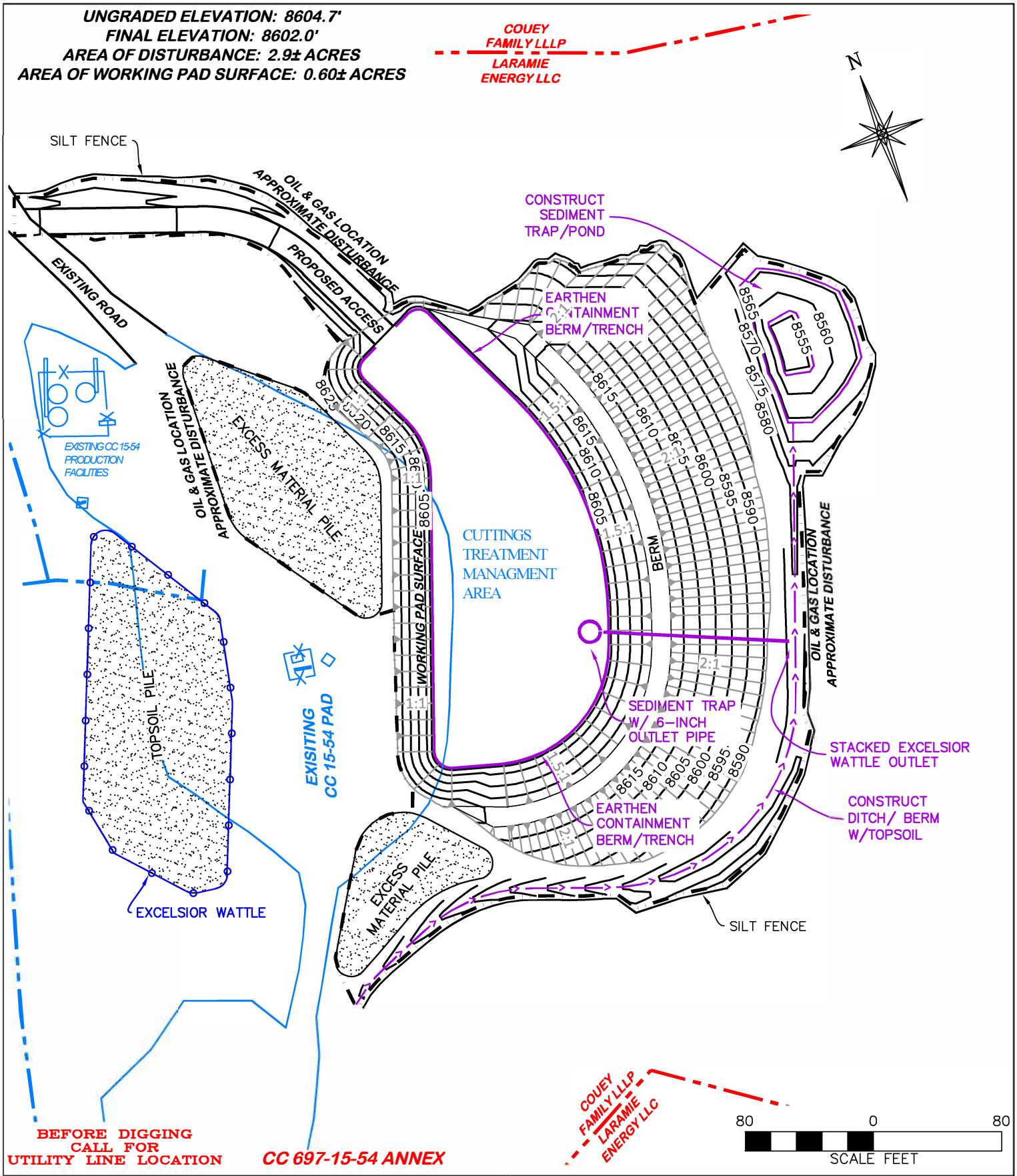
CUT SLOPES 1:1
FILL SLOPES 2:1

DRG GRIFFIN & ASSOCIATES, INC.
1414 ELK ST., ROCK SPRINGS, WY 82901
(307) 362-5028

DRAWN: 10/29/2021 - DEH	SCALE: H - 1" = 80' V - 1" = 80'
REVISED: N/A	DRG JOB No. 21379
	304b(7)Bi XSEC

LAYOUT DRAWING 2 OF 4

CONSTRUCTION LAYOUT DRAWING
CROSS SECTIONS
LARAME ENERGY, LLC
CC 697-15-54 ANNEX CUTTINGS FACILITY
SESE, SECTION 15, T.6S., R.97W., 6TH P.M.,
GARFIELD COUNTY, COLORADO

