Annex Cuttings Facility

Stormwater Management Plan

Rule 304.c.(15)
Rule 1002.f.

Laramie Energy, LLC
760 Horizon Drive, Suite 101
Grand Junction, CO 81506

1. Introduction – Stormwater Management Plan

The following plan addresses the applicable standards in Rule 1002.f. Stormwater Management as requirement by Rule 304.c.(15) Stormwater Management Plan under 300 Series of the Colorado Oil and Gas Conservation Commission's (COGCC) Rules.

Annex Cuttings Facility

Laramie Energy, LLC (Laramie) (Operator # 10433) is pursuing a Form 2A for a new Oil and Gas Location in Garfield County, Colorado for the development of a non-commercialized drill cuttings treatment and disposal site, the Annex Cuttings Facility (ACF) (**Appendix A – Vicinity Map**). The proposed site will be located on private property, owned by Laramie. The facility's main function will be to accommodate drill cuttings material from three well pad locations. The site's location is centralized to Laramie's Cascade Creek operations area.

The proposed Annex Cuttings Facility will be a non-commercialized E&P Waste Management Facility for the treatment and disposal of drill cuttings from three proposed well pad locations within Laramie's Cascade Creek field. The ACF and the three well sites are proposed in the *Laramie Energy 2021 Cascade Creek Oil and Gas Development Plan*. The facility will only manage the treatment and disposal of cuttings generated by Laramie's drilling activities and will not provide services to third parties. The site will be permitted and operated in accordance with applicable local, state, and Federal regulations.

Laramie Energy estimates that 19,800 cubic yards of untreated water-based bentonite drilling cuttings (to be managed as Oily Waste per COGCC Rule 905.g.(1)C.).will need to be transported to ACF. The proposed site design is to provide storage, treatment, and disposal for water-based bentonite drilling cuttings (to be managed as Oily Waste per COGCC Rule 905.g.(1)C.) for 40 wells from the 3 well sites and will allow for 22,000 cubic yards of material to be managed and treated.

Location

The site is located on Parcel #216921400026 within Garfield County, Colorado. The parcel is located 12.2 miles north of De Beque, Colorado. The site is located approximately 14 miles northeast of De Beque, Colorado and 21.8 miles northeast by access route. The site is located approximately 9.7 miles from the nearest public road, County Road 213.

Legal Description: SESE of Section 15, Township 6 South, Range 97 West, 6th P.M.
Location Coordinates: Latitude: 39.519233°; Longitude: -108.200979°.
Elevation: 8625 feet mean above sea level.

Construction and Operations Activities Time Frame

Operations will be conducted in the following stages: initial grading activities, transportation, treatment, burial/disposal, and final grading and reclamation activities. Phases may occur simultaneously at the site. Sampling and inspection activities will occur during the lifespan of the site; therefore, do not have a specific time interval. Laramie anticipates that the facility will remain in operations for approximately 3-5 years.

Table 1: Construction and Operations Time Intervals

Stage	Time Interval (Days)
Initial Grading Activities	10
Transportation	30-50
Treatment	540
Sampling and Inspections	-
Final Grading and Reclamation Activities	27

2. Supplement Site Information

The new location will be constructed on previously disturb land. The location was formerly developed as an annex pad to the CC 0697-15-54 well site. No native land will be disturbed in the development of this location/facility. The Layout Drawings for the proposed disturbance (**Appendix B**) includes topsoil, cut, and fill estimates for pad construction and stormwater control features. The total acreage disturbance for the facility will be 2.95 acres.

Table 2. Disturbance Acreage for the Annex Cuttings Facility

Annex Cuttings Facility Location	Disturbance in Acres
Proposed Construction on Previously Disturbed Land	2.95
Proposed Construction on Native Land	0
Working Pad Surface (WPS)	0.60
Total Area of Disturbance	2.95
Area to be Reclaimed	2.95
Production Phase/ Long-Term Disturbance (after Interim Reclamation)	0

After treatment of drill cuttings, the site will be reclaimed. There will be no long-term disturbance associated with this location. Final reclamation and grading activities will take approximately 27 days to complete.

Soil Description

A soils report from the Natural Resource Conservation Service (NRCS) indicates that within the proposed site perimeter and part of the surrounding area is the Parachute-Irigul-Rhone association (Map Unit 56) soils. The area bordering the northeast site perimeter is the Northwater-Adel complex (Map Unit 52) soils. The NRCS Soils Map is provided in **Appendix C**.

Parachute-Irigul-Rhone association (Map Unit 56)

The Parachute-Irigul-Rhone association soil unit is composed of Parachute and similar soils (35%), Irigul and similar soils (30%), Rhone and similar soil (30%) and minor components (5%). Parachute, Irigul, and Rhone all originated from accumulated weathered sandstone and shale Each have a water transmission rate that is low to moderately high at 0.01 to 0.57 inches per hour.

Parachute is a well drained soil with low available water storage of about 3.9 inches. Parachute is classified as hydrologic soil group C which defines the soil as having a slow infiltration rate

when thoroughly wet.
Typical profile: A - 0 to 10 inches: loam
Bw - 10 to 25 inches: very channery loam
R - 25 to 60 inches: bedrock

The NRCS states Irigul is a well drained soil with very low available water storage of about 1.5 inches. Irigul is classified as hydrologic soil group D which defines soils as having a very low infiltration rate when wet. This means the soils in group D have a higher potential for run off.
Typical Profile: A1 - 0 to 6 inches: channery loam
A2 - 6 to 13 inches: very channery loam
R - 13 to 60 inches: bedrock

Rhone is a well drained soil with moderate available water storage of about 8.3 inches. The NRCS classifies Rhone as hydrologic soil group B which is defined as having moderate infiltration rate when thoroughly wet.
Typical Profile: A1 - 0 to 10 inches: loam
A2 - 10 to 39 inches: channery loam
C - 39 to 55 inches: very channery loam
R - 55 to 60 inches: bedrock

Northwater-Adel complex (Map Unit 52)

The Northwater-Adel complex is well drained and composed of Northwater and similar soils (50%), Adel and similar soils (40%), and minor components (10%).

The Northwater is derived from accumulated weathered sedimentary rock. It has a moderate available water storage of about 7.9 inches and has a water transmission rate that is low to moderately high at 0.01 to 0.57 inches per hour. The NRCS classifies Northwater as hydrologic soil group B which is defined as having moderate infiltration rate when thoroughly wet.
Typical Profile: A - 0 to 28 inches: loam
Bt - 28 to 48 inches: very channery loam
R - 48 to 60 inches: bedrock

NRCS states Adel is composed of alluvium and/or colluvium derived from sedimentary rock. Adel has a high available water storage of about 10.1 inches and a moderately high water transmission rate of 0.21 to 0.71 inches per hour. Adel is classified as hydrologic soil group C which defines the soil as having a slow infiltration rate when thoroughly wet.
Typical Profile: A1 - 0 to 20 inches: clay loam
A2 - 20 to 31 inches: loam
C - 31 to 60 inches: loam

Table 3. Soils occurring in the project area.

Map Unit Symbol	Soil Name	Description	Estimated Acreage Disturbance
52	Northwater-Adel complex	Occurs on mountain slopes and is derived from colluvium over residuum weathered from sandstone and shale.	0.06
56	Parachute-Irgual-Rhone Association, 25-50% slopes	Not prime farmland. Is well drained with high runoff rating. This soil occurs on mountains.	2.89

Vegetation Description and Coverage

Vegetation within the ACF disturbance boundary is composed primarily of reseeded perennial grass species and shrubs used during interim reclamation. No new surface disturbance would occur as a result of the ACF location. Project construction activities would disturb areas that have undergone interim reclamation. A weed infestation was not observed in the project area.

WestWater Engineering (WestWater) conducted a vegetation assessment for the ACF reference area. 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. Vegetation monitoring was conducted by WestWater scientists on October 6, 2021. Monitoring was conducted at the end of the growing season; however, plants were easily identifiable during the assessment. Results from the line-point intercept permanent transect showed 56 percent foliar cover and zero percent basal cover. Approximately 38% bare ground was observed. The ACF Vegetation Assessment is provided in **Appendix D**.

Non-Stormwaters Discharges

There are two allowable non-stormwater discharges that may occur during construction of this project. Uncontaminated springs may be encountered during excavation and/or grading activities. In the event an uncontaminated spring is encountered, the preferred method of stabilization is to install a French drain. If site conditions allow, a French drain will be installed at the source of the spring and extended outward to a solid, buried pipe, a containment trench, or to stabilized vegetation. In all cases, the discharge end of the drain will be protected as necessary with rock aprons, excelsior wattle, and/or rock socks to reduce discharge velocity and prevent scouring. If a French drain is unable to be installed, the area immediately surrounding the spring will be stabilized with rock, erosion control fabric, mulch, and/or geotextile fabric to prevent the spring from causing erosion. Runoff from these springs will be passed through excelsior wattle, straw bales, rock socks, and/or sediment traps prior to being released as an allowable non-stormwater discharge.

In the event of a wildfire or structural fire, water discharged in the attempt to contain or extinguish the fire will be considered an allowable non-stormwater discharge. The project does not anticipate encountering any landscape irrigation systems during the construction of the project.

Construction dewatering involving uncontaminated groundwater is allowed as long as the water being removed does not leave the project area as surface runoff or flow into surface water. Groundwater will be drained or pumped into low lying areas within the project area to allow the water to be reabsorbed back into the ground. Excelsior wattle, rock socks, straw bales, silt fence, and rock aprons will be used as necessary to prevent scouring and erosion. Earthen berms can also be constructed within the confines of the project to create ponding areas to allow the groundwater return to ground.

Dust abatement to the access roads, pipeline rights-of-way, and well pads will be performed periodically to maintain a safe working environment and meet air quality standards. Water will also be applied at times during the construction of pads to aid with compaction. Water will be applied by water trucks in such a manner as to prevent any surplus water from discharging off of the project.

Concrete mixing, pumping, and delivery operations require periodic rinsing to prevent equipment damage. Rinsing operations will only occur on level ground where washout water is sufficiently able to be absorbed into the soil. Washout water will not be allowed to exit the project as runoff. Concrete washout operations will be allowed to occur within the center portion of any natural gas well pad located within the project area. The large surface area associated with natural gas pads will provide ample space for washout water to filter through surface material and be absorbed into the soil below. Excelsior wattle, gravel/earthen berms, silt fence, rock socks, and/or straw bales will be used to contain the washout residual to a confined area. Residual concrete resulting from the washout process will be properly disposed of at an off-site facility.

Potholing equipment will be used to locate existing utility lines as necessary. This process will utilize high pressure water to remove soil surrounding buried utility lines. This water and soil will be retrieved with the use of vacuum systems. The contents of the vacuum systems may be discharged onto subsoil or gravel located within the project area. Discharge sites need to be sufficiently flat, or sufficiently bermed to prevent any associated water or material from leaving the construction site. Water must absorb into the soil without exiting as a discharge. Soil removed during the potholing process may be incorporated into subsoil (farmed).

Receiving Waters

Two intermittent flow streams are located downgradient from the ACF WPS. An intermittent flow stream exists to 1072 feet to the southeast of the WPS. This intermittent flow stream flows towards the east into McKay Gulch. The second intermittent flow stream is located 1185 feet to the northeast from the WPS. This intermittent flow streams flows towards a spring. The spring is located 2420 feet to the northeast from the WPS. Downgradient of the spring, the stream has perennial flow.

The two streams stated above, flow into drainages which later terminate into Parachute Creek roughly 4 miles northwest of the town of Parachute. Parachute Creek flows southeast and becomes a tributary of the Colorado River near the town of Parachute. The Colorado River is the ultimate receiving water. The ACF Hydrology Map is provided in **Appendix E**.

3. Stormwater Management Control Measures

Cascade Creek Operations Area Stormwater Management Plan

The ACF location will be managed under the Laramie's Cascade Creek Stormwater Management Plan (SWMP) (**Appendix G**). The Cascade Creek SWMP describes procedures to minimize the potential for erosion, sedimentation, or the discharge of pollutants, by the use of proper construction techniques and the adoption of appropriate BMPs. These BMPs will be implemented and maintained during all phases of construction and maintained until the terms and conditions of the associated stormwater permit have been fulfilled.

The Cascade Creek SWMP was developed in accordance with COGCC Rule 1002.f. *Stormwater Management* to mitigate erosion and minimize potential sediment runoff at locations within the Cascade Creek operations area. The Cascade Creek SWMP details BMPs for the following requirements of COGCC Rule 1002.f.(2):

- **Rule 1002.f.(2).A.** Covering materials and activities and stormwater diversion
- **Rule 1002.f.(2).B.** Materials handling and spill prevention procedures and practices
- **Rule 1002.f.(2).C**. Erosion controls
- **Rule 1002.f.(2). D.** Self-inspection, maintenance, and good housekeeping procedures and schedules to facilitate identification of conditions that could cause breakdowns
- **Rule 1002.f.(2).E.** Spill response procedures
- **Rule 1002.f.(2).F**. Vehicle tracking control practices

CDPHE issued stormwater permit for the Cascade Creek Common Plan of Development is provided in the Cascade Creek SWMP.

Potential Pollution Sources

The sources of potential pollutants associated with construction activities occurring at the ACF are listed below:

- Disturbed Soil – Sediment, vehicle tracking, dust
- Vehicle & Equipment Operation – Fuels, hydraulic and motor oils, lubricants, coolants
- Well & Pipeline Construction/Maintenance – Concrete, paints, sealants, solvents, lubricants
- Herbicide Application – Herbicides, surfactants, dyes, anti-drift agents
- Non-Industrial Storage – Garbage, human waste, construction debris
- Drill Cuttings

These pollutant sources could be potentially present anywhere operations have or are occurring. Fuels, oils, lubricants, and coolants represent a potential risk during refilling/maintenance

operations, while equipment is being staged, and in the event of mechanical failure during normal vehicle and/or equipment operation. Sediment, vehicle tracking, clods, and dust will be a potential pollutant risk on all portions of the project where soils have been disturbed and along all gravel and dirt access roads. Concrete, paints, sealants, and solvents will represent a potential risk during the construction and maintenance of well and pipeline facilities. Garbage, human waste, and construction debris will be present at job sites and dumpster and portable toilet locations. Herbicide applications may be made during restoration phases of the project or on adjacent undisturbed land to prevent noxious weed encroachment and could potentially exist over the entire project area. Drill cuttings will only be present on actively or recently drilled pads and will typically be placed on or below the pad's cut-slope.

Structural Practices for Erosion and Sediment Control

Structural practices will represent the primary control measure in preventing or minimizing stormwater discharges and erosion at the ACF. The ACF Stormwater BMPs Figure identified erosion control and stormwater control features to be installed at the time of construction. Upon completion of construction, the site shall be reviewed by certified stormwater personnel and permanent BMPs will be installed where deemed necessary to manage sediment migration offsite. Structural BMPs to be constructed at the ACF include, but are not limited: to berms, sediment traps and excelsior wattle. Site-specific BMPs are displayed in the ACF Stormwater BMPs Figure.

Sediment discharge will be minimized on the gravel pad and access road by shaping the surface, installing culverts, and other structural BMPs. Access roads will be crowned or banked to direct stormwater into bar ditches or stabilized vegetation. This will minimize the amount of stormwater which travels down the access road. Water bars or rolling dips will be utilized to direct water off of the access roads where crowning or sloping are not feasible or will create uncontrolled discharge.

Trenches and/or earthen berms will be installed in areas anticipating high flows and require a robust BMP installation. Trenches and berms will direct water to discharge points which will consist of sediment trap(s), straw bales, straw wattles, and/or rock aprons. The ROW will be shaped to direct accumulated water to these discharge points or to the trenches and berms that will carry the water to the discharge points.

Silt fence, straw bales, earthen berms, and/or straw wattles will be installed along project area boundaries where disturbed or stored soils represent a risk of discharging off-ROW or into a sensitive resource area. Straw bales, straw wattles, and/or silt fence may also be installed perpendicular to slopes to slow water velocity, retain sediment, and minimize rilling.
Straw wattles, rock checks, rock aprons, straw bales, silt fence, and sediment traps may be installed to protect discharge points. Discharge points are sites where stormwater is intentionally, or unintentionally, allowed to leave the project area. Discharge points may include the exit side of water bars, rolling dips, or culverts. Down slope sides of dry, intermittent drainages, ephemeral drainages, and other natural topographic features within the project may also be discharge points.

BMPs will be installed to filter sediment, while allowing collected water to discharge off project while minimizing off-ROW erosion.

Straw wattle will be installed, as needed, perpendicular to cut and fill slopes to minimize erosion and sediment discharge. Stockpiled earth will have silt fence installed around the entire stockpile if a discharge risk is present.

Non-Structural Practices for Erosion and Sediment Control

Non-structural erosion and sediment control practices will be used in conjunction with structural practices to deliver effective stormwater erosion and sediment control. Permanent stabilization will be achieved by seeding and applying mulch as necessary. All areas of disturbance will be seeded to establish permanent vegetation when topsoil is returned during the reclamation process. Mulch will be applied as necessary to enhance the seeding process or to stabilize slopes to protect the new seeding. Hydro-seeding will be utilized in areas too steep to seed with conventional drills or broadcasters. Those areas that are predominantly (90-100%) rock faces that are vertical or near vertical will be left as is and monitored for slope stability.

Vehicle Tracking Controls

Laramie does not anticipate soil tracking to occur on any public paved roadways. The subject site is located approximately 10 miles from the intersection of Laramie's parcel entrance and County Road 213 (Conn Creek Road). From Laramie's private parcel entrance, vehicles travel on CR 213 (a public county dirt road) for approximately 4 miles until the road ends at County Road 204 (Roan Creek Road), a two-lane asphalt roadway. Therefore, the subject Oil and Gas Location is approximately 14 miles from the nearest public paved roadway, which greatly reduces the potential of vehicular tracking on paved roads from the subject location. A tracking pad will be installed at the gate of the Cascade Creek operations area (entrance to Laramie's private parcel). The tracking pad will minimize soil tracked onto public roads.

Some tracking is expected for the type of roads and terrain in the Piceance Basin. Tracking is not limited to only oil and a gas operations but occur also on BLM managed roads as well as Garfield County Roads that are not paved. To the extent possible, Laramie will minimize tracking within the Cascade Creek Operating area. Any severe tracking (I.E. rutting deeper than 3 inches) will be addressed once the conditions are dry enough to grade roads or pads. Any sediment transported off road due to tracking and run-off will be captured in Stormwater BMP's adjacent to the access road or sites and removed in accordance with Laramie's Stormwater Management Plan.

Materials Handling and Spill Prevention

Material handling and spill prevention will be attained by adhering to the following:

- No fuels or oils will be stored within 200 feet of any wetland or watershed
- No vehicles or equipment will be fueled within 200 feet of any wetland or watershed
- No vehicles or equipment will be serviced within 200 feet of any wetland or watershed
- Fuels and oils will be stored within 110% capacity secondary containment
- All containers holding fuels and oils will be labeled
- All fuel and oil waste will be disposed of properly

- Spill kits will be immediately available to all operations utilizing fuels and oils
- All spills will be properly cleaned up and reported as required

No bulk storage of fuels and oils will be allowed on any portion of the Cascade Creek Project Area that does not have SPCC Plans in place to direct proper storage and handling. All fuel and oil spills meeting reporting requirements must be reported. This process can be initiated by calling the CDPHE Colorado Environmental Release and Incident Reporting Line at 1-877-518-5608.

Management of Waste Material

Concrete is anticipated to be used while constructing the project. Concrete may be used in the installation of valves, launchers, receivers, footings, and in drilling operations. Concrete washout areas will be identified on site maps and protected by BMPs to prevent the discharge of concrete. Concrete will not be washed onto topsoil. Topsoil will be removed, then equipment can be washed onto subsoil or gravel surfaces. Earthen berms, silt fence, straw bales, or straw wattles will be used to capture concrete before water is allowed to be absorbed into the soil.

Refuse dumpsters, recycling bins, portable toilets, or any other containers storing liquid or solid waste will only be utilized under the following guidelines:

- Containers will be located a minimum of 200 feet away from sensitive areas
- Containers will be emptied at an appropriate location, or hauled off by an appropriate company
- Containers will be emptied on a regular basis to prevent overflow
- Fuels and oils will not be placed in refuse dumpsters or portable toilets
- Fuels and oils will be placed in approved, marked containers
- Fuels and oils will be disposed of at an approved facility
- Containers storing fuels and oils will be placed within secondary containment
- Portable toilets will be properly serviced and secured to prevent being blown over

4. Site-Specific Stormwater BMPs

Site-specific stormwater BMPs are depicted in the ACF Layout Drawings (**Appendix B**). Construction BMP's will be installed in accordance with the CDPHE construction permit and BMPs as identified in the Cascade Creek SWMP. The ACF Layout Drawings identify erosion control and stormwater control features to be installed at the time of construction. Upon completion of construction, the site shall be reviewed by certified stormwater personnel and permanent BMPs will be installed where deemed necessary to manage sediment migration offsite. Location of berms, silt fencing, sediment traps and excelsior wattle to be constructed at the CC 0697-15-08 are displayed Layout Drawings. Stormwater BMPs may be modified to depending on site-specific conditions. Laramie may utilize additional stormwater BMPs if deemed necessary. Stormwater BMPs will be construction and installed based on the specifications shown in **Appendix F**.

The ACF was designed to accommodate a 100-year, 24-hour storm event. The facility was designed and will be graded with a run-on control system to prevent flow onto the cuttings

management area during peak discharge and a run-off control system to contain the water volume from a 25-year, 24-hour storm event. The site will be graded to divert all stormwater into a proposed sediment trap. A diversion ditch will be installed along the south and will follow the east perimeter of the cuttings management area to direct stormwater away from the cuttings management area and into the sediment trap. The access road will be constructed to divert flow into the sediment trap. Calculations were performed by DRG to determine dimensions of the sediment trap/pond and are detailed in the Calculations Report (**Attachment H**).

5. Inspections and Maintenance Procedure

Laramie Energy, LLC contracted Aspen Environmental Field Services, LLC (AEFS) to develop the Cascade Creek SWMP and to administrate all aspects of stormwater management compliance. AEFS is responsible for implementing, maintaining, and revising the Cascade Creek SWMP. AEFS will provide staff to serve as Qualified Stormwater Managers to conduct and document required inspections, update the SWMP, and provide oversight of the installation and maintenance of BMPs.

Construction Phase

To maintain compliance, in areas of active construction, or areas that will resume construction, inspections must be made once every 14 days. Inspections will be made more frequently if necessary to ensure BMPs are in place and functioning properly.

All BMPs will be inspected within 24 hours of the conclusion of any precipitation event or snowmelt event that causes surface erosion. If ROW conditions do not allow for timely, post-storm inspection of BMPs, the inspection will take place within 72 hours of the event and prior to the re-commencing of construction activities. Any such delays in the inspection of BMPs must be documented in the inspection report.

Post-Construction Phase

BMP inspection intervals may be reduced to once a month and post-storm inspections are no longer required if the following conditions exist:

- All ground disturbance construction activities are completed.
- All activities identified in the SWMP for final restoration are completed (seeding not required).
- SWMP has been amended to indicate areas under reduced inspection intervals.

BMPs identified as being insufficient will continue to be properly maintained and/or reinstalled as necessary. Monthly inspections will continue until final restoration has been successfully achieved and these areas are indicated in the SWMP as meeting final restoration requirements.

Winter Inspection Exclusions

Routine 14-day, monthly, and post-storm inspections are not required for those areas where construction activities are temporarily halted, snow cover exists over the entire site for an extended period, and melting conditions are not present. This exclusion should be properly documented in inspection reports indicating dates when snow cover occurred, date when construction activities ceased, and date melting conditions began.