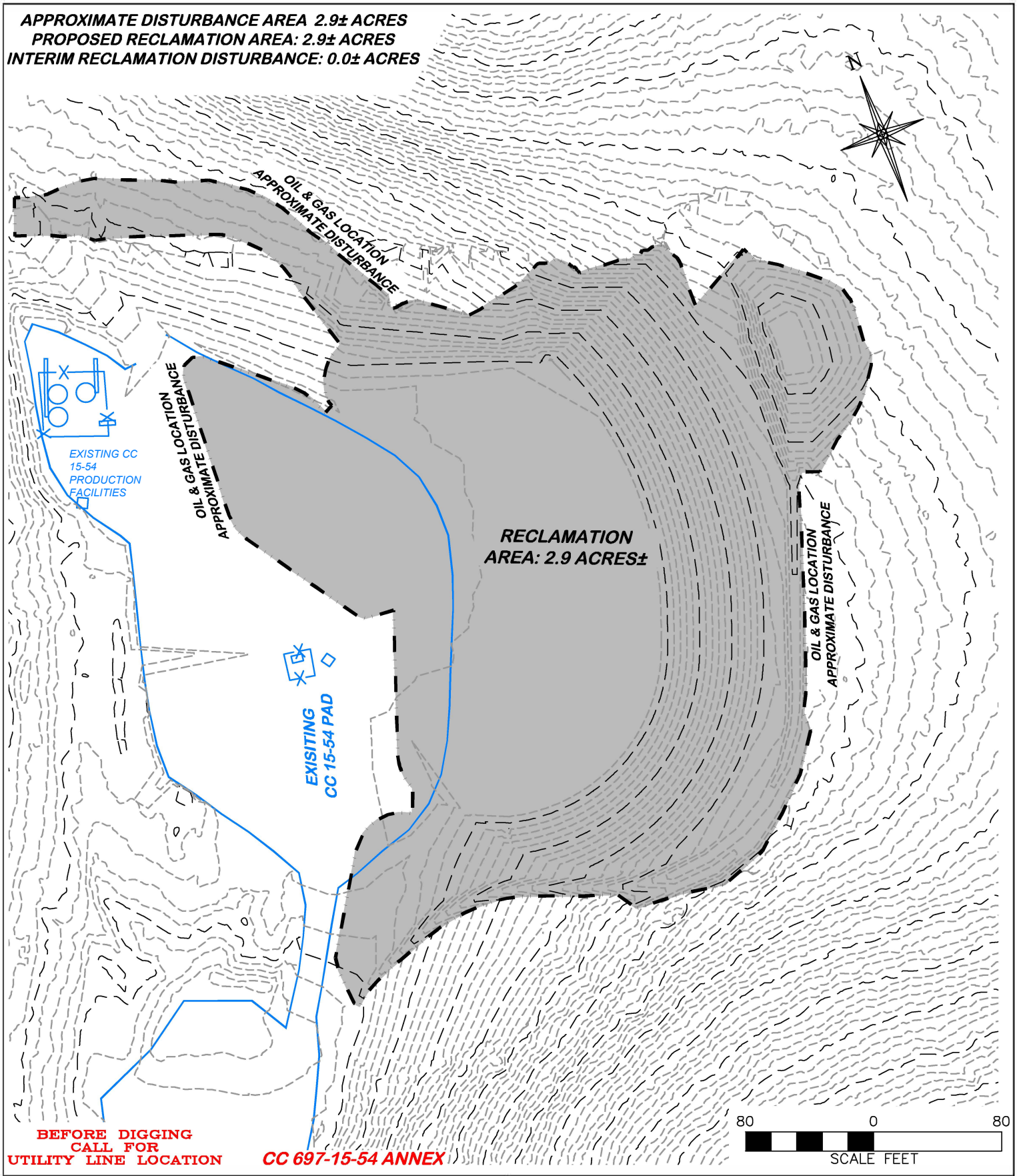


DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 10/29/2021 - DEH	SCALE: 1" = 80'
REVISED: N/A	DRG JOB No. 21379
	304c(15) BMP

LAYOUT DRAWING 3 OF 4 - GRADING LINES DISPLAYED

FACILITY LAYOUT DRAWING
LARAME ENERGY, LLC
CC 697-15-54 ANNEX CUTTINGS FACILITY
SESE, SECTION 15, T.6S., R.97W., 6TH P.M.,
GARFIELD COUNTY, COLORADO



DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028 1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 10/29/2021 - DEH	SCALE: 1" = 80'
REVISED: N/A	DRG JOB No. 21379
	304b.(7),B

LAYOUT DRAWING 4 OF 4

PROPOSED FINAL RECLAMATION
LARAMIE ENERGY, LLC.
CC 697-15-54 ANNEX CUTTINGS FACILITY
SESE, SECTION 15, T. 6 S., R. 97 W., 6th P.M., GARFIELD COUNTY, COLORADO

APPENDIX B

TOPSOIL SAMPLE FIELD OBSERVATIONS

SOIL SAMPLE AND PIT #1

Topsoil Depth	Munsell Color	Texture	Comments
0-9 inches	7.5 YR 3/2	Sandy clay loam	Upper A horizon, high organic content, roots, dry
9+ inches	7/5 YR 3/4	Clay loam	Subtle lightening of soil near 9-inch depth. Indicating close contact with C horizon.

Photo of Soil Sample and Pit #1

SOIL SAMPLE AND PIT #2

Topsoil Depth	Munsell Color	Texture	Comments
0-9 inches	10 YR 3/1	Clay loam	Upper A horizon, high organic content, roots, dry
9+ inches	10 YR 3/3	Clay	Subtle lightening of soil near 9-inch depth. Indicating close contact with C horizon. A change in soil texture and lack of root structure was noted.

Photo of Soil Sample and Pit #2

SOIL SAMPLE AND PIT #3

Topsoil Depth	Munsell Color	Texture	Comments
0-8 inches	7.5 YR 3/2	Clay loam	Upper A horizon, high organic content, roots, dry
8+ inches	7.5 YR 3/4	Clay	Subtle lightening of soil near 9-inch depth. Indicating close contact with C horizon. A change in soil texture and lack of root structure was noted.

Photo of Soil Sample and Pit #3

SOIL SAMPLE AND PIT #4

Topsoil Depth	Munsell Color	Texture	Comments
0-7 inches	7.5 YR 3/2	Sandy clay loam	Upper A horizon, high organic content, roots, dry
7+ inches	7.5 YR 4/2	Clay loam	Subtle lightening of soil near 7-inch depth. Indicating close contact with C horizon.

Photo of Soil Sample and Pit #4

Account No. : 21702

Soil Analysis Report

WILSEY, AMIE
WESTWATER ENGINEERING
2516 FORESIGHT CIR #1
GRAND JUNCTION CO 81505-1022

Invoice No. : 1356757
Date Received : 10/12/2021
Date Reported : 10/14/2021

Results For : AMIE WILSEY
Location : CC 697-15-54

Lab No. : 118183	**Depth :** 0 - 9
ID : WP 542	
1:1 Soil pH	6.4
Modified WDRF BpH	6.7
Soluble Salts 1:1, mmho/cm	0.16
Excess Lime Rating	NONE
Organic Matter LOI, %	6.7
Nitrate-N KCl, ppm N	2.8
Nitrate-N, lbs N / Acre	8
Phosphorus Olsen P, ppm P	9.6
Potassium NH_4OAc, ppm K	275
Sulfate M-3, ppm S	2.7
Zinc DTPA, ppm Zn	0.69
Iron DTPA, ppm Fe	33.8
Manganese DTPA, ppm Mn	3.8
Copper DTPA, ppm Cu	0.14
Calcium NH_4OAc, ppm Ca	2026
Magnesium NH_4OAc, ppm Mg	248
Sodium NH_4OAc, ppm Na	11
Boron Hot Water, ppm B	0.57

Sum of Cations, me/100g	**% Saturation**				
	H	**K**	**Ca**	**Mg**	**Na**
16.2	20	4	62	13	0

Soil Texture	**Sand, %**	**Silt, %**	**Clay, %**
Sandy Loam	58	28	14

Reviewed By : Nick Ward **10/18/2021** **Copy : 1** **Page 11 of 17**

Account No. : 21702

Soil Analysis Report

WILSEY, AMIE
WESTWATER ENGINEERING
2516 FORESIGHT CIR #1
GRAND JUNCTION CO 81505-1022

Invoice No. : 1356757
Date Received : 10/12/2021
Date Reported : 10/14/2021

Results For : AMIE WILSEY
Location : CC 697-15-54

Lab No. : 118184	**Depth :** 0 - 10
ID : WP 543	
1:1 Soil pH	6.7
Soluble Salts 1:1, mmho/cm	0.12
Excess Lime Rating	NONE
Organic Matter LOI, %	9.2
Nitrate-N KCl, ppm N	2.0
Nitrate-N, lbs N / Acre	6
Phosphorus Olsen P, ppm P	8.4
Potassium NH_4OAc, ppm K	324
Sulfate M-3, ppm S	1.4
Zinc DTPA, ppm Zn	0.89
Iron DTPA, ppm Fe	33.5
Manganese DTPA, ppm Mn	3.3
Copper DTPA, ppm Cu	0.09
Calcium NH_4OAc, ppm Ca	2414
Magnesium NH_4OAc, ppm Mg	276
Sodium NH_4OAc, ppm Na	11
Boron Hot Water, ppm B	0.66