Maintenance

Every effort will be made to repair or replace any BMP that has failed within 72 hours of discovery or notification. If a BMP fails for any reason other than improper installation, the BMP will be replaced with a more robust installation, enlarged in size, or additional BMPs will be installed to minimize the risk of reoccurrence. Maintenance of silt fence, straw wattles, straw bales, rock checks, rock socks, and sediment traps will be required once the BMP has reached 75% of its sediment retaining capabilities or the structural integrity of the BMP is compromised. Maintenance will involve removing the captured sediment from the BMP and returning it to the ROW and/or making the necessary repairs to correct structural problems.

Maintenance will be performed to rock aprons, crimped mulch, hydro-seed, and erosion control matting as soon as the failure of any of these BMPs are allowing erosion channels to form. Maintenance of rock aprons will involve removing the eroded channel and rearranging the rock or adding additional rock to prevent future failures. Maintenance of crimped mulch, hydro-seed, and erosion control matting will consist of removing the eroded channel, reseeding the damaged area, then reapplying mulch, hydro-mulch, or erosion control matting.

6. Site-Specific Construction and Stormwater/Erosion Control BMPs

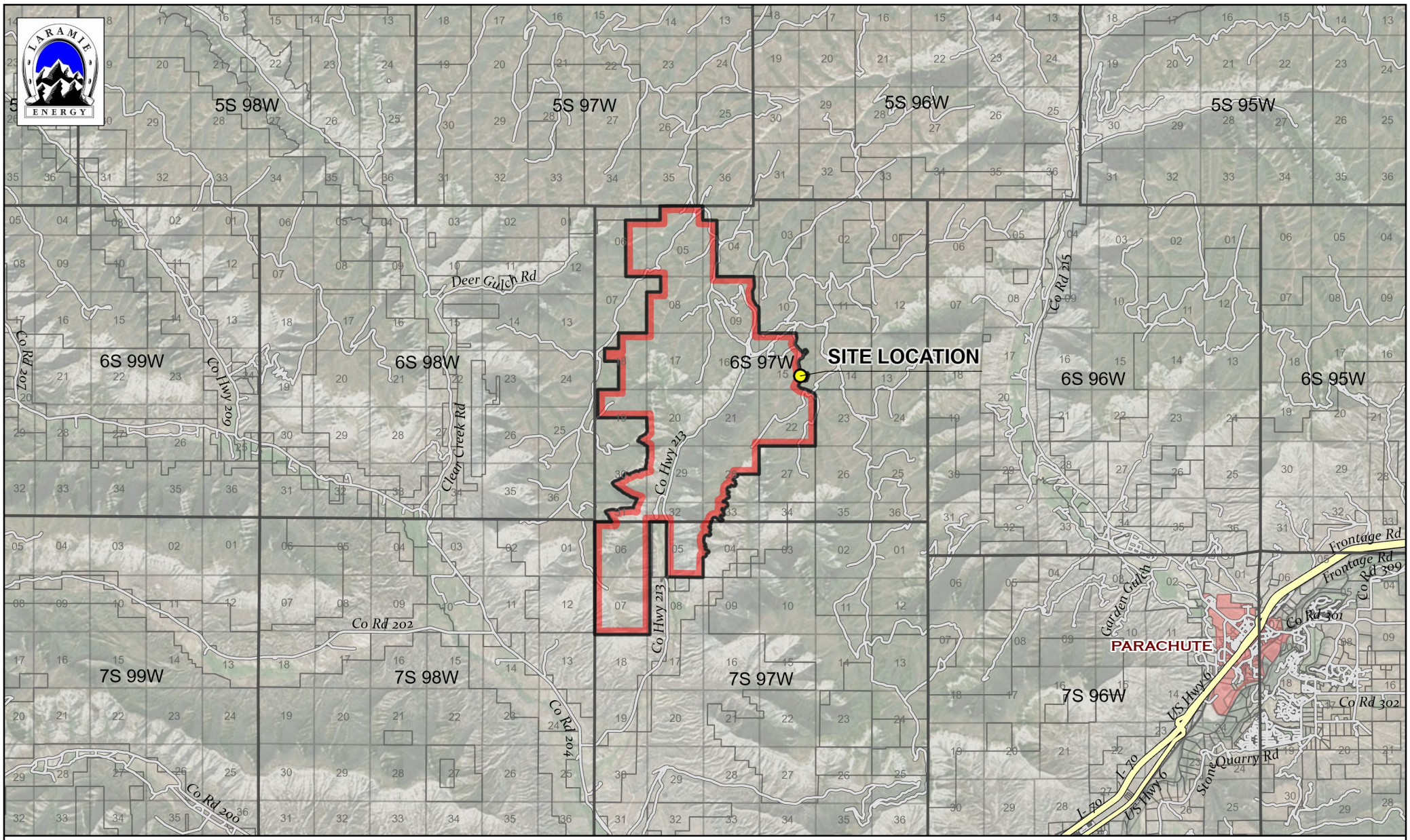
- During construction phase: to maintain compliance, in areas of active construction, or areas that will resume construction, inspections must be made once every 14 days.
- All BMPs will be inspected within 24 hours of the conclusion of any precipitation event or snowmelt event that causes surface erosion. If ROW conditions do not allow for timely, post-storm inspection of BMPs, the inspection will take place within 72 hours of the event and prior to the re-commencing of construction activities.
- Routine 14-day, monthly, and post-storm inspections are not required for those areas where construction activities are temporarily halted, snow cover exists over the entire site for an extended period, and melting conditions are not present.
- Every effort will be made to repair or replace any BMP that has failed within 72 hours of discovery or notification. If a BMP fails for any reason other than improper installation, the BMP will be replaced with a more robust installation, enlarged in size, or additional BMPs will be installed to minimize the risk of reoccurrence.
- Non-structural erosion and sediment control practices will be used in conjunction with structural practices to deliver effective stormwater erosion and sediment control. Permanent stabilization will be achieved by seeding and applying mulch as necessary.
- No fuels or oils will be stored within 200 feet of any wetland or watershed
- No vehicles or equipment will be fueled within 200 feet of any wetland or watershed
- No vehicles or equipment will be serviced within 200 feet of any wetland or watershed
- Fuels and oils will be stored within 110% capacity secondary containment
- All containers holding fuels and oils will be labeled
- All fuel and oil waste will be disposed of properly
- Spill kits will be immediately available to all operations utilizing fuels and oils
- All spills will be properly cleaned up and reported as required

List of Appendices

Appendix A

Vicinity Map

Laramie Energy, LLC – Operator Number 10433



Reclamation Status

Garfield County Parcels

Parcel

0 3 6 mi

1 inch = 3 mi

N W E S

Project No:	020-014
Map By:	NDB
Date:	9/28/2020

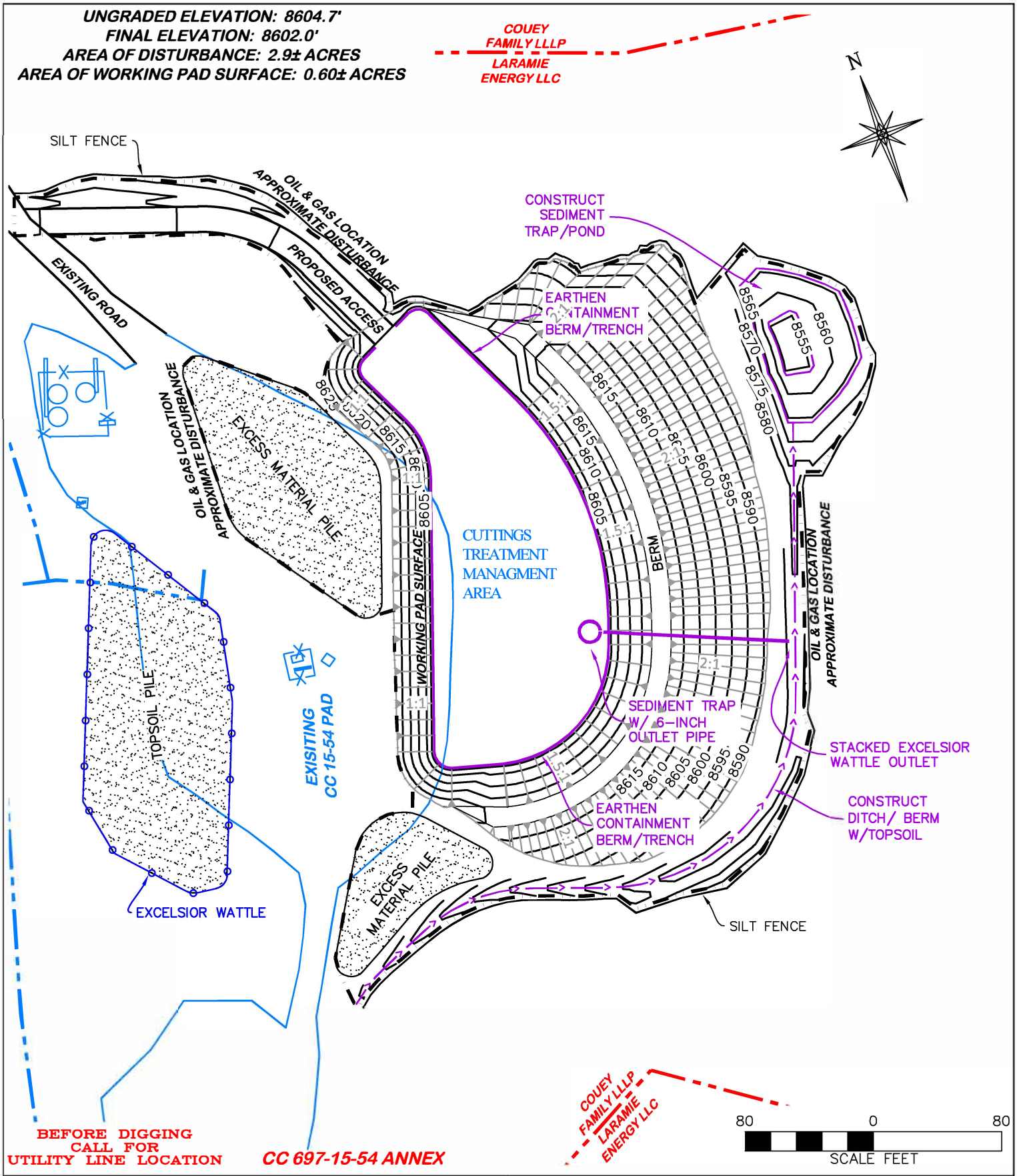
LOCATION OVERVIEW MAP
CASCADE CREEK 697-15-54
ANNEX CUTTING FACILITY
LARAMIE ENERGY
GARFIELD COUNTY, COLORADO

ENTRADA CONSULTING GROUP
330 Grand Avenue, Unit C
Grand Junction, CO 81501
970-549-1015

Figure
1

Appendix B

Layout Drawings

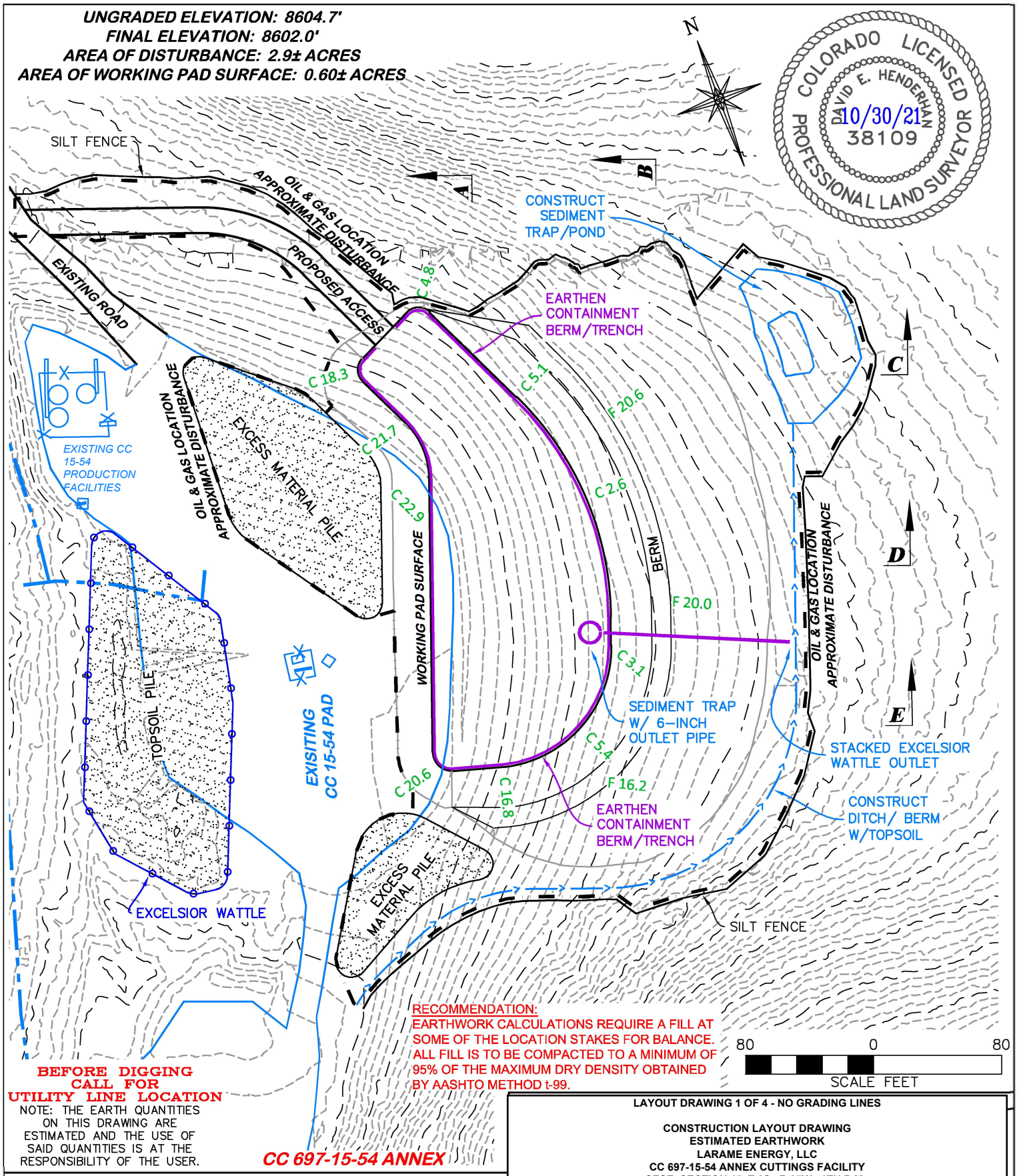


DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028 1414 ELK ST., ROCK SPRINGS, WY 82901

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

STORMWATER MANAGEMENT PLAN

BEST MANAGEMENT PRACTICES
LARAMIE ENERGY, LLC.
CC 697-15-54 ANNEX
SESE, SECTION 15, T. 6 S., R. 97 W., 6th P.M., GARFIELD COUNTY, COLORADO



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 - NO GRADING LINES

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

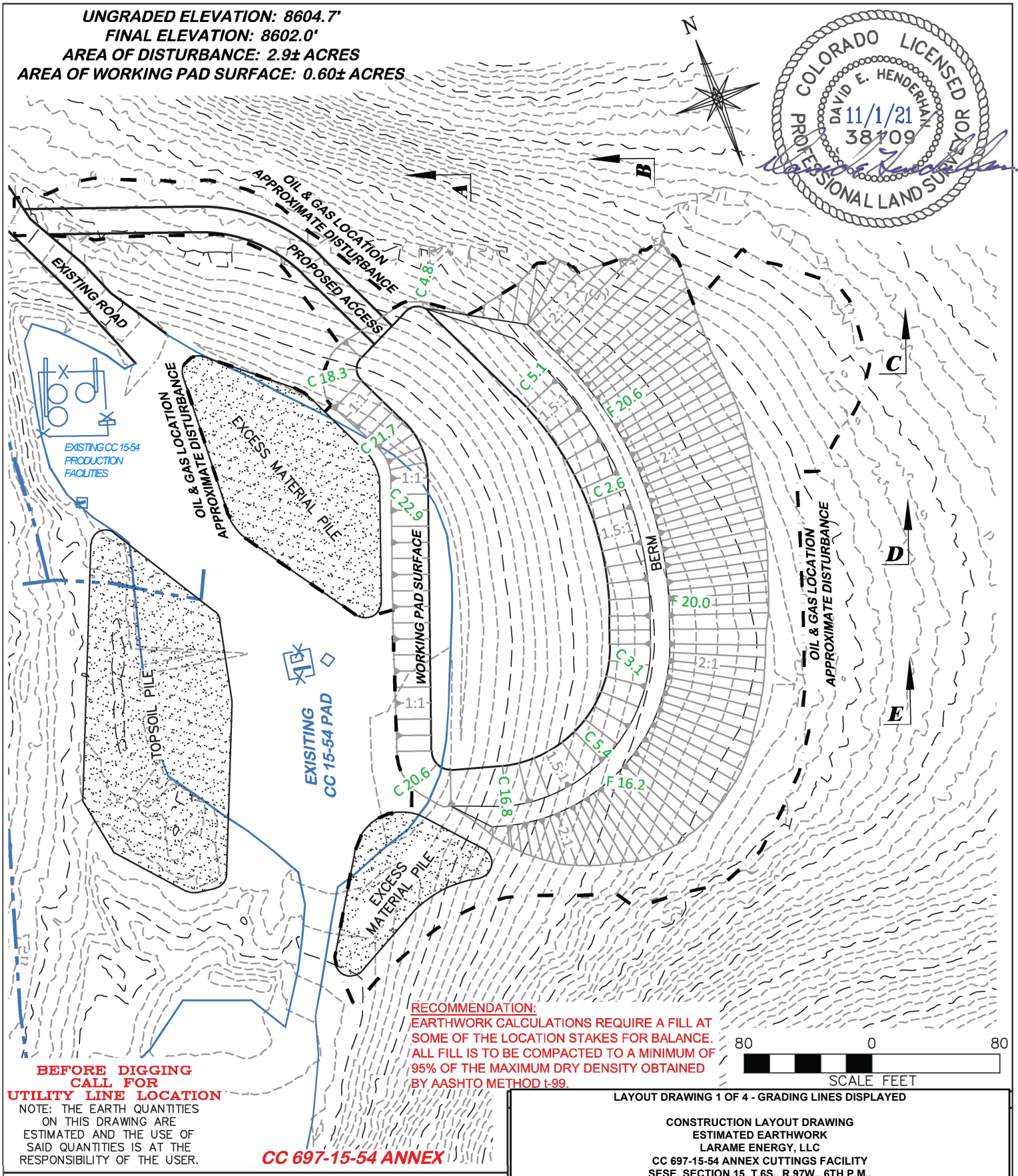
DRG GRIFFIN & ASSOCIATES, INC.
1414 ELK ST., ROCK SPRINGS, WY 82901
(307) 362-5028

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

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
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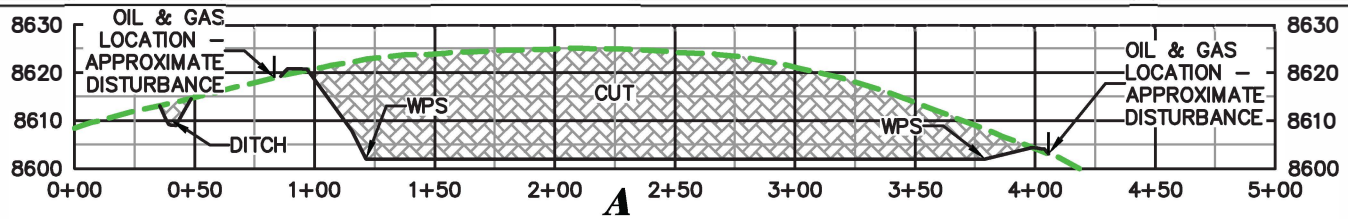

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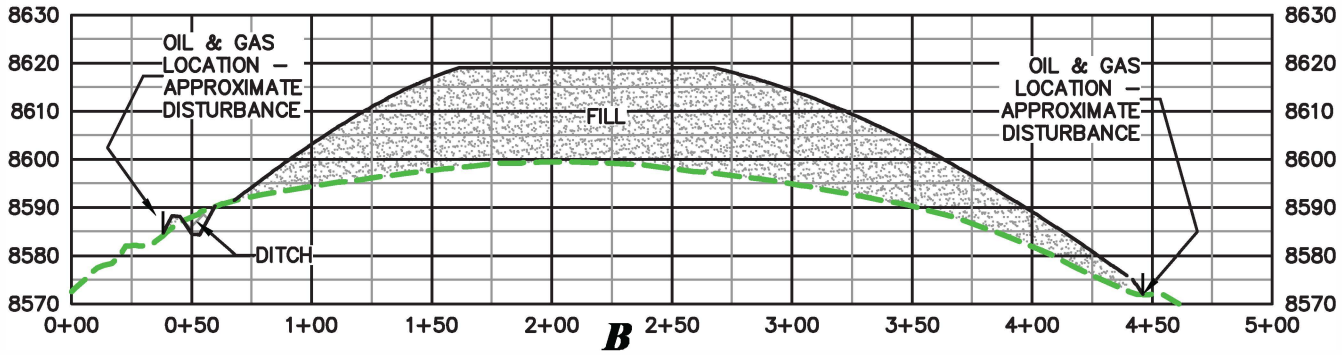

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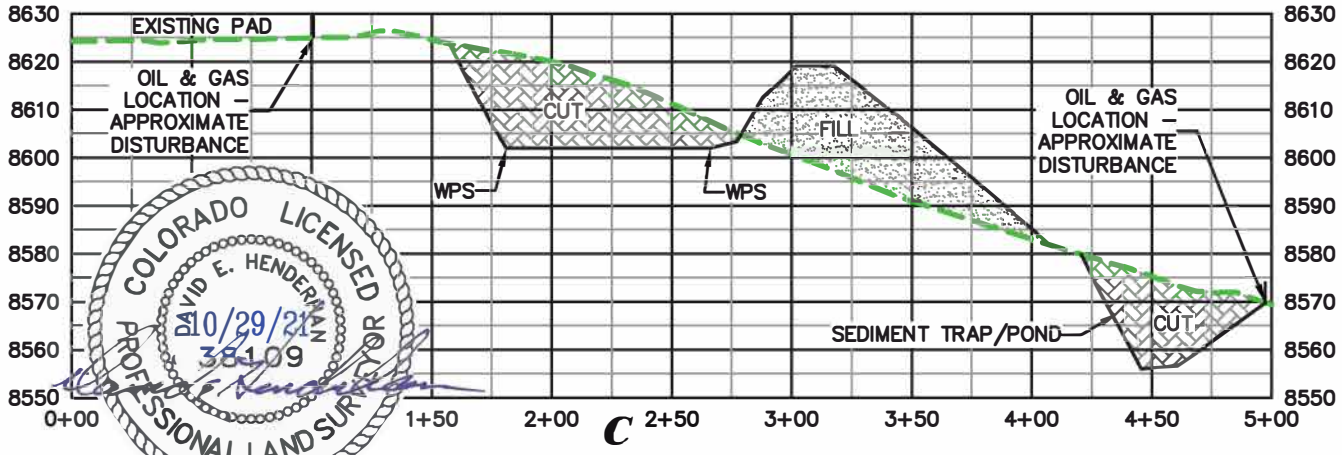