Sum of Cations, me/100g	**% Saturation**				
	H	**K**	**Ca**	**Mg**	**Na**
15.3	0	5	79	15	0

Soil Texture	**Sand, %**	**Silt, %**	**Clay, %**
Sandy Loam	56	32	12

Reviewed By : Nick Ward **10/18/2021** **Copy : 1** **Page 12 of 17**

Account No. : 21702

Soil Analysis Report

WILSEY, AMIE
WESTWATER ENGINEERING
2516 FORESIGHT CIR #1
GRAND JUNCTION CO 81505-1022

Invoice No. : 1356757
Date Received : 10/12/2021
Date Reported : 10/14/2021

Results For : AMIE WILSEY
Location : CC 697-15-54

Lab No. : 118185	**Depth :** 0 - 8
ID : WP 544	
1:1 Soil pH	6.6
Soluble Salts 1:1, mmho/cm	0.11
Excess Lime Rating	NONE
Organic Matter LOI, %	4.7
Nitrate-N KCl, ppm N	3.3
Nitrate-N, lbs N / Acre	8
Phosphorus Olsen P, ppm P	8.7
Potassium NH_4OAc, ppm K	291
Sulfate M-3, ppm S	1.7
Zinc DTPA, ppm Zn	0.44
Iron DTPA, ppm Fe	23.3
Manganese DTPA, ppm Mn	4.4
Copper DTPA, ppm Cu	0.15
Calcium NH_4OAc, ppm Ca	2149
Magnesium NH_4OAc, ppm Mg	267
Sodium NH_4OAc, ppm Na	9
Boron Hot Water, ppm B	0.57

Sum of Cations, me/100g	**% Saturation**				
	H	**K**	**Ca**	**Mg**	**Na**
13.8	0	5	78	16	0

Soil Texture	**Sand, %**	**Silt, %**	**Clay, %**
Sandy Loam	60	26	14

Reviewed By : Nick Ward **10/18/2021** **Copy : 1** **Page 13 of 17**

Account No. : 21702

Soil Analysis Report

WILSEY, AMIE
WESTWATER ENGINEERING
2516 FORESIGHT CIR #1
GRAND JUNCTION CO 81505-1022

Invoice No. : 1356757
Date Received : 10/12/2021
Date Reported : 10/14/2021

Results For : AMIE WILSEY
Location : CC 697-15-54

Lab No. : 118186	**Depth :** 0 - 7
ID : WP 545	
1:1 Soil pH	6.8
Soluble Salts 1:1, mmho/cm	0.10
Excess Lime Rating	NONE
Organic Matter LOI, %	5.2
Nitrate-N KCl, ppm N	2.3
Nitrate-N, lbs N / Acre	5
Phosphorus Olsen P, ppm P	8.2
Potassium NH_4OAc, ppm K	202
Sulfate M-3, ppm S	2.1
Zinc DTPA, ppm Zn	0.31
Iron DTPA, ppm Fe	16.1
Manganese DTPA, ppm Mn	4.7
Copper DTPA, ppm Cu	0.20
Calcium NH_4OAc, ppm Ca	2712
Magnesium NH_4OAc, ppm Mg	292
Sodium NH_4OAc, ppm Na	16
Boron Hot Water, ppm B	0.57

Sum of Cations, me/100g	**% Saturation**				
	H	**K**	**Ca**	**Mg**	**Na**
16.6	0	3	82	15	0

Soil Texture	**Sand, %**	**Silt, %**	**Clay, %**
Sandy Loam	60	26	14

Reviewed By : Nick Ward **10/18/2021** **Copy : 1** **Page 14 of 17**

APPENDIX C

TOPSOIL PROTECTION BEST MANAGEMENT PRACTICES

Topsoil Protection BMPs

- Protection from Contamination - based on changes in physical characteristics (e.g., organic content, color, texture, density, or consistency) soil horizons will be segregated and stockpiled separately; topsoil stockpiles will be separated by compacted earthen berms, sediment control logs, straw bale barriers, etc.; and stabilizing stockpile surfaces to control for erosion and sedimentation;
- Protection from Compaction - topsoil stockpiles will be indicated on site with signage; stockpiles will be placed in areas away from vehicle and equipment traffic; and when stockpiling, compaction will be minimized by limiting the number of equipment passes, limiting stockpile height, and using vegetation;
- Protection from Wind Erosion - surface roughening, applying hydro-seed/mulch, using soil tackifier, covering stockpiles with rolled erosion control products or other similar measures;
- Protection from Water Erosion - surface roughening, applying hydro-seed/mulch, using soil tackifier, covering stockpiles with rolled erosion control products or other similar measures; and
- Weed Establishment Prevention - mechanical, biological, and chemical controls will be used to prevent the establishment of weeds.