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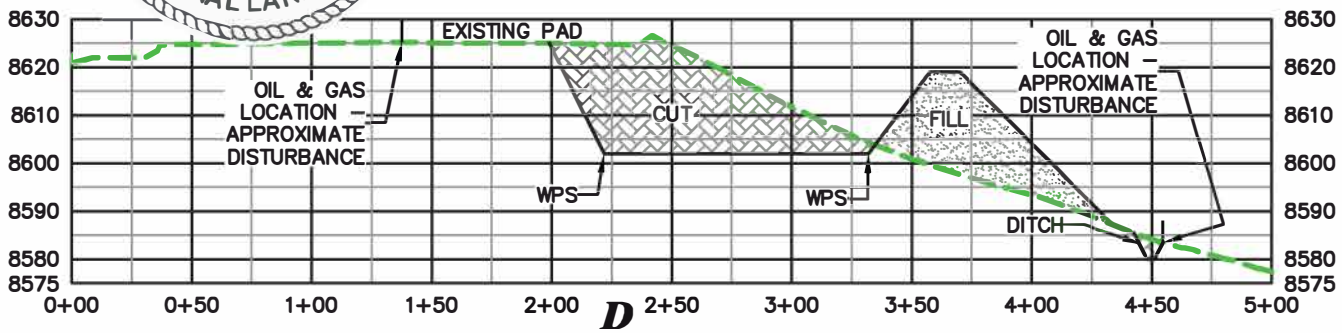
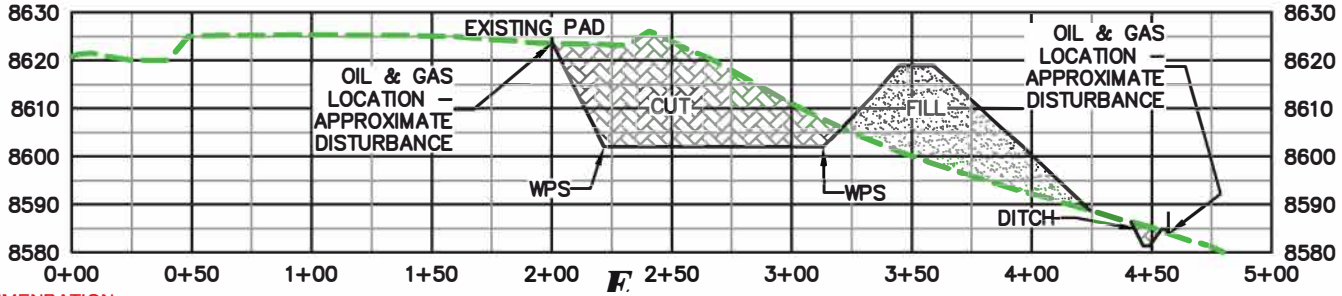


D



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

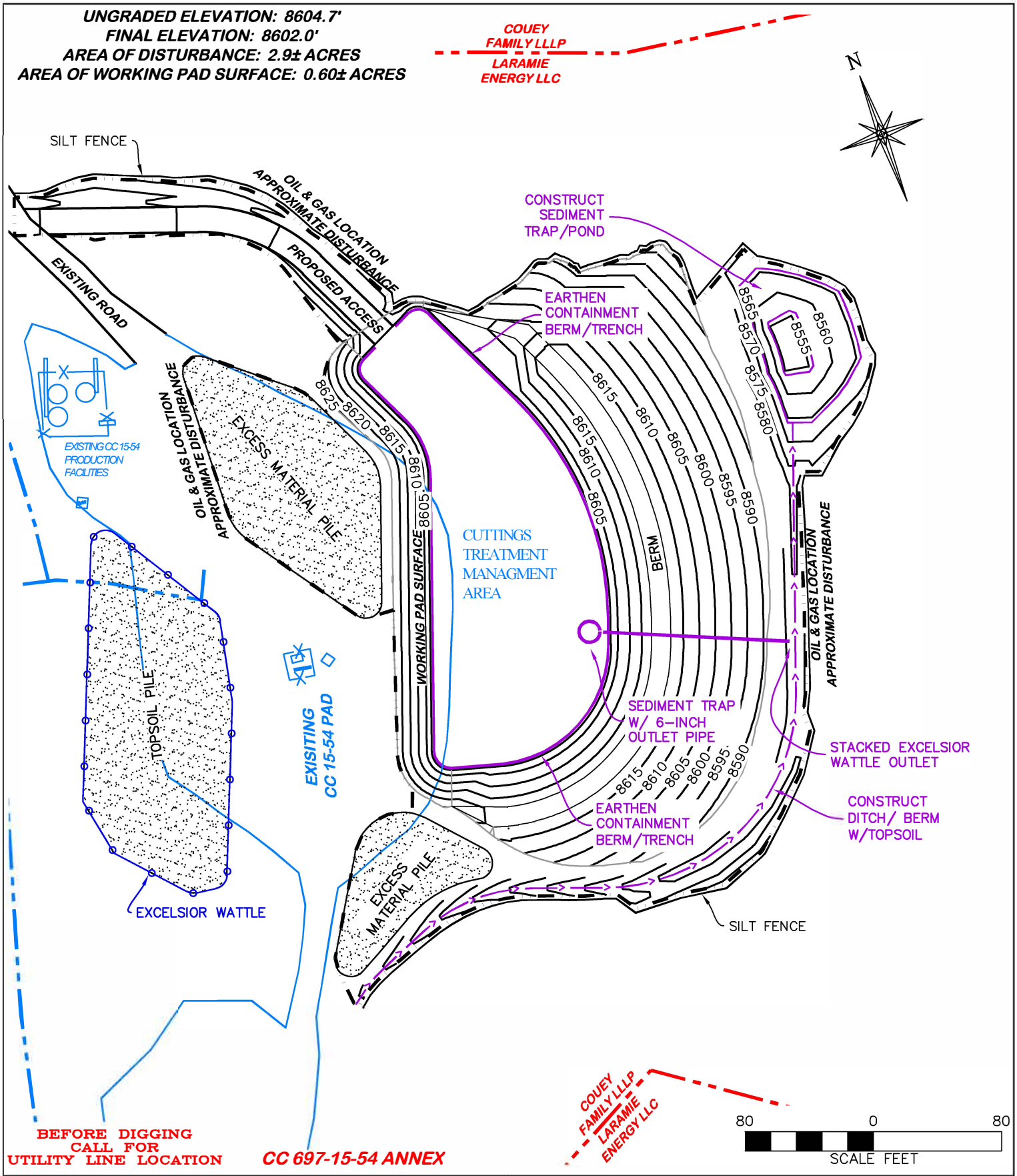
CUT SLOPES 1:1
FILL SLOPES 2:1

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

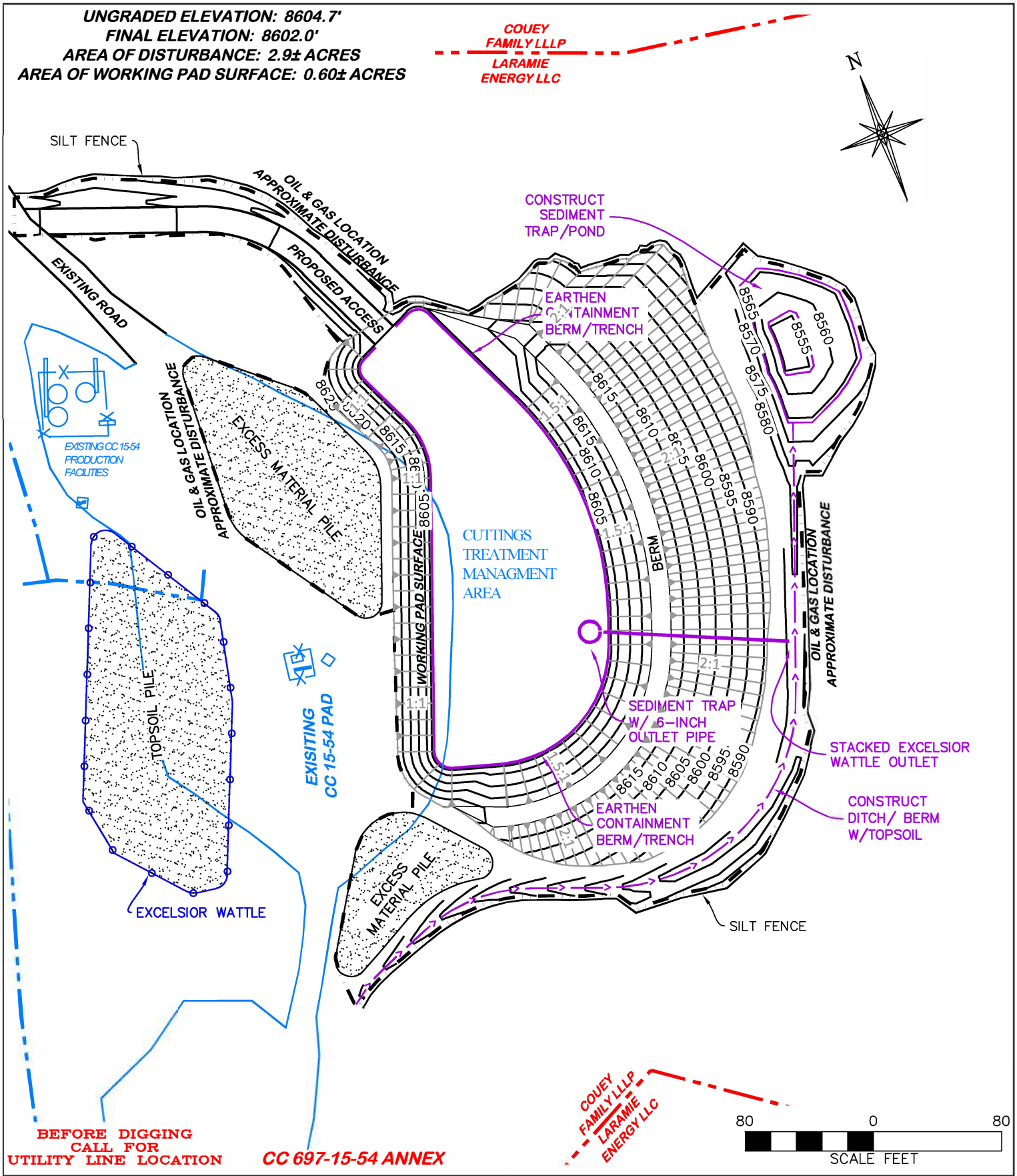


DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

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

LAYOUT DRAWING 3 OF 4 - NO GRADING LINES

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

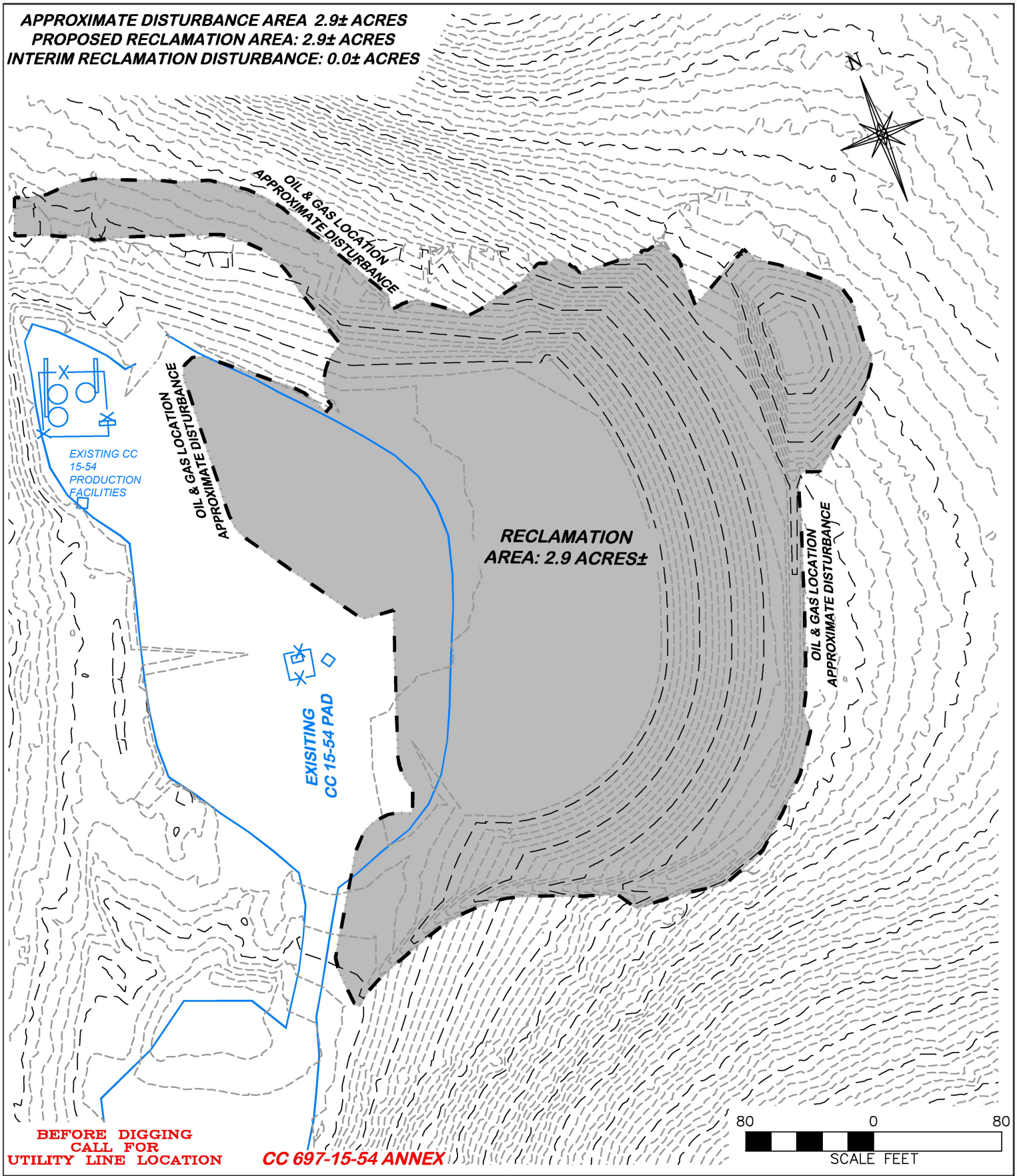


DRG GRIFFIN & ASSOCIATES, INC.
(307) 362-5028
1414 ELK ST., ROCK SPRINGS, WY 82901

DRAWN: 10/29/2021 - DEH	SCALE: 1" = 80'
REVISED: N/A	DRG JOB No. 21379
	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

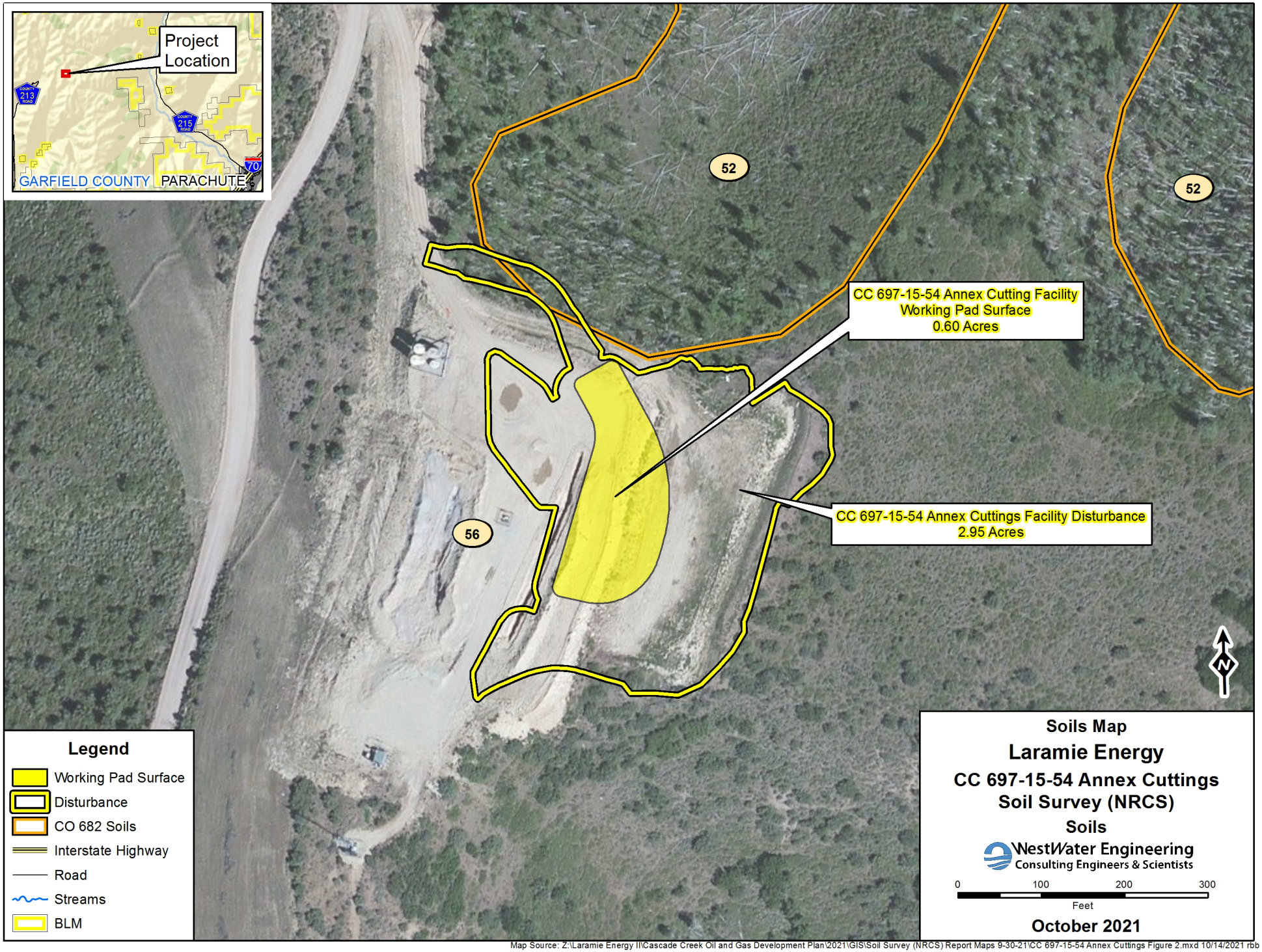
DRAWN: 10/29/2021 - DEH	SCALE: 1" = 80'
REVISED: N/A	DRG JOB No. 21379
	304b.(7),B

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 C

NRCS Soils Map



Map Source: Z:\Laramie Energy II\Cascade Creek Oil and Gas Development Plan\2021\GIS\Soil Survey (NRCS) Report Maps 9-30-21\CC 697-15-54 Annex Cuttings Figure 2.mxd 10/14/2021 rbb

Appendix D

Vegetation Assessment

Laramie Energy, LLC – Operator Number 10433

LARAMIE ENERGY
ANNEX CUTTINGS FACILITY
VEGETATION ASSESSMENT

Cover Photo: Reference vegetation transect.

Prepared for:
Laramie Energy, LLC
760 Horizon Drive, Suite 101
Grand Junction, CO 81506

Prepared by:

WestWater Engineering
2516 FORESIGHT CIRCLE, #1
GRAND JUNCTION, COLORADO 81505

October 2021

INTRODUCTION

Laramie Energy, LLC. requested that WestWater Engineering (WestWater) conduct a vegetation assessment for the Cascade Creek 0697-15-08 well pad location. The project would be located on private surface in Garfield County, Colorado in Section 15, Township 6 South, Range 97 West, Sixth Principal Meridian.

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.

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 1.

Table 1. 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

Common Name	Scientific Name	Abundance*	Habitat Type
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
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

Common Name	Scientific Name	Abundance*	Habitat Type
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.			

VEGETATION ASSESSMENT

Sampling methods

The vegetation sampling protocol used involves a modified "line point-intercept method" based on the National Park Service Fire Monitoring Handbook (USDI National Park Service 2003) and Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Volume 1: Core Methods (Herrick et al 2015). The line point-intercept method uses the contact of a point to measure cover. The theory behind this method is that if an infinite number of points are placed in a two-dimensional area, the exact cover of a plant species can be determined by counting the number of points that intersect that species.

One reference transect was established within the near the well pad in a similar vegetation community. The following techniques were used to collect the sample data:

1. Each sample site was randomly selected within an area representative of the vegetative community being affected by the project.
2. The transect was designated Transect 1 (reference).
3. A metal rebar stake was placed in the ground to anchor a 50-meter measuring tape (0-meters) and the tape extended across the vegetation on the site. A second rebar stake was placed and anchored the 50-meter end of the tape.
4. The beginning and ending point of the transect was recorded using a GPS receiver. Azimuths from the 0-meter to the 50-meter point were recorded.
5. Photographs were taken along the transect that recorded vegetation condition from 0 to 50-meters.
6. Point count data were collected at 1.0-meter intervals along a 50-meter tape measure using a thin, straight metal rod for a total of fifty samples taken along the transect.

7. The first plant species encountered was recorded in the "Top Layer" column. Subsequent species and litter were recorded in the "Lower Canopy Layers" columns. Each species was recorded by 4 letter code (first two letters each of genus and species); unique species were recorded only once per sample point.
8. Ground cover was recorded as a species code (for a basal intercept), rock, bedrock, moss, soil, embedded litter, or duff as defined by the sampling protocol.
9. Other species of vegetation incidentally observed in the sample area were recorded (in addition to those recorded during sampling).

Identification of plant species was aided by using pertinent published field guides (Ackerfield 2015, Whitson et al. 2006, Weber and Wittmann 2012).

Results

Vegetation monitoring was conducted by WestWater scientists on October 6, 2021. Monitoring was conducted at the end of the growing season; however, plants were easily identifiable during the assessment. Percent foliar cover and percent basal cover results from the line-point intercept permanent transect are provided in Table 2, along with UTM locations and magnetic azimuth from 0-meters to 50-meters for each transect.

Table 2. Percent foliar and basal cover for vegetation monitoring transect.

Transect 1 – Reference Transect		
Transect Location (UTM Zone 12, NAD83 datum) 0-meter terminus: 4378149N, 740737E 50-meter terminus: 4378129N, 740783E Azimuth (true north): 73°		
Group	**% Foliar Cover**	**% Basal Cover**
Native Perennial Graminoids	20	0
Introduced Perennial Graminoids	0	0
Native Annual Graminoids	0	0
Introduced Annual Graminoids	0	0
Native Perennial Forbs	4	0
Introduced Perennial Forbs	0	0
Native Annual/Biennial Forbs	0	0
Introduced Annual/Biennial Forbs	0	0
Subshrubs/Shrubs	32	0
Trees	0	0
Total	**56**	**0**
Bare ground	**38**	

The reference transect is located in a mixed mountain shrubland plant community composed primarily of mountain snowberry, mountain big sagebrush, yellow rabbitbrush with an understory of native perennial grass species. A summary of plant species recorded along the transect and their percent foliar cover along is displayed in Table 3.

Table 3. Plant species recorded along reference transect.

Common Name	*Scientific Name*	Percent Foliar Cover
Columbia needlegrass	*Achnatherum nelsonii*	6
Geyer's sedge	*Carex geyeri*	4
Heartleaf arnica	*Arnica cordifolia*	4
Kentucky bluegrass	*Poa pratensis*	8
Mountain big sagebrush	*Artemisia tridentata* ssp. *vaseyana*	6
Roundleaf snowberry	*Symphoricarpos rotundifolius*	16
Western wheatgrass	*Pascopyrum smithii*	2
Yellow rabbitbrush	*Chrysothamnus viscidiflorus*	10
	Total	**56**

REFERENCES

Ackerfield, J. 2015. Flora of Colorado. Colorado State University Herbarium, Brit Press.

Herrick, J.E., J.W. Van Zee, S.E. McCord, E.M. Courtright, J.W. Karl, and L.M. Burkett. 2015. Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Second Edition, Volume 1: Core Methods. USDA-ARS Jornada Experimental Range, Las Cruces, NM.

USDI, National Park Service. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274p.

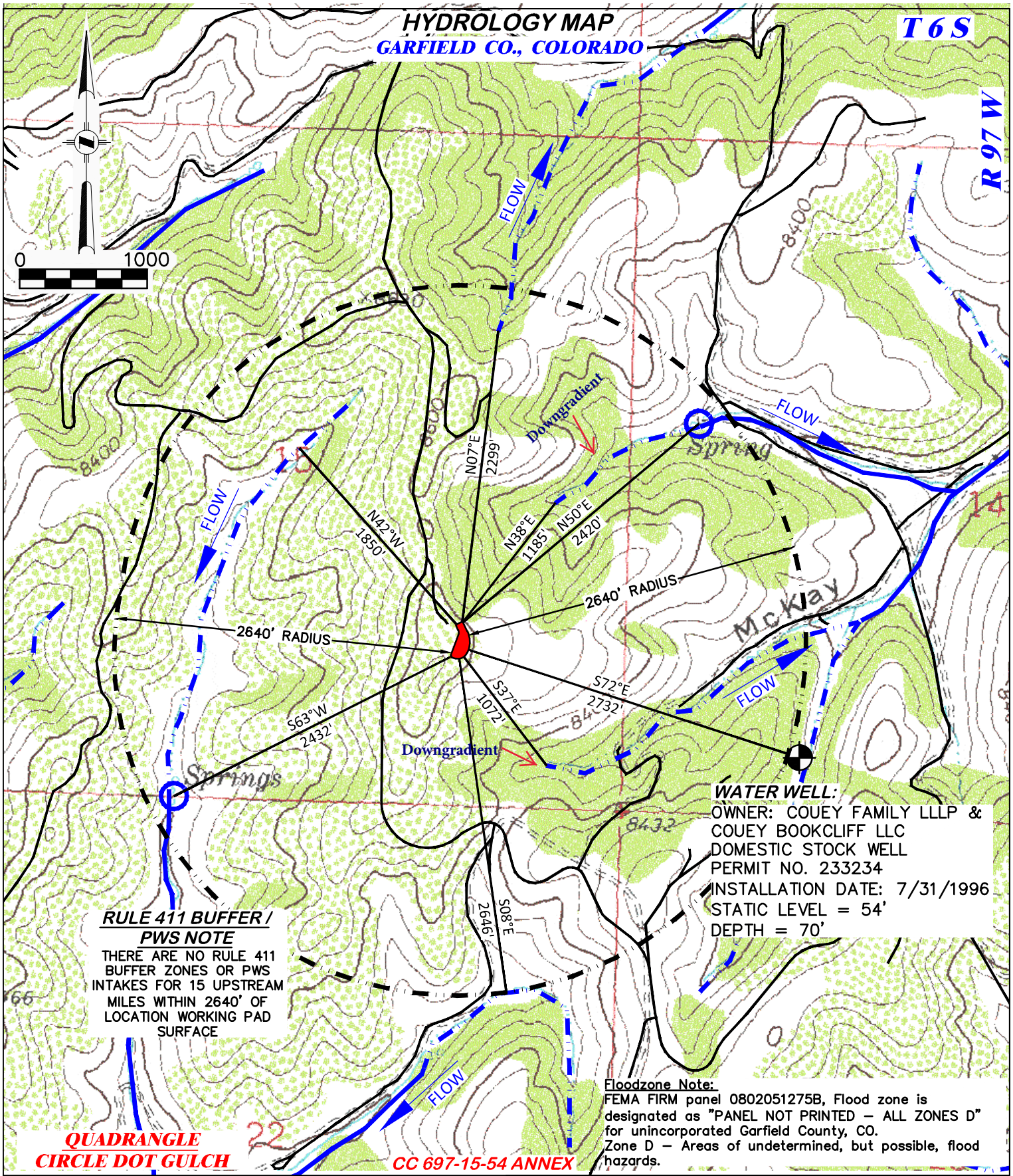
Weber, W. A., and R. C. Wittman. 2012. Colorado Flora, Western Slope. Fourth Edition. University Press of Colorado, Boulder.

Whitson, T. D. (editor), L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, and Robert Parker. 2006. Weeds of the West, Ninth Edition. Western Society of Weed Science in cooperation with Cooperative Extension Services, University of Wyoming. Laramie.

Appendix E

Hydrology Map

Laramie Energy, LLC – Operator Number 10433



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

HYDROLOGY MAP
LARAMIE ENERGY, LLC.
CC 697-15-54 ANNEX
SESE, SECTION 15, T. 6 S., R. 97 W., 6th P.M.,
GARFIELD COUNTY, COLORADO

PROPOSED WORKING PAD SURFACE

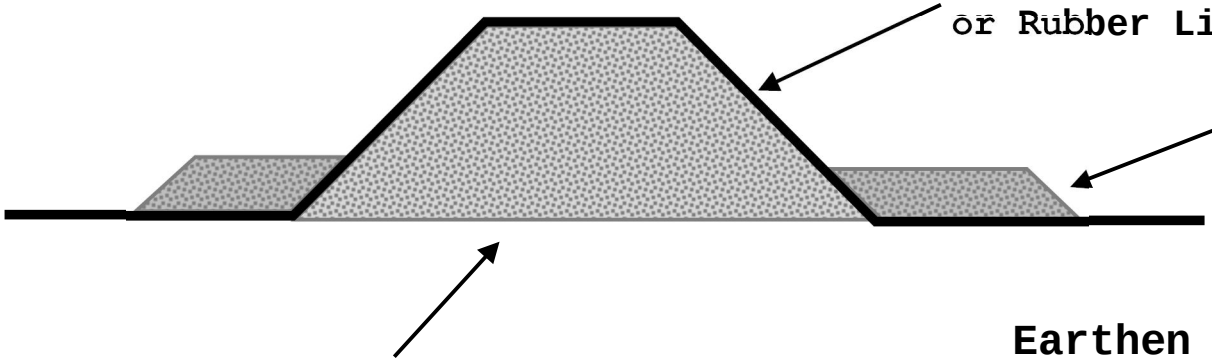
DRAWN: 6/2/2021 - DEH	SCALE: 1" = 1000'
REVISED: 10/12/2021 - DEH	DRG JOB No. 21379
MISCELLANEOUS EDITS	304b(7)E HYDRO

HISTORIC SPRING	PERENNIAL FLOW
INTERMITTENT FLOW	EXISTING ROAD

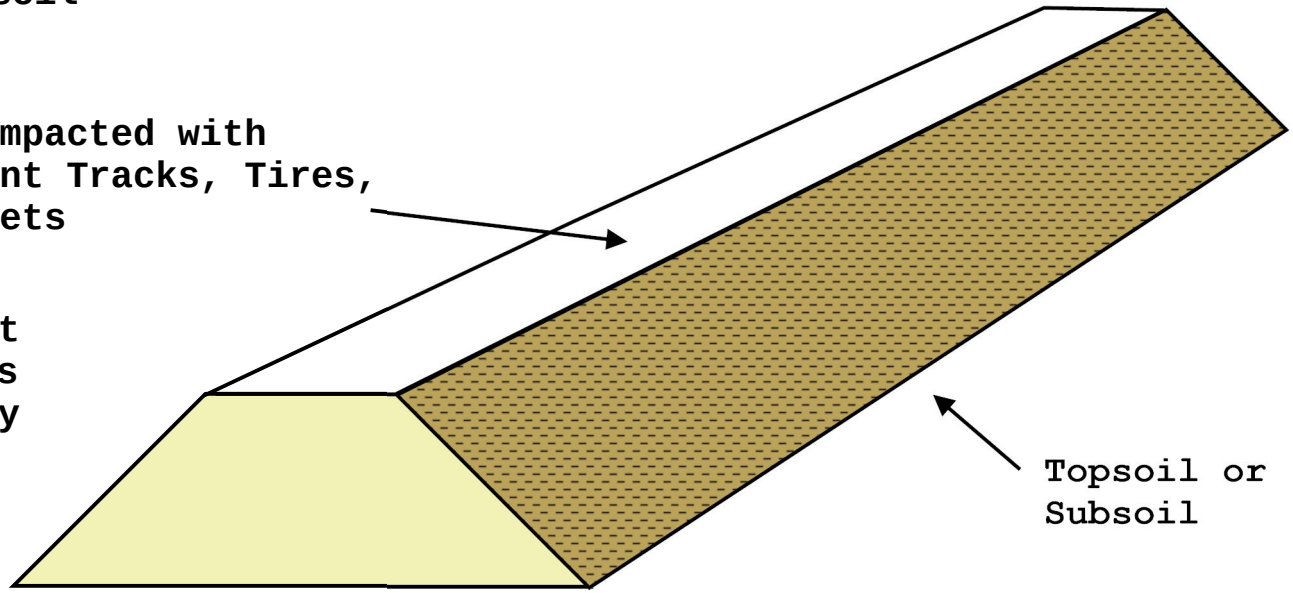
Appendix F

Structural Stormwater BMPs Specifications

Lined Containment Berm



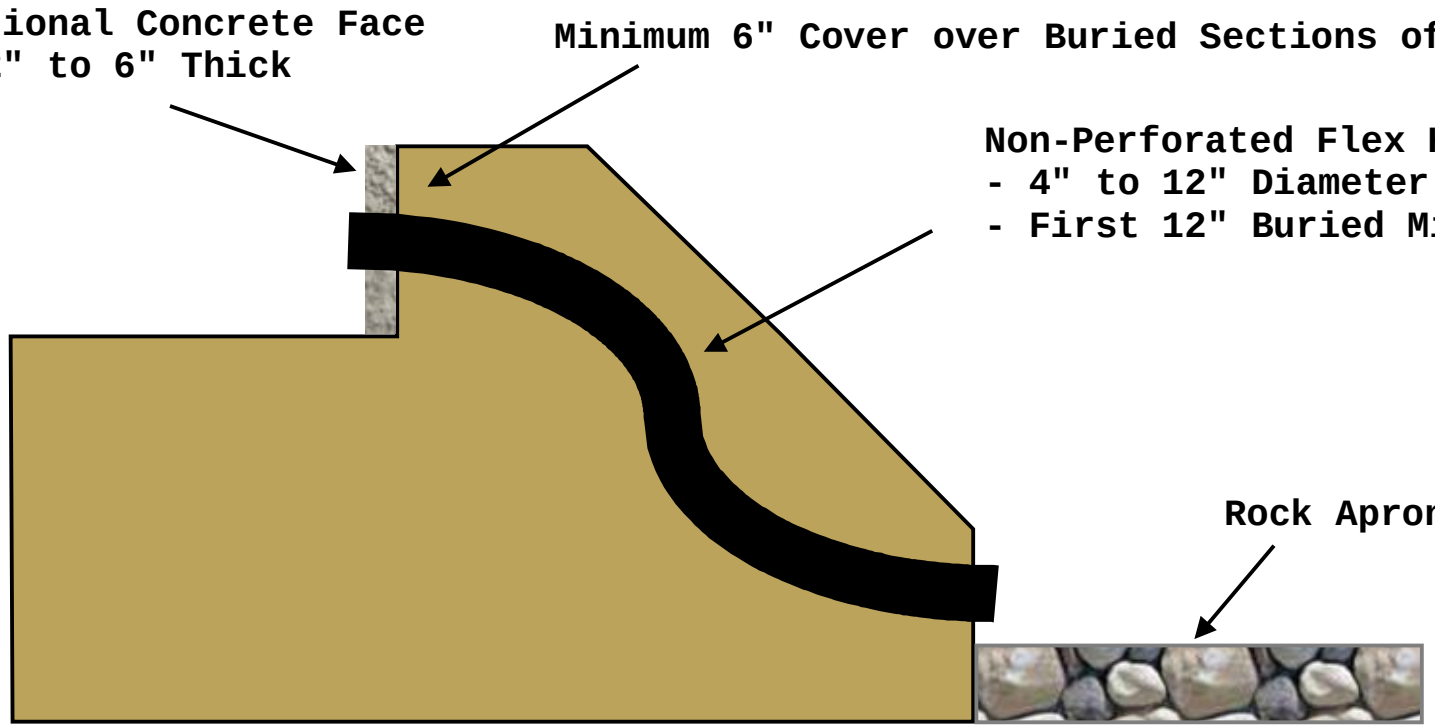
Earthen Containment Berm



All Types of Containment Berms are to be Twice as Wide at the Base as they are Tall

BMP Typical Drawing
Containment Berm
- Earthen & Lined

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524



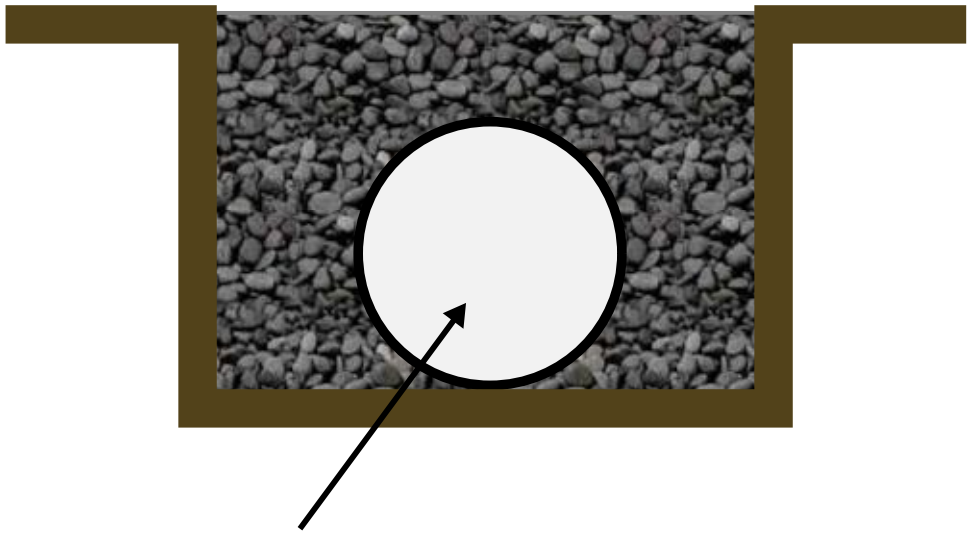
Flex Hose Outlets can be used in Conjunction with Sediment Traps, Turnouts, and Water Bars

Flex Hose Outlets need Sediment Retaining BMPs Installed Immediately Above and/or Below the Flex Hose

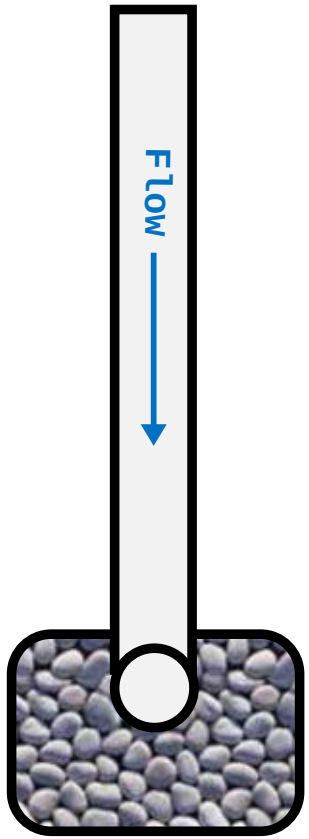
BMP Typical Drawing
Flex Hose Outlet

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524

Perforated Pipe Backfilled with Clean Gravel 1/2" to 4" in Diameter



4" to 12" Perforated Poly Pipe with Perforations Located on the Top Side of the Pipe

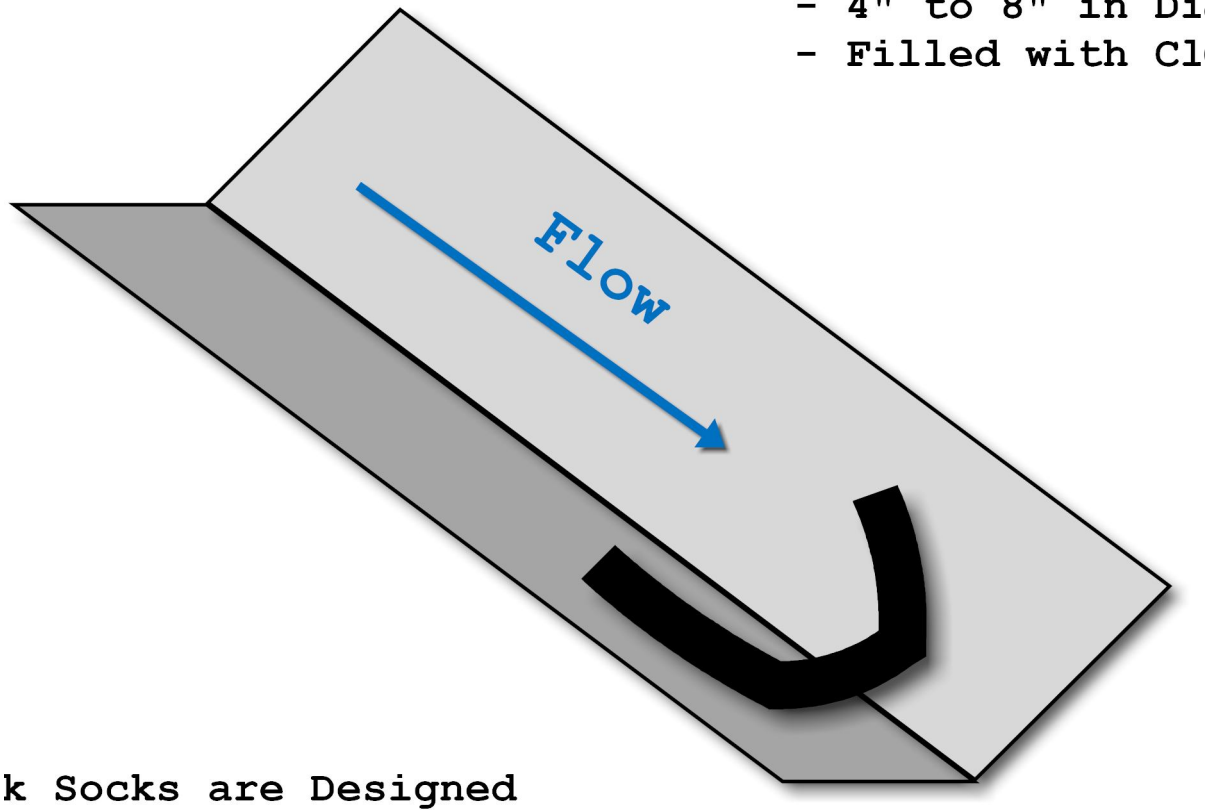


Rock Apron Installed On French Drain Outlet

BMP Typical Drawing
French Drain

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524

Rock Socks
- 2' to 10' in Length
- 4" to 8" in Diameter
- Filled with Clean 3/4" Gravel



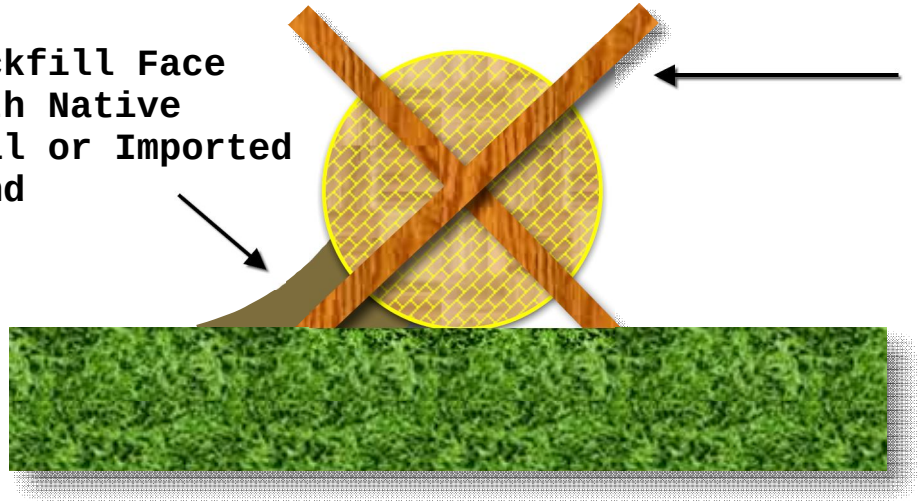
Rock Socks are Designed to be set Directly on the Ground to Retain Minor Amounts of Sediment, Typically in Bar Ditches

BMP Typical Drawing
Rock Sock

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524

Surface Installation of Wattle
- **In Frozen Conditions**
- **In Heavy Roots/Debris**
- **When Trenching is not Allowed**

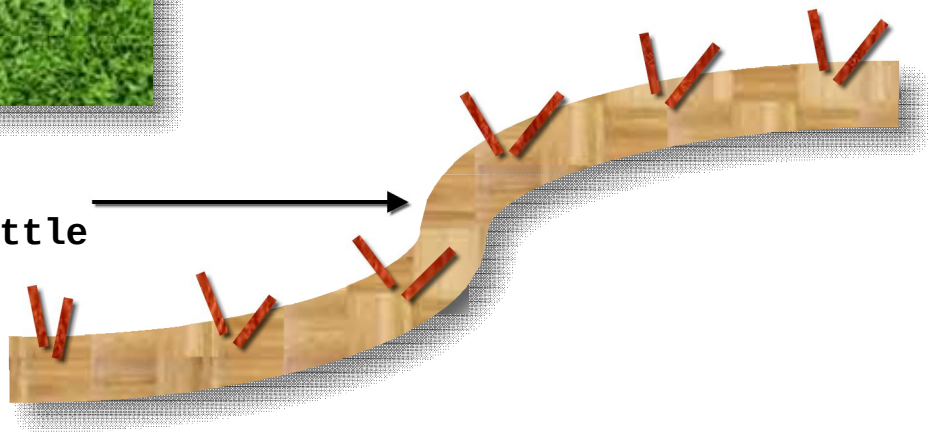
Flow



Backfill Face with Native Soil or Imported Sand

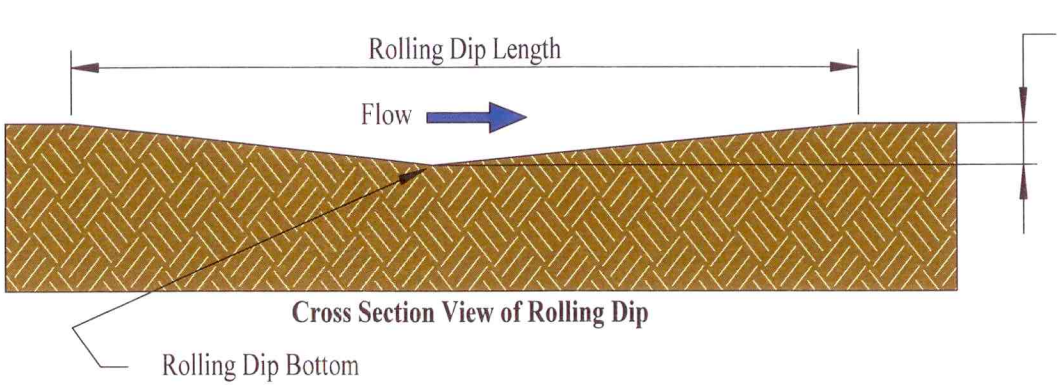
Stakes Installed at 45 to 60 Degree Angles

Stake Spacing 30 Inches
- **24 Stakes per 25-Foot Wattle**

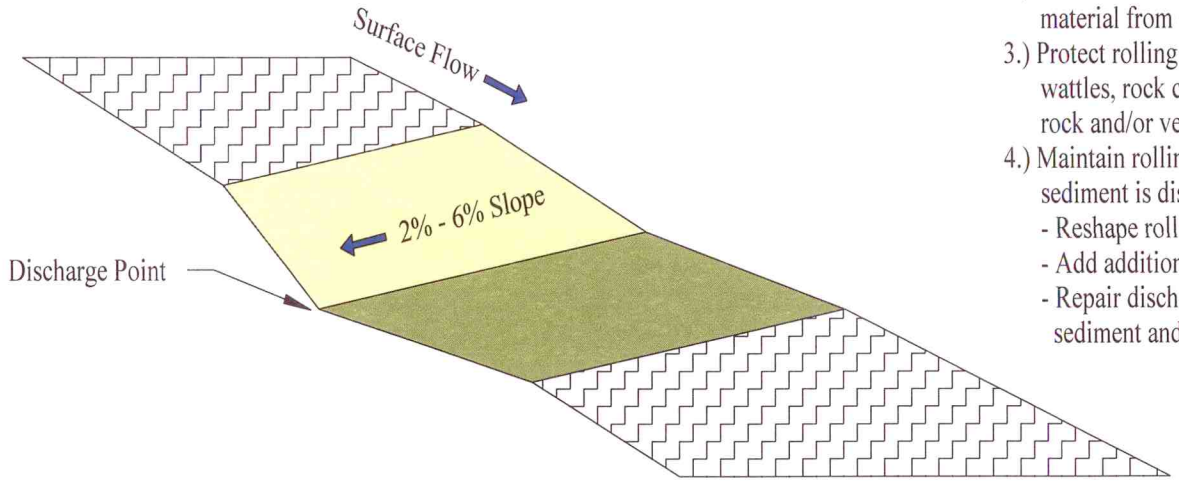


BMP Typical Drawing
Straw & Excelsior Wattle
- Surface Installation

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524



Cross Section View of Rolling Dip



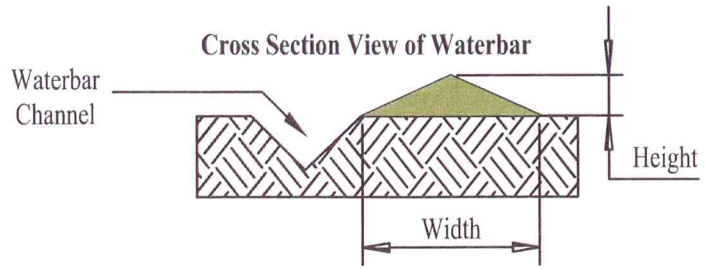
Rolling Dip Installation and Maintenance Procedures

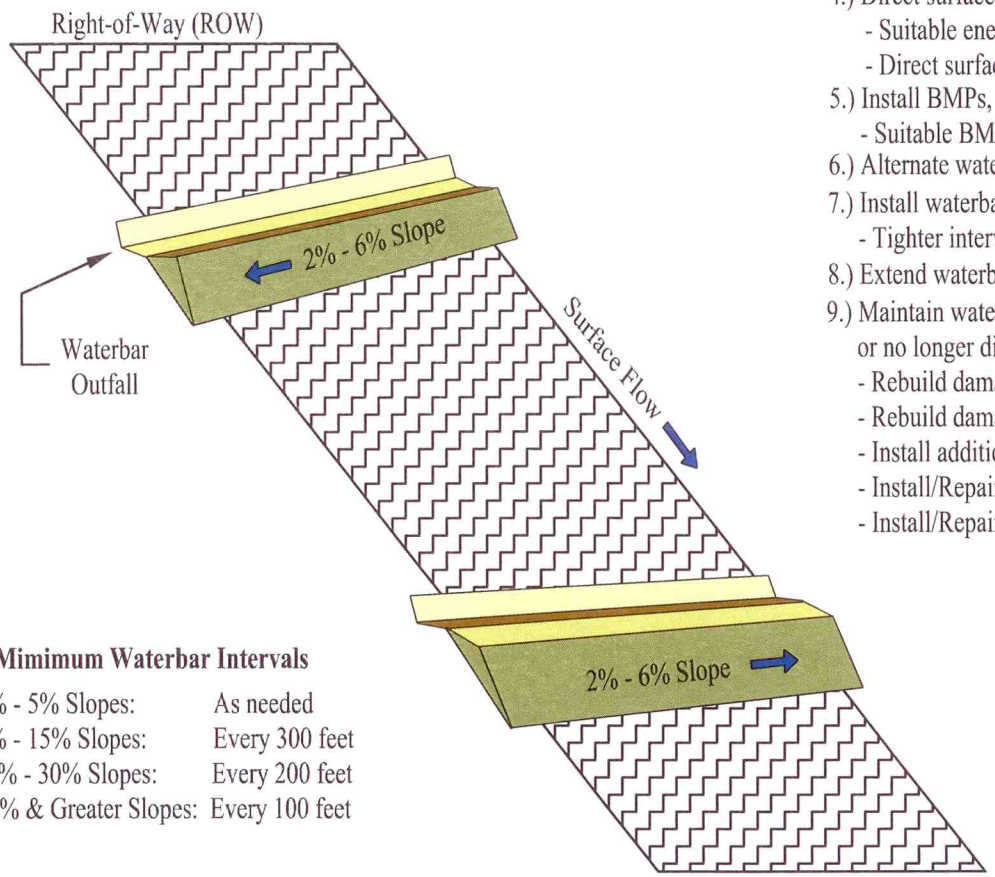
1.) Determine rolling dip dimensions based on anticipated flow, slope, and soil type
   - Install rolling dip with a 2% to 6% outfall slope
   - Downstream rolling dip height built above the grade of the rolling dip bottom
   - Rolling dip length determined to allow traffic to pass without dragging on the rolling dip
2.) Store soil or road material appropriately to prevent removed material from discharging
3.) Protect rolling dip discharge with silt fence, straw bales, straw wattles, rock check, or sediment trap unless protected by existing rock and/or vegetation
4.) Maintain rolling dip if water is able to flow over or around rolling dip, sediment is discharged, or directed water is producing erosion
   - Reshape rolling dip to direct water to discharge point
   - Add additional rolling dips if overwhelmed
   - Repair discharge BMPs as necessary to capture discharged sediment and to prevent erosion

Typical BMP Drawing and Mainatenance Procedures

Rolling Dip

ASPEN ENVIRONMENTAL FIELD SERVICES, LLC
Project Compliance Management - Permitting - Site Restoration





Mimimum Waterbar Intervals

0% - 5% Slopes:	As needed
5% - 15% Slopes:	Every 300 feet
15% - 30% Slopes:	Every 200 feet
30% & Greater Slopes:	Every 100 feet

Waterbar Installation and Maintenance Procedures

1.) Determine size of waterbar based on anticipated flow, slope, and soil type
   - Install waterbar with a 2% to 6% slope
2.) The waterbar should always be at least twice as wide as it is tall
3.) Compact soil used to construct waterbar with equipment tires/tracks or similar device
4.) Direct surface flow into stable areas (rock or well vegetated) or install BMPs at outfall
   - Suitable energry dissipating BMPs include: rock aprons, straw wattles, straw bales, and silt fence
   - Direct surface flow to areas that will carry water away from the project
5.) Install BMPs, as necessary, in the waterbar channel and/or outflow to minimize sediment discharge
   - Suitable BMPs include rock checks, straw wattles, straw bales, and silt fence
6.) Alternate waterbar outfall locations to prevent concentrated flow on either side of the project ROW
7.) Install waterbars at listed minimum waterbar intervals
   - Tighter interval spacing may be required to sufficiently protect the ROW
8.) Extend waterbars 1 to 2 feet passed the edge of ROW
9.) Maintain waterbars if breached, overwhelmed, discharging sediment, causing erosion channels to form, or no longer directing water to outfall as designed.
   - Rebuild damaged waterbar with correct slope to direct water to outfall
   - Rebuild damaged waterbar to larger demensions if breached
   - Install additional waterbar(s) up slope of damaged waterbar if overwhelmed
   - Install/Repair energy dissipating BMPs if erosion channels are forming
   - Install/Repair sediment retaining BMPs if sediment is discharging

Typical BMP Drawing and Mainatenance Procedures

Waterbar

Aspen Environmental Field Services, LLC

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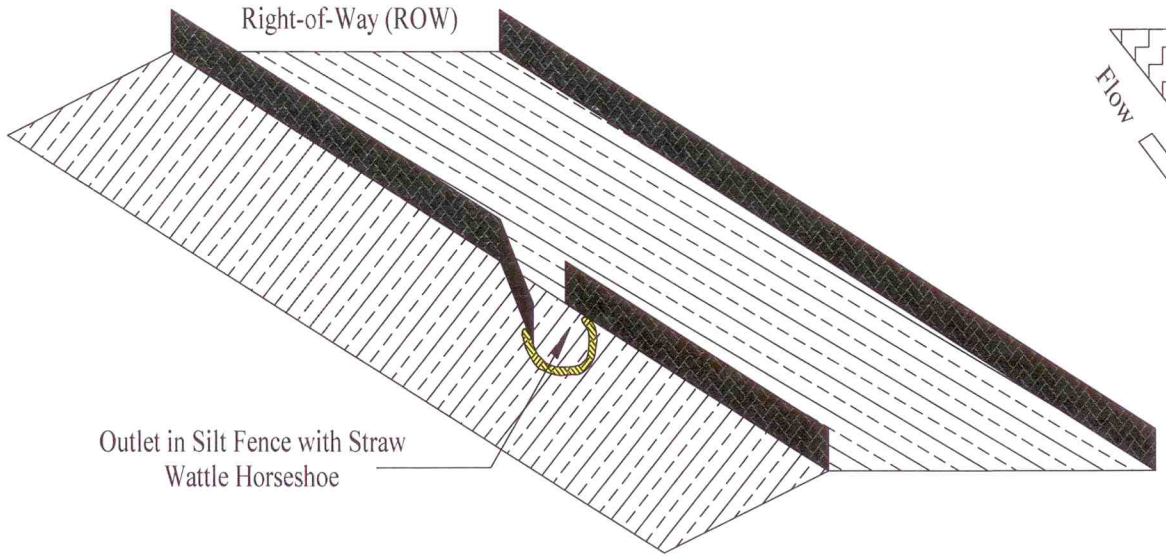
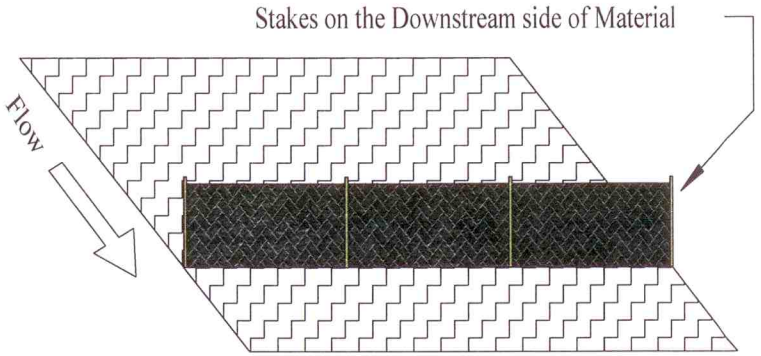
Cross Section View of Silt Fence

Silt Fence Installation and Maintenance Procedures

1.) Determine type of silt fence and type of stakes based on anticipated flow, velocity, soil type, and type of material to be retained by silt fence
2.) Dig installation trench a minimum of 6 inches deep
3.) Install silt fence in trench with the stakes on the downstream side of the fence, or wrap material around each stake 1 to 3 wraps
4.) Drive stakes until bottom 6 inches of fence is below ground level
5.) Return soil to the trench and compact by hand
6.) Roll fence together or install overlap between each roll of silt fence
7.) Maintain silt fence if damaged or 50% of its sediment retaining capacities are met
   - Remove captured sediment and store approriately to prevent discharging sediment
   - Replace broken stakes, add additional stakes as needed
   - Tie or staple loose silt fence to stakes
   - Completely replace silt fence if severely damaged





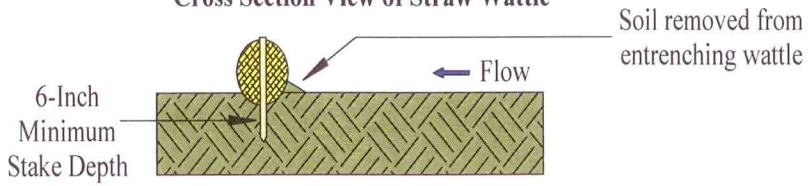
Typical BMP Drawing and Mainatenance Procedures

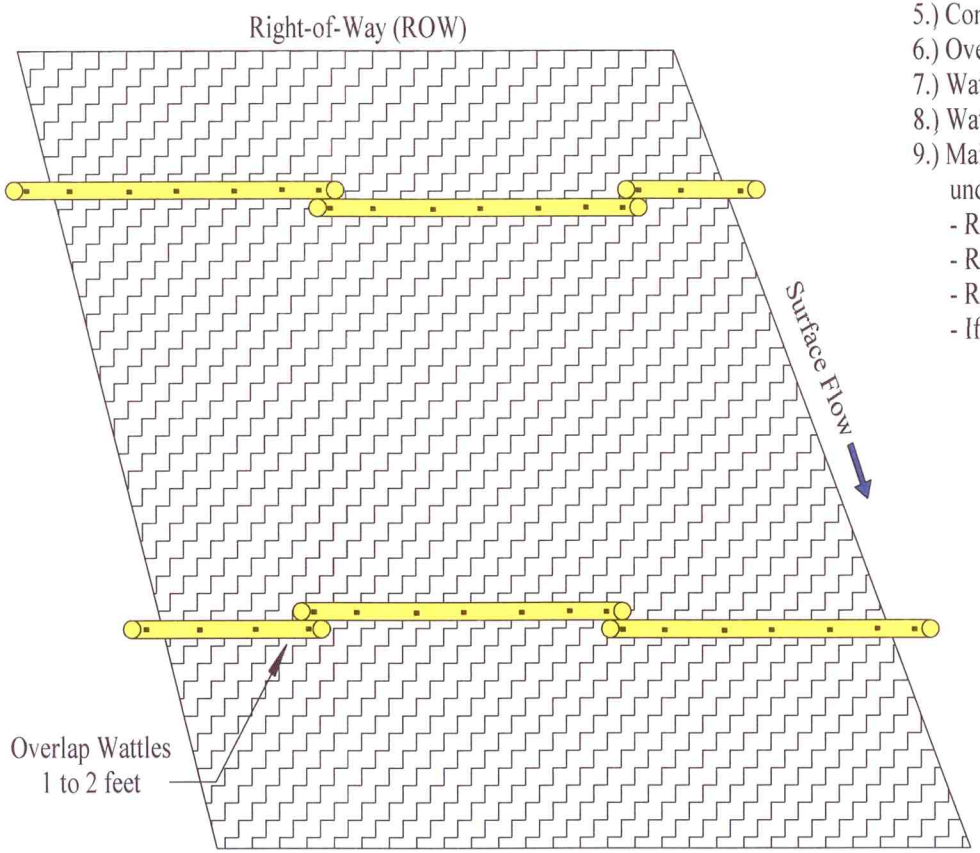
Silt Fence

ASPEN ENVIRONMENTAL FIELD SERVICES, LLC

Project Compliance Management - Permitting - Site Restoration

Cross Section View of Straw Wattle

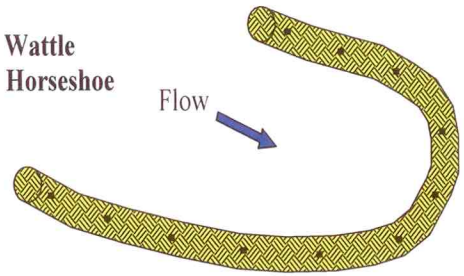




Straw Wattle Installation and Maintenance Procedures

1.) Determine diameter and interval spacing of straw wattle based on anticipated flow, slope, and soil type
2.) Entrench wattle 1 to 3 inches into the soil
3.) Secure wattle with 18 to 24-inch wood stakes measuring a minimum of 1" X 1" on the side
4.) Drive one stake through the wattle every 4 to 6 feet, perpendicular to ground
   - Drive stake until nearly flush with wattle
5.) Compact soil removed from the trench on the upslope side of the wattle
6.) Overlap wattles 1 to 2 feet when installing multiple wattles
7.) Wattles installed over curlex or other erosion control matting may be installed without trenching
8.) Wattles installed perpendicular to flow to dissipate water energy and to retain sediment
9.) Maintain wattles when 75% of the sediment retention capacity is met, when water is able to flow under the wattle, or the wattle is damaged.
   - Remove captured sediment and store accordingly to avoid discharging sediment
   - Repair channel allowing water to flow under wattle and drive additional stakes to secure wattle
   - Replace any damaged wattle with new wattle
   - If wattles are overwhelmed, add additional wattle, or replace with straw bales or other BMP

Straw Wattle Discharge Horseshoe



Typical BMP Drawing and Mainatenance Procedures

Straw Wattle

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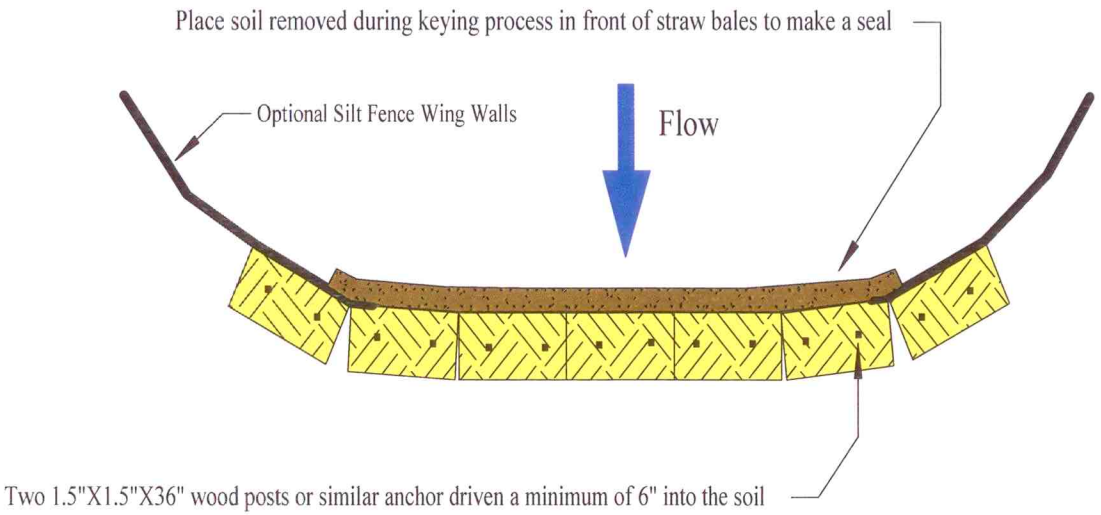
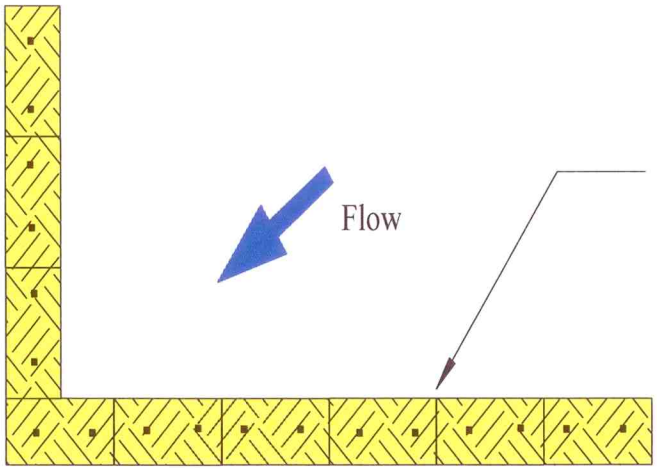
Project Compliance Management - Permitting - Site Restoration

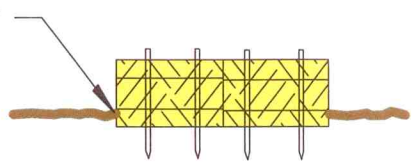
Top View of Straw Bale Barrier with Optional Silt Fence Wing Walls



Straw Bale Installation and Maintenance Procedures

1.) Select straw bale barrier size based on anticipated flow, slope, and soil type
2.) Entrench (Key) straw bales 4 to 6 inches into the soil
3.) Place soil removed to create trench on the upslope side of straw bales and compact by hand
4.) Place straw bales firmly against adjacent straw bales
5.) Drive two stakes through straw bales until nearly flush with bale
   - Drive stakes perpendicular to ground
   - Stakes should measure a mimimum of 1.5" X 1.5" X 36"
6.) Maintain straw bale barries when it has reached 50% of its sediment retention capacity, water is able to flow under or around barrier, or straw bales are damaged.
   - Remove captured sediment and store appropriately to prevent sediment discharge
   - Repair eroded channels flowing under straw bales and reinstall straw bale, compact soil on the upslope side of straw bale
   - Replace any deteriorated straw bales
   - Enlarge barrier if overwhelmed or water is flowing around straw bales





Typical BMP Drawing and Mainatenance Procedures

Straw Bale Barrier

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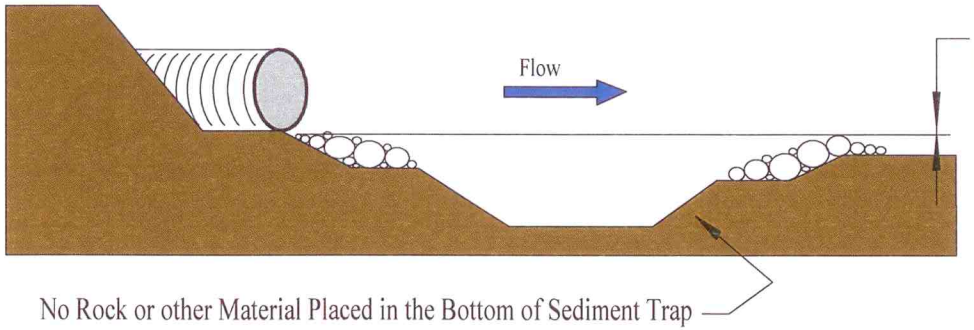
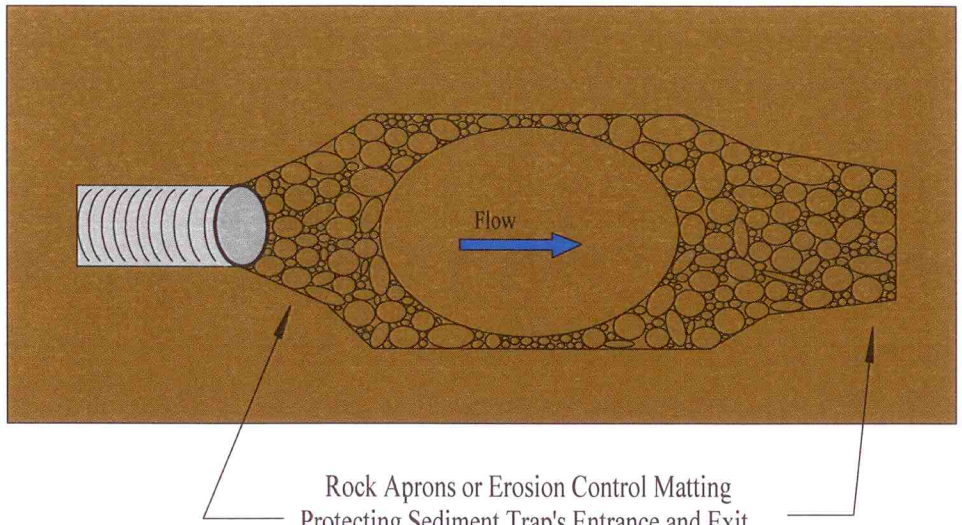
Cross Section View of Sediment Trap



Top View of Sediment Trap



Sediment Trap Installation and Maintenance Procedures

1.) Design sediment trap based on anticipated volume and velocity of water
2.) Protect against erosion on the entrance and exit of sediment trap
   - Rock or erosion control matting may be used for erosion control
3.) No rock or erosion control matting placed in the bottom of the sediment trap to facilitate the removal of collected sediment
4.) Outfall of sediment trap built below the grade of the culvert or other discharge point to prevent restricting flow
5.) Maintain sediment trap if entrance or exit of sediment trap is eroding or 50% of the sediment storage capacity is full
   - Remove captured sediment and store accordingly to prevent sediment from discharging
   - Repair rock or erosion control matting on entrance and exit if eroded channels form
   - Enlarge sediment trap or install additional sediment traps if overwhelmed

Typical BMP Drawing and Mainatenance Procedures

Sediment Trap

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Slope Roughening/Crimped Mulch
Installation and Maintenance Procedures

1.) Determine the type and amount of slope roughing and crimped mulch based on the anticipated flow, velocity, soil types, and slopes
2.) Install slope roughening with tracked equipment or other attachment
   - Track perpendicular to slopes
3.) Create numerous small indentations in the soil to trap sediment and slow water velocity
4.) To install crimped mulch, apply 1/2 to 2 tons of certified weed-free straw per acre then incorporate mulch into the soil by slope roughening or crimping
5.) Maintain slope roughening and/or crimped mulch by reapplying the process

Typical BMP Drawing and Mainatenance Procedures

Slope Roughening/Crimped Mulch

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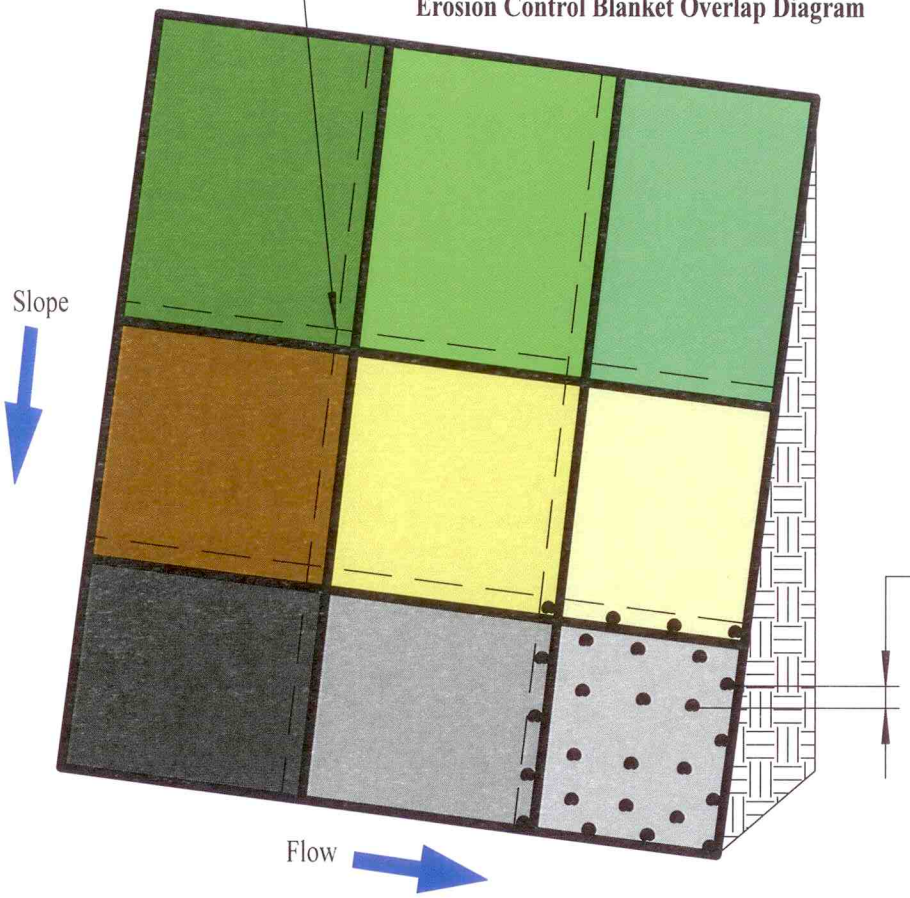
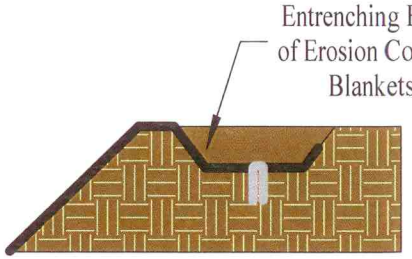
Overlap blankets a minimum of 4 inches. Upslope and upstream blankets are placed over blankets installed downslope or downstream

Erosion Control Blanket Overlap Diagram



Erosion Control Blanket Installation and Maintenance Procedures

1.) Select the type of erosion control blanket and staples based on the expected volume and water velocity, the type of soil, and the percent slope
2.) Remove rocks, logs, or other debris from installation area that may prevent the erosion control blanket from having full ground contact
3.) Smooth area to be covered by erosion control blanket and seed with temporary and/or permanent seed mix
4.) Install blankets in "shingle" pattern, with a 4-inch minimum overlap
   - Blankets installed downslope are overlapped by blankets installed upslope
   - Blankets installed downstream are overlapped by blankets installed upstream
5.) Insert 6-inch or longer staples, or functionally equivalent anchors, approximately every 2 feet on center
6.) Secure outer edges of blanket install with straw wattle and/or entrenching edges
7.) Maintain erosion control blankets if structural damage occurs
   - Replace torn blankets as needed
   - Install additional staples to secure loose blankets



Staple Blanket, then Backfill Trench and Compact Soil

Typical BMP Drawing and Mainatenance Procedures

Erosion Control Blanket

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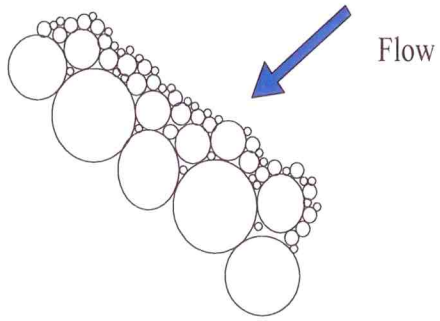
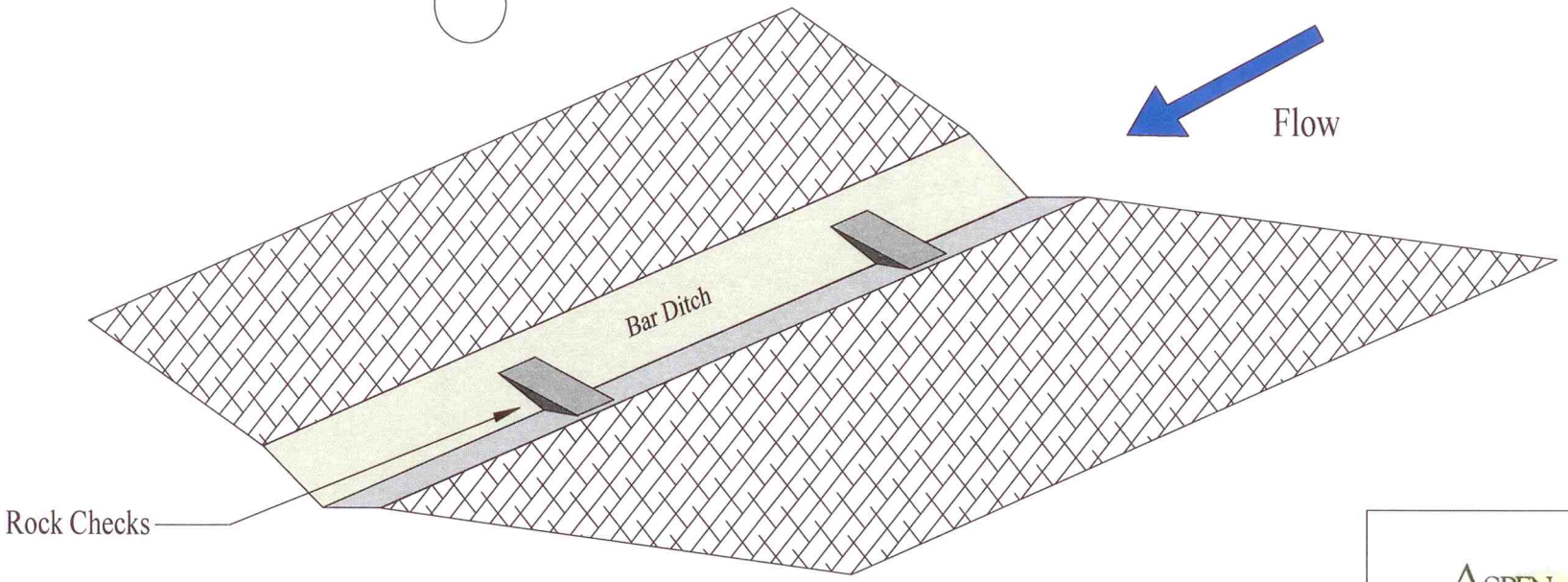
Top View of Rock Check

Place larger rock in back, smaller rock in front



Rock Check Installation and Maintenance Procedures

1.) Select rock size and rock check dimensions based on anticipated flow and velocity
2.) Construct rock checks with 1 to 12-inch diameter rock. Avoid using rock which contains fine material that could be discharged
3.) Place smaller rock upstream and in gaps between larger rock
4.) Construct rock checks below surrounding grade to direct water over the rock check.
5.) Maintain rock checks if water is flowing under or around the checks or 75% of its sediment retention capacity has been met
   - Remove captured sediment and store accordingly to prevent sediment from discharging
   - Reorganize rock or add additional rock to prevent water from flowing under or around check
   - Add additional rock checks if checks are being overwhelmed



Typical BMP Drawing and Mainatenance Procedures

Rock Check

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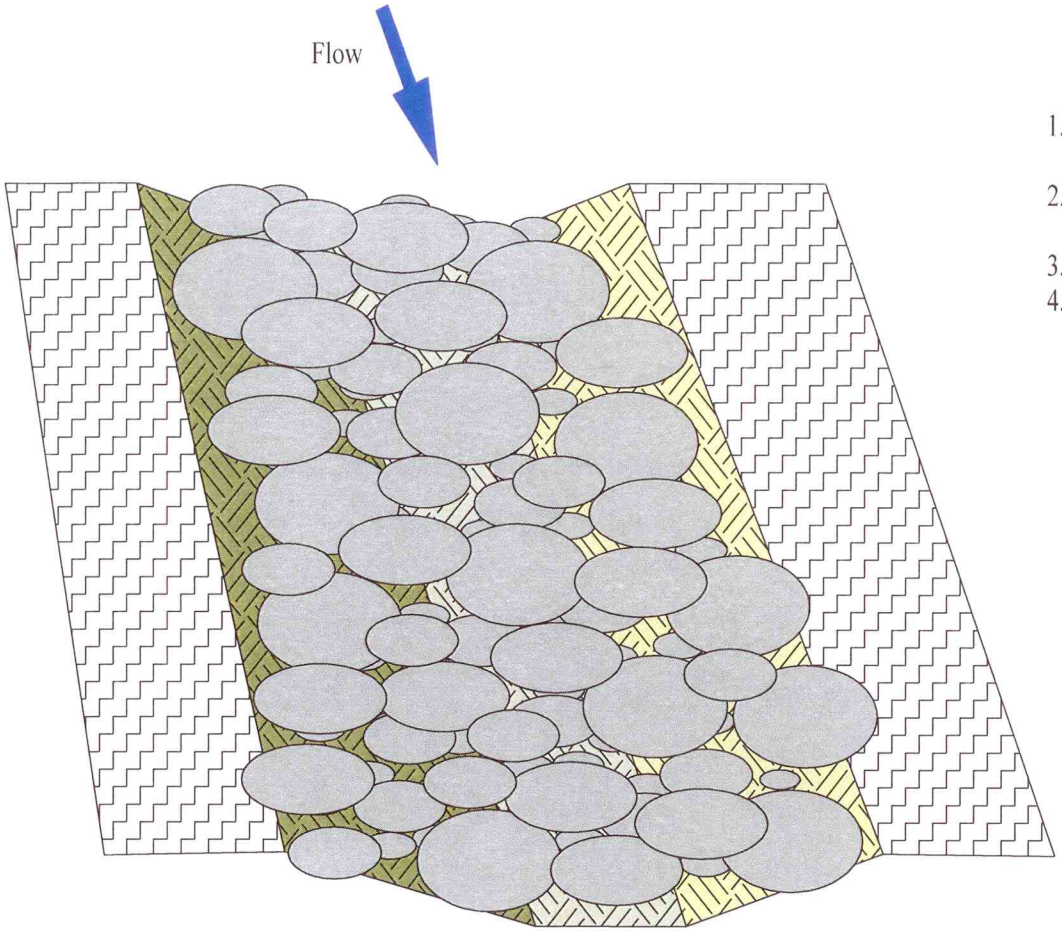
Project Compliance Management - Permitting - Site Restoration



Rock Apron Installation and Maintenance Procedures

1.) Select type and diameter of rock based on the expected volume and water velocity, the type of soil, and the percent slope
2.) Install rock in channel water will travel and extend rock apron to protect soil subjected to flow
3.) Use rock with limited fine material to prevent discharging sediment
4.) Maintain rock apron if water is able to produce eroded channels
   - Rake out eroded channels
   - Reorganize or add additional rock to prevent erosion

Typical BMP Drawing and Mainatenance Procedures

Rock Apron

ASPEN ENVIRONMENTAL FIELD SERVICES, LLC

Project Compliance Management - Permitting - Site Restoration

Appendix G

Cascade Creek Stormwater Management Plan

- **CDPHE Permit**
- **BMP Drawings**
- **Seed Mixes**

Laramie Energy, LLC – Operator Number 10433

Stormwater Management Plan

Cascade Creek Project Area

Laramie Energy, LLC

Prepared By:

Aspen Environmental Field Services, LLC

Project Compliance Management - Permitting - Site Restoration

Cascade Creek Project Area
Stormwater Management Plan

SWMP Last Updated: 3/19/2020

SWMP Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system design to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature	Title	Date
	V.P. Field Ops.	3/19/2020

TABLE OF CONTENTS

ATTACHMENTS

Attachment 1 – Project Area Map
Attachment 2 – Stormwater Permit
Attachment 3 – BMP Typical Drawings
Attachment 4 – Recommended Seed Mixes
Attachment 5 – Individual Projects

APPENDICIES

Appendix A – Inspection Reports
Appendix B – Site Maps

1.0 INTRODUCTION

This Stormwater Management Plan (SWMP) identifies operating procedures associated with stormwater management for the Cascade Creek Project Area (project). These procedures comply with the requirements, set forth by Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (Division), for controlling stormwater discharges associated with construction activity.

Procedures identified in this plan apply to Laramie Energy, LLC and the contractor(s) it employs to perform construction and/or maintenance operations within the project. Measures in this plan pertain to the entire project area, which is defined as all temporary and permanent rights-of-way (ROW), temporary use areas, access roads, and staging areas located within the Cascade Creek Project Area boundaries.

This SWMP describes procedures to minimize the potential for erosion, sedimentation, or the discharge of pollutants, by the use of proper construction techniques and the adoption of appropriate Best Management Practices (BMPs). These BMPs will be implemented and maintained during all phases of construction and maintained until the terms and conditions of the associated stormwater permit have been fulfilled.

A copy of this plan is required by CDPHE, Water Quality Control Division, to be stored on project from the date of project initiation to the date of expiration. Upon request, the SWMP is to be provided to the Division, EPA, or any local agency affiliated with, or impacted by stormwater.

The SWMP, in its entirety, will be retained for a period of three years after final stabilization has been achieved, all associated permit terms have been fulfilled, and a Notice of Inactivation has been submitted to the State.

Laramie Energy has transferred ownership of a Certificate to Discharge under CDPS General Permit COR-030000, Stormwater Discharges Associated with Construction. Permit information is listed below:

Certification Number	Expiration Date
COR402705	3/31/24

A copy of this permit is included as Attachment 2 – Stormwater Permit

2.0 SITE DESCRIPTION

2.1 Nature of Construction Activities

The Cascade Creek Project involves the development of infrastructure needed to produce and transport natural gas and other related by-products. Up to 100, level pads may be developed to construct compressor stations, water handling facilities, natural gas wells, or other related facilities. The development of these 100 pads would disturb approximately 500 acres of land. Approximately 50 miles of road may also be constructed or improved to facilitate access to these locations and could disturb up to an additional 300 acres. As many as 100 pipelines of various diameters and lengths could be constructed to transfer liquids and gases to and from pad locations. Pipeline construction could potentially disturb up to another 700 acres. The total disturbance throughout the life of the project is projected to not exceed 1,500 acres. Of the 1,500 acres of forecasted disturbance, less than 1,000 acres is anticipated to not meet final stabilization requirements at any one point in time.

Pad, pipeline, and road construction will involve grading and excavation activities. Topsoil will be segregated prior to conducting any activities involving subsoil. Subsoil will be graded to create level working and/or travel surfaces. Road base and/or surface gravel may be imported to create final working surfaces.

The Cascade Creek Project Area includes the following sections:

- Township 6S, Range 97W, Sections 3-10, 15-22, and 27-34
- Township 7S, Range 97W, Sections 3-28, 33, and 34
- Township 7S, Range 96W, Sections 9, 10, 15-20, and 30

The project area boundary map is included as Attachment 1.

2.2 Sequence of Major Activities

The construction process for developing well pads, pipelines, access roads, and related facilities within the Cascade Creek Project Area is described below:

1.) Install Pre-Construction BMPs – Temporary and/or permanent BMPs will be installed prior to soil disturbing activities to protect sensitive resources and/or to minimize off-ROW deposits of earth, rocks, vegetation, construction debris, and/or sediment. At times, vegetation clearing activities will need to occur prior to installing pre-construction BMPs to gain access to installation sites. Vegetation clearing will be limited to removing above grade vegetation while leaving root structure intact until pre-construction BMPs are installed.

2.) Access Road Improvement – Existing roads will be utilized to access construction sites to the greatest extent practical. Improvements will likely be required to existing roads to better facilitate access and to provide infrastructure to enhance stormwater management. Road improvements

made to facilitate access may include: widening the road or creating pullouts, shaping the existing road (crowning), adding additional surface material, and preparing the final surface for travel (grading, watering, rolling). Infrastructure improvements may include: creating/improving bar ditches, adding water bars or rolling dips, and/or installing culverts.

3.) Access Road Development – In areas where existing roads do not provide adequate access to construction sites, new roads will be developed. Constructing new roads may include some of the same tasks identified under "Access Road Improvement", as well as, additional operations specific to new construction. Vegetation, rocks, fences, and/or debris will need to be cleared prior to road construction. Once clearing is complete, on average, 6 inches of topsoil will be stripped and segregated from the designated road surface and stored on either or both edges of the roadway. After clearing and topsoiling activities are complete, subsoil will be shaped to create the desired roadway. Approximately 6 to 12 inches of base rock will then be applied to the road surface to provide adequate strength to support heavy vehicle and equipment traffic. The road surface will typically be finished with the addition of 2 to 6 inches of finer surface material.

4.) Install Access Road BMPs – Once access roads are improved or created, additional BMPs will be installed to enhance or replace those installed during pre-construction. Rock checks and/or rock socks will be placed or constructed in bar ditches to create sediment retention capacity and to slow concentrated flow. Sediment traps will be installed on the inlet and/or outlet ends of culverts, turnouts, or other discharge points to filter stormwater before allowing it to exit the project. Rock aprons will be installed in conjunction with sediment traps to minimize erosion and dissipate flow.

5.) Access Road Restoration – Once permanent BMPs have been installed (rock aprons and sediment traps), cut banks, shoulders, and other slopes will be broadcast or drill seeded with the recommended seed mixture. Certified weed-free straw may be applied as mulch if the seeded area lacks the necessary organics or structure. Seeding may be deferred as necessary to enter a proper seeding window. Seeding requirements and/or recommendations are included as Attachment 4 – Recommended Seed Mixes.

6.) Well or Facility Pad Development – The development of pads will usually follow soon after road access is development. Some degree of clearing is typically required to prepare pad locations for pre-construction BMP installations and topsoiling activities. After pre-construction BMPs are installed, approximately 6 inches of topsoil will be stripped from the entire location and placed on the edges of the project. Topsoil will be utilized to form containment berms and sediment traps around the perimeter of the pad. Containment berms will be slope roughened (track walked) if possible, then seeded and mulched. If containment berms are unable to be compacted, heavier amounts of mulch will be applied to provide additional stabilization. The actual pad construction will involve leveling the site by cutting the upslope portion of the pad and depositing the material to the down-slope portion of the site. Fill will be watered and compacted as necessary to adhere to construction specifications. Roughly 2 to 6 inches of gravel are applied to the final pad surface.

7.) Install Well or Facility Pad BMPs – Once the pad is finished, BMPs will be installed in addition to, or to replace those installed prior to, or during construction. The primary BMPs installed at this point are the outlets on large capacity sediment traps which were formed by creating containment berms around the perimeter of the pad. Outlets will consist of flex hose outlets, rock aprons, and/or horseshoe wattles. Large capacity rock checks will be added between fill slopes and containment berms as possible to slow water velocity and provide additional soil retention upstream of large capacity sediment traps which are typically located at the lower portions of the pad.

8.) Install Permanent Wells or Facilities – Once the pad construction is complete, the actual well(s), facilities, supporting infrastructure, buildings, tanks, etc. will be installed.

9.) Pipeline Construction – After a location is constructed, or possibly prior to facilities being installed, pipelines may be installed to carry water, natural gas and/or related byproducts from the location to other infrastructure. Construction will closely mirror those listed above for road construction. In fact, pipelines are often installed in conjunction with roads being placed in the cut and/or fill slopes. Pipeline construction primarily differs from road and pad development in the fact that almost all disturbance associated with the installation is fully restored and returned to the original land use and vegetation.

10.) Well Pad Restoration – After a location is completed, temporary equipment and supplies are removed. Portions of the pad that are no longer operationally required will be restored. Restoration will involve returning original contours and redistributing topsoil over those areas. During proper seeding windows, the redistributed topsoil will be seeded and possibly mulched as required.

11.) Access Road, Pipeline, and Pad Maintenance – Structural and non-structural BMPs associated with access roads, pipelines, and pads will continue to be inspected on a routine 30-day stormwater inspection cycle. BMPs will be repaired and maintained as necessary until final restoration requirements have been fulfilled. Noxious weeds will be identified and treated as necessary throughout the life of the project.

2.3 Acreage Disturbed by Construction Activities

The Cascade Creek Project Area includes approximately 39,040 acres within its boundaries. Approximately 1,500 acres located within the project area may be disturbed during the construction of the Project. Estimated disturbances are listed below:

Developing Pads	500 acres
New Roads and Pipelines	1,000 acres

Total: 1,500 acres

The project will be constructed over multiple years. It is anticipated that there will not be more than 1,000 acres of disturbance at any one point in time.

2.4 Soil Description and Potential for Erosion

A custom soil resource report was generated through the Natural Resource Conservation Service to serve as a reference to the soil types located within the Cascade Creek Project Area. This report determined that the project area is primarily comprised of the following soil types:

- Biedsaw-Sunup gravelly loams, 10 to 40 percent slopes
- Happle very channery sandy loam, 3 to 12 percent slopes
- Happle-Rock outcrop association, 25 to 65 percent slopes
- Northwater-Adel complex, 5 to 50 percent slopes
- Parachute-Irigul complex, 5 to 30 percent slopes
- Parachute-Irigul-Rhone association, 25 to 50 percent slopes MLRA 48A
- Parachute-Rhone loams, 5 to 30 percent slopes
- Tosca channery loam, 25 to 80 percent slopes MLRA 48A

The soils listed above are in land capability class 4e, 6e, and 7e. These land capability classes all indicate that the soils present in the Cascade Creek Project Area have significant limitations that will restricts the types of plants able to be grown and are highly susceptible to erosion.

2.5 Description of Existing Vegetation

Disturbance within the Cascade Creek Project Area will occur between 5,700 and 8,700 feet in elevation. The project area is comprised of rolling hills, pastures, drainages, steep slopes, and rock outcrops. Slopes range from near zero to well over 100 percent. Vegetation differs widely throughout the project as well due to the large variances in elevation.

The project area includes two perennial streams and numerous springs. Vegetation along the perennial streams largely consists of cottonwood, willow, oak brush, greasewood, and irrigated pasture. Vegetation near springs typically contains aspen, sedge grasses, and/or willows.

The project area also contains many intermittent and ephemeral drainages. These drainages are often bordered by willow, cottonwood, shrub riparian, sagebrush, irrigated agriculture, oak brush, and a variety of grasses.

Upper elevation uplands are primarily comprised of aspen, oak brush, sagebrush, smooth brome, wheatgrass, and evergreens on many of the north aspect slopes. Lower elevation vegetation largely consists of greasewood, oak brush, rabbitbrush, sagebrush, cheatgrass, and crested wheatgrass.

The estimated, natural occurring ground cover for the project is between 25 and 75 percent. Irrigated pastures contain near 100 percent ground cover, while isolated rock outcrops and natural slides have little to no vegetation.

2.6 Potential Pollutant Sources

The six sources of potential pollutants associated with construction activities occurring within the Whittaker Flats Project Area are listed below:

- Disturbed Soil – Sediment, vehicle tracking, dust, clods
- Vehicle & Equipment Operation – Fuels, hydraulic and motor oils, lubricants, coolants
- Well & Pipeline Construction/Maintenance – Concrete, paints, sealants, solvents, lubricants
- Herbicide Application – Herbicides, surfactants, dyes, anti-drift agents
- Non-Industrial Storage – Garbage, human waste, construction debris
- Drill Cuttings

These six pollutant sources could be potentially present anywhere operations have or are occurring within the project area. Fuels, oils, lubricants, and coolants represent a potential risk during refilling/maintenance operations, while equipment is being staged, and in the event of mechanical failure during normal vehicle and/or equipment operation. Sediment, vehicle tracking, clods, and dust will be a potential pollutant risk on all portions of the project where soils have been disturbed and along all gravel and dirt access roads. Concrete, paints, sealants, and solvents will represent a potential risk during the construction and maintenance of well and pipeline facilities. Garbage, human waste, and construction debris will be present at job sites and dumpster and portable toilet locations. Herbicide applications may be made during restoration phases of the project or on adjacent undisturbed land to prevent noxious weed encroachment and could potentially exist over the entire project area. Drill cuttings will only be present on actively or recently drilled pads and will typically be placed on or below the pad's cut-slope.

2.7 Non-Stormwater Discharges

There are four allowable non-stormwater discharges that may occur during construction of this project. Uncontaminated springs that do not originate within disturbed soils may be encountered during the construction of the project and are considered an allowable non-stormwater discharge. Irrigation return flow could also be encountered during the project development and is also an allowable non-stormwater discharge. In either case, areas where these types of flows are anticipated, disturbed soils and/or soils to be disturbed will be protected in such a fashion as to avoid scouring and discharging sediment. Several types of BMPs may be employed alone or in combination including: high-velocity erosion control blanket, tarps/plastic/visqueen, culvert/pipe/PVC, silt fence, rock armor, and/or excelsior wattle.

Concrete mixing, pumping, and delivery operations require periodic rinsing to prevent equipment damage. Rinsing operations will only occur on level ground where washout water is sufficiently able to be absorbed into the soil. Washout water will not be allowed to exit the project as runoff. Concrete washout operations will be allowed to occur within the center portion of any natural gas well pad located within the project area. The large surface area associated with natural gas pads will provide ample space for washout water to filter through surface material and be absorbed into the soil below. Excelsior wattle, gravel/earthen berms, silt fence, rock socks, and/or straw bales will be used to contain the washout residual to a confined area if necessary. Residual concrete resulting from the washout process will be properly disposed of at an off-site facility.

In the event of a wildfire or structural fire, water discharged in the attempt to contain or extinguish the fire is also considered to be an allowable discharge.

2.8 Receiving Waters

The project area includes two perennial streams, Conn Creek and Cascade Creek. The project area also contains two named springs, Mount Callahan Spring and Pritchard Spring, as well as, many unnamed springs located throughout the project area. The project area includes numerous intermittent and ephemeral drainages located fairly uniformly throughout the project. Most of these drainages are unnamed but also include: Crystal Creek, House Log Creek, Riley Gulch, Baker Gulch, Logan Wash, Bowdish Gulch, Tourist Run, and Gilman Gulch.

Approximately 90% of the project area drains south and west into Roan Creek, while the remaining 10% drains east into Parachute Creek. Cascade Creek and Logan Wash both terminate into Conn Creek. Conn Creek flows into Roan Creek approximately 7 miles north of De Beque. Roan Creek flows south and becomes a tributary of the Colorado River at the town of De Beque. The portion of the project that drains to the east flows into Riley Gulch and several other unnamed drainages. These drainages terminate into Parachute Creek roughly 4 miles north west of the town of Parachute. Parachute Creek flows southeast and becomes a tributary of the Colorado River near the town of Parachute. The Colorado River is the ultimate receiving water.

The project area does not include any municipal storm sewer systems.

Table below identifies all of the locations in which the project has/or plans to cross streams:

Stream	Type of Crossing	Location	Coordinates
Cascade Creek	Culvert	Lower Loop Road	39.5422°/-108.2217°
Cascade Creek	Culvert	Mountain Road	39.5045°/-108.2370°
Cascade Creek	Culvert	CC 697-16D Road	39.5163°/-108.2222°
Conn Creek	Culvert	CC 797-06-07 Road	39.4765°/-108.2477°
Conn Creek	Culvert	Mountain Road	39.5010°/-108.2424°
Conn Creek	Culvert	Mountain Road	39.5051°/-108.2421°
Conn Creek	Culvert	CC 620-21 Road	39.5129°/-108.2454°
Conn Creek	Culvert	CC 697-20-28 Road	39.5136°/-108.2463°
Conn Creek	Culvert	CC 697-15-50 Road	39.5169°/-108.2470°
Gilman Gulch	Open Cut	CC 797-06-07 Pad	39.4799°/-108.2544°
Unnamed Drainage	Culvert	Lower Loop Road	39.5275°/-108.2112°

3.0 SITE MAP

The Cascade Creek Project Area resides entirely within Garfield County, Colorado. Maps are included as Attachment 1 which depicts an overview of the Cascade Creek Project Area. Site specific maps are included as Appendix B, which illustrates individual construction projects.

Site specific maps will identify:

Site specific maps will identify:

- Construction site boundaries
- Flow arrows that depict stormwater flow directions
- All areas of ground surface disturbance including borrow and fill areas
- Areas used for soil storage
- Areas used for storage of waste
- Locations of all structural BMPs
- Locations of all non-structural BMPs
- Locations of springs, streams, wetlands, and other surface waters
- Locations of stream crossings

Dedicated asphalt or concrete batch plants will not be utilized, therefore will not be depicted on the site-specific maps.

4.0 STORMWATER MANAGEMENT CONTROLS

4.1 SWMP Administrator

Laramie Energy, LLC contracted Aspen Environmental Field Services, LLC (AEFS) to develop this SWMP and to administrate all aspects of stormwater management compliance. AEFS is responsible for implementing, maintaining, and revising this SWMP. AEFS will provide the following staff to serve as Qualified Stormwater Managers to conduct and document required inspections, update the SWMP, and provide oversight of the installation and maintenance of BMPs:

Criss C. Duncan, Owner
Mark Carlson, Senior Manager
Troy Portnoff, Environmental Inspector

4.2 Potential Pollutant Sources

In accordance to the Stormwater Management Plan contents guideline, the following pollutant sources are evaluated for discharge potential as related to this project.

1.)	All Disturbed and Stored Soils -	Potential Pollutant
2.)	Vehicle Tracking of Sediments -	Potential Pollutant
3.)	Management of Contaminated Soils -	Potential Pollutant
4.)	Loading and Unloading Operations -	Potential Pollutant
5.)	Outdoor Storage Activities -	Potential Pollutant
6.)	Vehicle and Equipment Maintenance and Fueling -	Potential Pollutant
7.)	Significant Dust or Particulate Generating Process -	Potential Pollutant
8.)	Routine Maintenance -	Potential Pollutant
9.)	On-Site Waste Management -	Potential Pollutant
10.)	Concrete Truck/Equipment Washing	Potential Pollutant
11.)	Dedicated Asphalt/Concrete Batch Plants -	No Pollutant Potential
12.)	Non-Industrial Waste -	Potential Pollutant
13.)	Activities Identified in Section 2.6	Potential Pollutant

4.3 Best Management Practices for Stormwater Pollution Prevention

4.3.1 Structural Practices for Erosion and Sediment Control

Structural practices will represent the primary control measure in preventing or minimizing stormwater discharges and erosion in the Cascade Creek Project Area.

Sediment discharge will be minimized on all gravel or earth access roads by shaping the road surface, installing culverts, and other structural BMPs. Where feasible, roads will be crowned or banked to direct stormwater into bar ditches or stabilized vegetation. This will minimize the amount of stormwater which travels down the access road. Water bars or rolling dips will be utilized to direct water off of the access roads where crowning or sloping are not feasible or will create uncontrolled discharge.

Rock checks, straw wattle, or rock socks will be installed in bar ditches as needed to capture sediment and slow water velocity. Culverts will be installed to allow water to exit bar ditches in areas which would otherwise pond. Culverts will have sediment traps installed on the entrance and/or exit end of the pipe to minimize sediment discharge.

All discharge points associated with access roads (water bars, rolling dips, culverts, bar ditches) will have rock aprons installed to slow discharge velocity and prevent scouring, unless this will be performed by existing vegetation and native materials. Sediment traps and rock or straw wattle checks may also be incorporated to capture sediment and slow discharge velocities.

Gravel access pads will be installed, as needed, to minimize the tracking of earth onto access roads.

Sediment discharge will be minimized on rights-of-way (ROW) by installing perimeter BMPs, directing accumulated water off of the ROW to discharge points, and stabilizing disturbed slopes. Trenches and/or earthen berms will be installed in areas anticipating high flows and require a robust BMP installation. Trenches and berms will direct water to discharge points which will consist of sediment trap(s), straw bales, straw wattles, and/or rock aprons. The ROW will be shaped to direct accumulated water to these discharge points or to the trenches and berms that will carry the water to the discharge points.

Silt fence, straw bales, earthen berms, and/or straw wattles will be installed along project area boundaries where disturbed or stored soils represent a risk of discharging off-ROW or into a sensitive resource area. Straw bales, straw wattles, and/or silt fence may also be installed perpendicular to slopes to slow water velocity, retain sediment, and minimize rilling.

Straw wattles, rock checks, rock aprons, straw bales, silt fence, and sediment traps may be installed to protect discharge points. Discharge points are sites where stormwater is intentionally, or unintentionally, allowed to leave the project area. Discharge points may include the exit side of water bars, rolling dips, or culverts. Down slope sides of dry, intermittent drainages, ephemeral drainages, and other natural topographic features within the project may also be discharge points. BMPs will be installed to filter sediment, while allowing collected water to discharge off project while minimizing off-ROW erosion.

Straw wattle will be installed, as needed, perpendicular to cut and fill slopes to minimize erosion and sediment discharge. Stockpiled earth will have silt fence installed around the entire stockpile if a discharge risk is present. The locations of structural BMPs are identified in site specific maps included as Appendix B.

4.3.2 Non-Structural Practices for Erosion and Sediment Control

Non-structural erosion and sediment control practices will be used in conjunction with structural practices to deliver effective stormwater erosion and sediment control. As feasible, vegetative buffer strips will be maintained between areas of disturbance and discharge points, drainages, wetlands, surface water, and seasonal or permanent streams. Vegetative buffer strips will further minimize sediment discharge and scouring when used in conjunction with structural BMPs.

Permanent stabilization will be achieved by seeding and applying mulch. All areas of disturbance will be seeded to establish permanent vegetation when topsoil is returned during the reclamation process. Mulch will be applied as necessary to enhance the seeding process or to stabilize slopes to protect the new seeding. Hydro-seeding will be utilized in areas too steep to seed with conventional drills or broadcasters.

Slope roughening will be utilized to stabilize areas of cut and fill where the activity can be performed safely. In areas of cut and fill that are too steep to perform slope roughing and the installation of structural BMPs are deemed ineffective, slopes will be stabilized with straw mulch, erosion control matting, or a hydro-mulch/tackifier application. The location of non-structural BMPs are identified in site specific maps included in Appendix B.

4.3.3 Phased BMP Implementation

Structural and non-structural BMPs will be installed and/or maintained through all phases of construction outlined in Section 2.2 – Sequence of Major Activities. The relationship between the phases of construction and the implementation and maintenance of BMPs is described below:

1.) Preconstruction BMP Installation – Preconstruction BMPs will be installed prior to soil disturbance and will protect sensitive areas from physical damage or receiving sediment or other pollutant discharge. Sensitive areas include archeological, paleontological, and biological resources, surface waters of the State, municipal storm drains, and public roads.

Preconstruction BMPs will include silt fence, straw bales, straw wattles, and/or construction fence which will serve as a barrier between construction activities and sensitive areas. These BMPs will serve as a visual reminder to restrict activities beyond the installed BMPs and to minimize the risk of sediment or other pollutants entering a sensitive area. Preconstruction BMPs may also be used to create vegetative buffer areas between construction activities and sensitive areas to further protect against the discharge of pollutants into sensitive areas.

Preconstruction BMPs will also be installed along edges of right-of-way (ROW) or construction site boundaries which may be susceptible to discharging sediment or other pollutants offsite. Preconstruction BMPs will be designed to capture sediment before it leaves the construction site, while allowing stormwater to exit the area. Areas susceptible to discharging sediment include dry drainages, flowing streams, areas of cut and fill, and sloped portions of the ROW.

2.) Access Road Improvement – Water bars, rolling dips, and, bar ditches will be installed as needed during access road improvements.

3.) Access Road Development – Water bars, rolling dips, and bar ditches will be installed as needed during access road development.

4.) Install Access Road BMPs – Rock or straw wattle checks will be installed in bar ditches, after road construction or improvements are made. BMPs will be installed on inlet and/or outlet ends of culverts, rolling dips, water bars, bar ditches, and other discharge points. Inlet and outlet BMPs will include sediment traps, rock aprons, erosion control matting, and rock or straw wattle checks.

5.) Access Road Restoration –All areas of cut and fill and road shoulders will be seeded with the recommended seed mixture. Seeding may be deferred to a later time, if outside of seeding timeframes. Seed mixtures, seeding time windows, and other seeding requirement and/or recommendations are listed in Attachment 4 – Recommended Seed Mixes.

6.) Well Pad Development – BMPs will be installed during preconstruction BMP installations (see above #1).

7.) Install Well Pad BMPs – Once the well pad is created, BMPs will be installed in addition to those installed during preconstruction, to protect the entire perimeter of the pad and to stabilize the cut and fill portions of the pad. Trenches or earthen berms will be installed on the perimeter of the pad on the down-slope side. The trenches or berms will lead water to discharge points which will allow the water to exit the facility. Discharge points will minimize the discharge of sediment and scouring by flowing the water through sediment traps, rock or straw wattle checks, and rock aprons.

8.) Pipeline Construction – BMPs will primarily consist of water bars to divert sheet flow off of the ROW, wattle to check flow and serve as outlets, silt fence to contain material on the ROW, and straw bale barriers to contain material and outlet water.

9.) Install Permanent Well Pad Facilities – Secondary containment systems will be installed as necessary for liquid storage areas.

10.) Well Pad Restoration – Portions of the pad no longer required for construction of the well will be reclaimed by redistributing topsoil, seeding and mulching.

11.) Access Road and Well Pad Maintenance - BMPs associated with access roads and well pads will continue to be inspected and repaired as necessary until final restoration requirements have been fulfilled.

4.3.4 Materials Handling and Spill Prevention

Material handling and spill prevention will be attained by adhering to the following:

- No fuels or oils will be stored within 200 feet of any wetland or watershed
- No vehicles or equipment will be fueled within 200 feet of any wetland or watershed
- No vehicles or equipment will be serviced within 200 feet of any wetland or watershed
- Fuels and oils will be stored in secure areas to prevent damage or vandalism
- Fuels and oils will be stored within 110% capacity secondary containment
- All containers holding fuels and oils will be labeled
- All fuel and oil waste will be disposed of properly
- Spill kits will be immediately available to all operations utilizing fuels and oils
- All spills will be properly cleaned up and reported as required

No bulk storage of fuels and oils will be allowed on any portion of the Cascade Creek Project Area that does not have SPCC Plans in place to direct proper storage and handling.

All fuel and oil spills meeting reporting requirements must be reported. This process can be initiated by calling the CDPHE Colorado Environmental Release and Incident Reporting Line at 1-877-518-5608.

4.3.5 Dedicated Concrete or Asphalt Batch Plants

The Cascade Creek Project does not anticipate utilizing dedicated concrete or asphalt batch plants.

4.3.6 Vehicle Tracking Control

It is the Contractor's responsibility to control vehicle tracking and to remove soil once tracking has occurred. The Contractor will utilize street sweepers, scraping equipment, or hand tools, to remove sediment tracked onto paved or other actively traveled roads. Soil tracked onto paved surfaces will be removed by the end of each day. Severe vehicle tracking that becomes a safety concern will be removed immediately. BMPs such as straw bales or straw wattle may be placed in bar ditches to serve as discharge protection for tracked soil.

If needed, rock access pads will be installed to minimize vehicle tracking onto paved roads. Rock access pads will be constructed of clean rock (containing no fine material) and placed onto geotextile material to facilitate removal, unless otherwise approved by landowner.

4.3.7 Waste Management and Disposal, Including Concrete Washout

Concrete is anticipated to be used while constructing the project. Concrete may be used in the installation of valves, launchers, receivers, footings, and in drilling operations. Concrete washout areas will be identified on site maps and protected by BMPs to prevent the discharge of concrete. Concrete will not be washed onto topsoil. Topsoil will be removed, then equipment can be washed onto subsoil or gravel surfaces. Earthen berms, silt fence, straw bales, or straw wattles will be used to capture concrete before water is allowed to be absorbed into the soil.

Refuse dumpsters, recycling bins, portable toilets, or any other containers storing liquid or solid waste will only be utilized under the following guidelines:

- Containers will be located a minimum of 200 feet away from sensitive areas
- Containers will be emptied at an appropriate location, or hauled off by an appropriate company
- Containers will be emptied on a regular basis to prevent overflow
- Fuels and oils will not be placed in refuse dumpsters or portable toilets
- Fuels and oils will be placed in approved, marked containers
- Fuels and oils will be disposed of at an approved facility
- Containers storing fuels and oils will be placed within secondary containment
- Portable toilets will be properly serviced and secured to prevent being blown over

4.3.8 Groundwater and Stormwater Dewatering

A CDPHE discharge permit will be secured to dewater any groundwater encountered during trenching operations. All permit terms and conditions will be followed to meet compliance with groundwater dewatering.

Stormwater dewatering will occur when trenches are inundated with stormwater. BMPs will be utilized to successfully dewater trenches, while preventing the discharge of sediment. Pump intakes will be protected from lifting sediment from the bottom of the trench by suspending the intake or placing material between the intake and the bottom of the trench. Discharge hoses will be placed in stabilized vegetation and/or discharged through a sediment bag or other BMP to minimize the discharging of sediment. The discharge hose will use a dissipater or other BMP to minimize scouring if necessary.

5.0 FINAL STABILIZATION AND LONG-TERM STORMWATER MANAGEMENT

5.1 Final Stabilization

Final stabilization of the project will be considered during all phases of construction. All things being equal, choices made during construction will favor those options that will enhance the final stabilization process. During clearing and grading activities, the minimum amount of soil and vegetation will be disturbed as possible. In particular, the removal of mature brush and trees will be limited to only those that must absolutely be removed to provide a safe and effective ROW. The minimum amount of stream bank features will be disturbed when crossing perennial or intermittent streams. Rocks, logs, and other vegetative debris will be placed on the edge of the ROW to be used as erosion control during final restoration. Vegetation may be shredded or mulched and windrowed with topsoil.

Topsoil will be removed and segregated prior to performing any excavations or cut and fill operations. The amount of topsoil removed will be based on individual landowner requirements. In general, the entire topsoil layer will be removed and protected. After the pipeline is installed and contours are restored, topsoil will be redistributed over the entire disturbed ROW in a uniform manner. Compacted topsoil will be scarified to a depth of 3 to 4 inches to produce a viable seedbed.

All disturbed sites will be seeded with the landowner approved seed mixes listed in Attachment 4. Seeding will only occur when soil conditions are conducive and will not occur during muddy or snow-covered conditions. All seed used will be certified weed-free.

Where possible, seed will be incorporated into the soil with the use of a no-till or agricultural drill. In areas unable to be seeded with a drill, seed will be broadcast with manually operated cyclone-bucket spreaders, mechanical spreaders, or blowers. Broadcasted seed will be incorporated into the soil with a rake, harrow, cultipacker, or chain. Broadcast seed rates will be double that of the drill rates. All seed tags will be collected for future reference.

Crimped mulch, tackified mulch, or erosion control matting will be installed as needed to areas subject to erosion. Permanent water bars and rock aprons will be installed to direct water off of the ROW or across the ROW as needed. Rock, logs, and vegetative debris removed during clearing will be scattered across the ROW to provide additional erosion protection.

Final stabilization is reached when all ground disturbing activities have been completed, and uniform vegetative cover has been established with an individual plant density of at least 70 percent of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed.

5.2 Long-Term Stormwater Management

Oversight of long-term stormwater management will be the responsibility of Aspen Environmental Field Services, LLC (AEFS). The assigned Stormwater Inspector will conduct monthly inspections of BMPs and note areas of erosion or poor vegetation return. Maintenance will be performed by AEFS or contractors it employs.

6.0 INSPECTION AND MAINTENANCE

6.1 Inspection

AEFS will provide qualified Stormwater Inspector(s) and/or Environmental inspector(s) to perform inspections of all BMPs located within the Cascade Creek Project Area. Inspectors will also monitor the restoration process on all disturbed land within the project and identify additional BMP, seed, and stabilizer requirements. Inspectors will be responsible for completing inspection reports to properly document the implementation of the SWMP.

6.1.1 Construction

In areas of active construction, or areas that will resume construction, inspections must be made once every 14 days. Inspections will be made more frequently if necessary to ensure BMPs are in place and functioning properly.

All BMPs will be inspected within 24 hours of the conclusion of any precipitation event or snowmelt event that causes surface erosion. If ROW conditions do not allow for timely, post-storm inspection of BMPs, the inspection will take place within 72 hours of the event and prior to the re-commencing of construction activities. Any such delays in the inspection of BMPs must be documented in the inspection report.

6.1.2 Post-Construction

BMP inspection intervals may be reduced to once a month and post-storm inspections are no longer required if the following conditions exist:

- All ground disturbance construction activities are completed
- All activities identified in the SWMP for final restoration are completed (seeding not required)
- SWMP has been amended to indicate areas under reduced inspection intervals

BMPs identified as being insufficient will continue to be properly maintained and/or reinstalled as necessary. Monthly inspections will continue until final restoration has been successfully achieved and these areas are indicated in the SWMP as meeting final restoration requirements.

6.1.3 Winter Inspection Exclusions

Routine 14-day, monthly, and post-storm inspections are not required for those areas where construction activities are temporarily halted, snow cover exists over the entire site for an extended period, and melting conditions are not present. This exclusion should be properly documented in inspection reports indicating: dates when snow cover occurred, date when construction activities ceased, and date melting conditions began.

6.2 Maintenance

AEFS is responsible for overseeing BMP installation, maintenance, and repair. AEFS will schedule environmental crews to complete maintenance as soon as possible when needs are identified. BMPs will commonly be maintained within 72 hours of discovery or notification, but may take up to 10 to 14 days during larger storm events or during the initial spring runoff.

Every effort will be made to repair or replace any BMP that has failed within 72 hours of discovery or notification. If a BMP fails for any reason other than improper installation, the BMP will be replaced with a more robust installation, enlarged in size, or additional BMPs will be installed at that location to minimize the risk of reoccurrence. The SWMP must be updated to include any newly installed BMPs.

Maintenance of silt fence, straw wattles, straw bales, rock checks, rock socks, and sediment traps will be required once the BMP has reached 75% of its sediment retaining capabilities or the structural integrity of the BMP is compromised. Maintenance will involve removing the captured sediment from the BMP and returning it to the ROW and/or making the necessary repairs to correct structural problems.

Maintenance will be performed to rock aprons, crimped mulch, hydro-seed, and erosion control matting as soon as the failure of any of these BMPs are allowing erosion channels to form. Maintenance of rock aprons will involve removing the eroded channel and rearranging the rock or adding additional rock to prevent future failures. Maintenance of crimped mulch, hydro-seed, and

erosion control matting will consist of removing the eroded channel, reseeding the damaged area, then reapplying mulch, hydro-mulch, or erosion control matting.

Additional BMP specific maintenance procedures are outlined in the BMP typical drawings included as Attachment 3.

The stormwater inspector will document ROW and weather conditions if these maintenance and replacement timelines cannot be met due to poor ROW conditions or unusually large backlogs of maintenance requests. Access may also be blocked periodically by landowners or construction activities that are unsafe work nearby. These situations will also be documented by the stormwater inspector.

OXY USA WTP LP
760 Horizon Drive, Suite 101
Grand Junction, CO 81506

Cascade Creek Operational Area
Land and Lease Map

Updated: Jan 15, 2016 Garfield County, Colorado

0 0.55 1.1 1.65 2.2 2.75 Miles

Federal 604-11
605-1
604-12-13
604-41-32
697-05C
605-23
605-13-22
697-04D
604-44
603-23-32
605-2
604-1 SWD
610-21-41
697-08A
608-41
609-2
610-22-43
608-43-31
609-1
609-33
610-24-43
697-08-53
697-09-61
617-41
609-14 & Annex
697-15-01 & Annex
Mesa Storage Yard
616-21-32
697-17A
697-16-16 & Annex
697-15-23
697-17B
697-16A & Annex
697-16-28 & Annex
697-17-50
617-24
Federal 23-15
697-15-54
697-16D
620-21
697-20-28
620-33
620-43-32
620-24-43
620-1
629-31-11
629-2
629-23-42
629-1 SWD
632-13-22
632-21-41
797-06-07
705-22-43
Shell 797-03A
797-05-36
Shell 797-03B
797-05-52
Federal 708-11
Shell 797-09A
Federal 797-08-19
Federal 797-08-51D
Shell 797-14-01
LW 797-23A
LW 796-16B
LW 796-17A
LW 796-17C
LW 797-24-47D (TA)
LW 796-19C
LW 797-23-45AX
Shell 797-27A
Logan Trail 28-10
215 - PARACHUTE CREEK RD
213 - CONN CREEK RD
GarCo 204 - ROAN CREEK DR
492'
299'
200'

- Well Pad (Existing)
- Well Pad (Proposed)
- Storage Pond (Existing)
- Facilities
- Oxy Access Road
- Oxy et al property
- Cascade Creek Mineral Lease
- Unimproved Public Road
- Gravel Public Road
- Paved Public Road

COLORADO
Department of Public Health & Environment

CERTIFICATION TO DISCHARGE
UNDER
CDPS GENERAL PERMIT COR400000
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES

Certification Number: **COR402705**

This Certification to Discharge specifically authorizes:

Owner Laramie Energy LLC
Operator Laramie Energy LLC

to discharge stormwater from the facility identified as

Cascade Creek Common Plan of Development

To the waters of the State of Colorado, including, but not limited to:

to Cascade Creek to Colorado River

Facility Activity :	Gas/Oil Field Exploration and/or Development
Disturbed Acres:	5 acres
Facility Located at:	13 Mi N of Debeque (See map in file) Debeque CO 81630 Garfield County Latitude 39.5125 Longitude -108.236111
Specific Information (if applicable):	

Certification is issued 4/1/2019

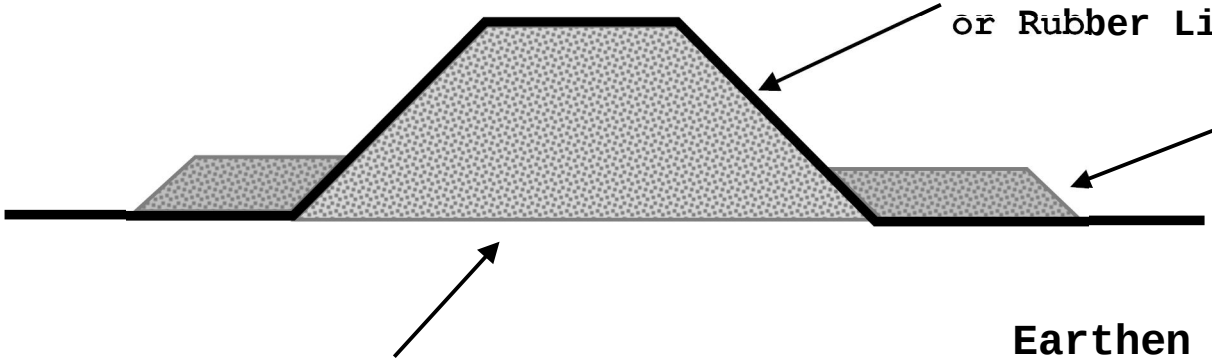
Certification is effective 4/1/2019

Expiration date of general permit : 3/31/2024

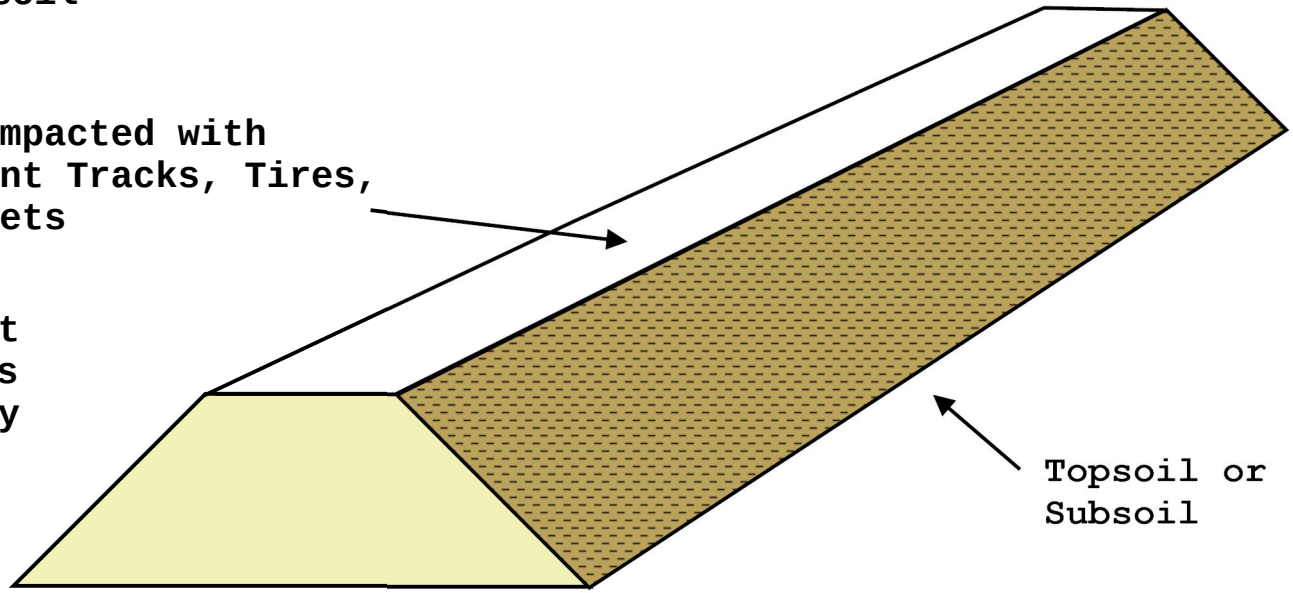
This certification under the permit requires that specific actions be performed at designated times. The certification holder is legally obligated to comply with all terms and conditions of the permit.

This certification was approved by:
Meg Parish, Unit Manager
Permits Section
Water Quality Control Division

Lined Containment Berm



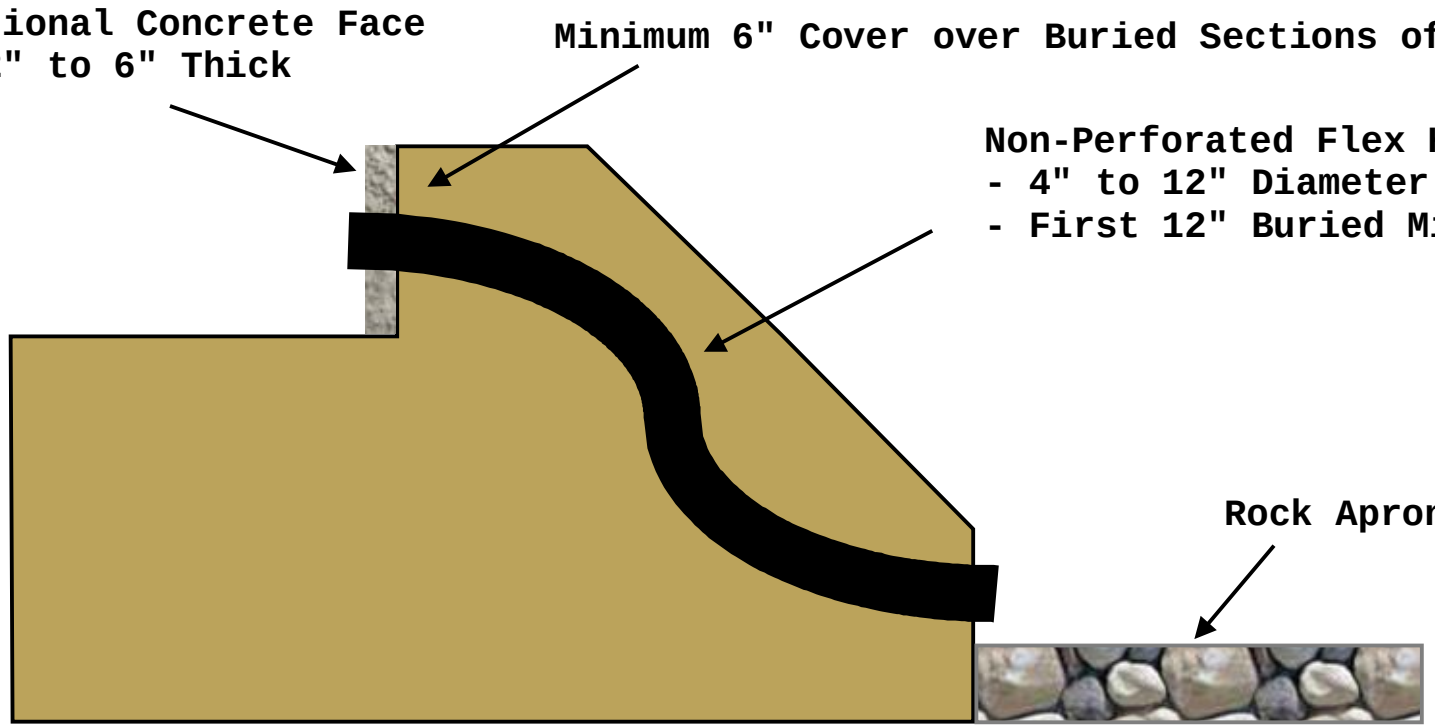
Earthen Containment Berm



All Types of Containment Berms are to be Twice as Wide at the Base as they are Tall

BMP Typical Drawing
Containment Berm
- Earthen & Lined

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524



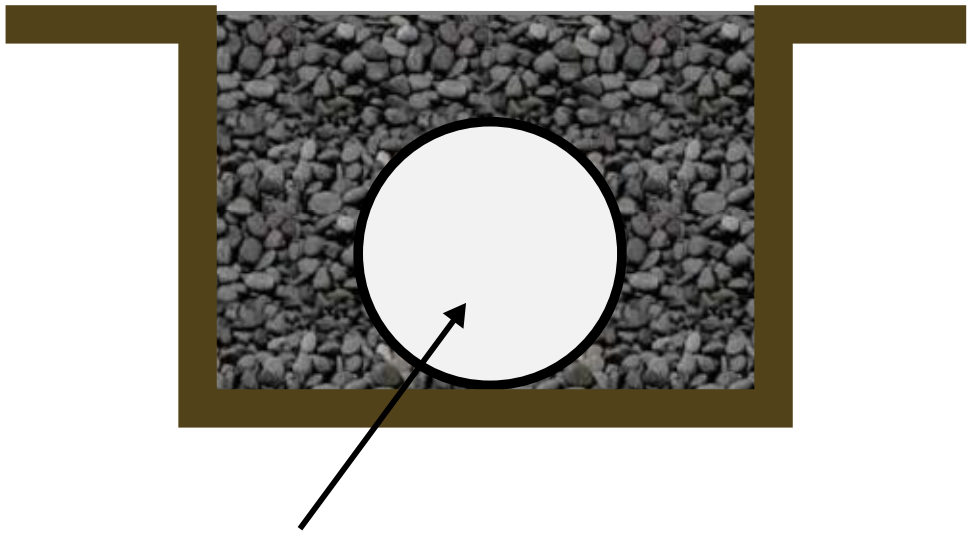
Flex Hose Outlets can be used in Conjunction with Sediment Traps, Turnouts, and Water Bars

Flex Hose Outlets need Sediment Retaining BMPs Installed Immediately Above and/or Below the Flex Hose

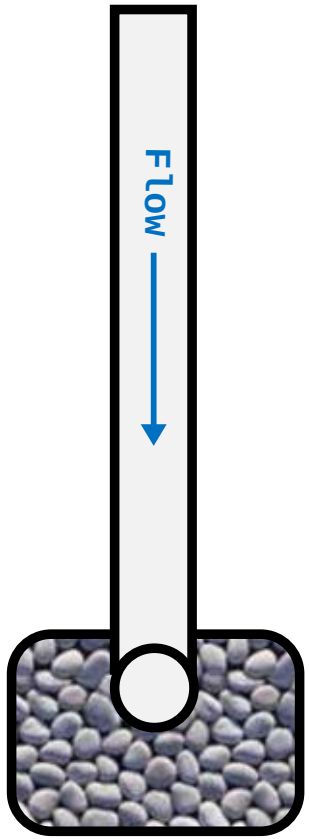
BMP Typical Drawing
Flex Hose Outlet

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524

Perforated Pipe Backfilled with Clean Gravel 1/2" to 4" in Diameter



4" to 12" Perforated Poly Pipe with Perforations Located on the Top Side of the Pipe

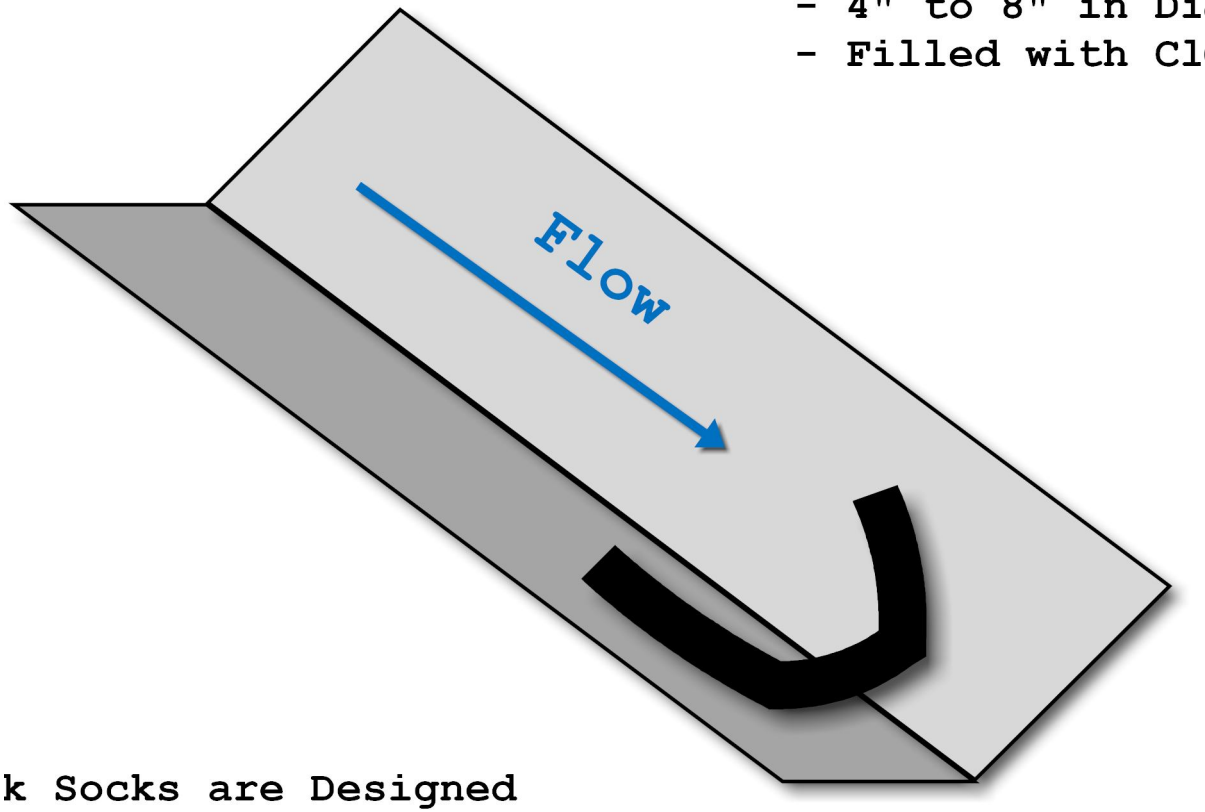


Rock Apron Installed On French Drain Outlet

BMP Typical Drawing
French Drain

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524

Rock Socks
- 2' to 10' in Length
- 4" to 8" in Diameter
- Filled with Clean 3/4" Gravel



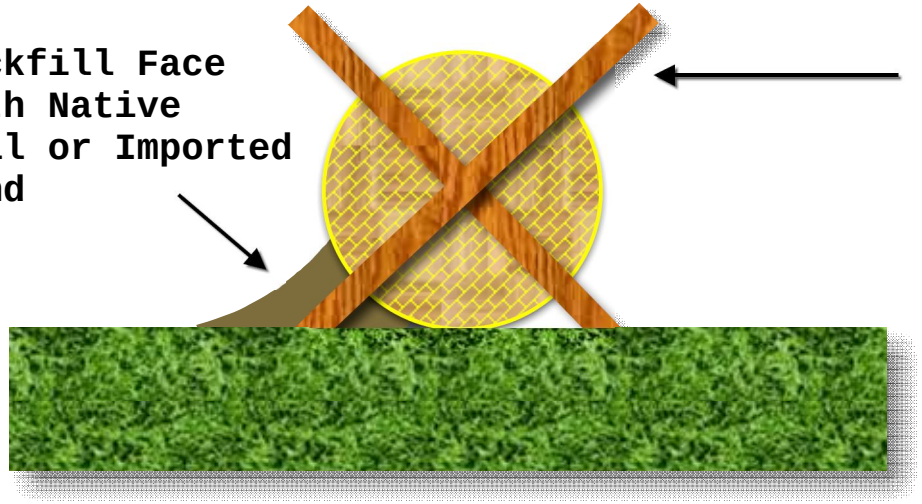
Rock Socks are Designed to be set Directly on the Ground to Retain Minor Amounts of Sediment, Typically in Bar Ditches

BMP Typical Drawing
Rock Sock

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524

Surface Installation of Wattle
- **In Frozen Conditions**
- **In Heavy Roots/Debris**
- **When Trenching is not Allowed**

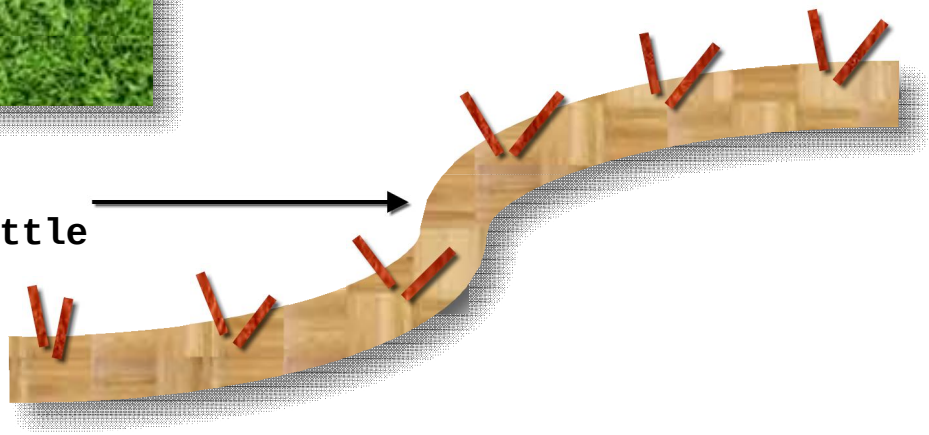
Flow



Backfill Face with Native Soil or Imported Sand

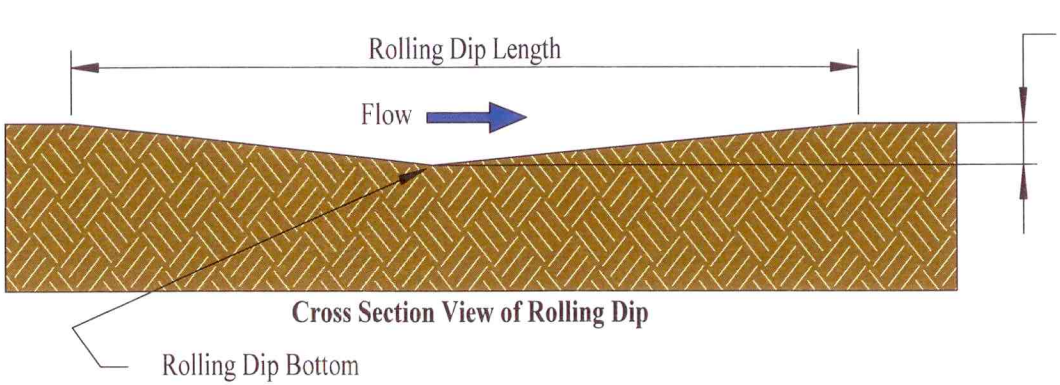
Stakes Installed at 45 to 60 Degree Angles

Stake Spacing 30 Inches
- **24 Stakes per 25-Foot Wattle**

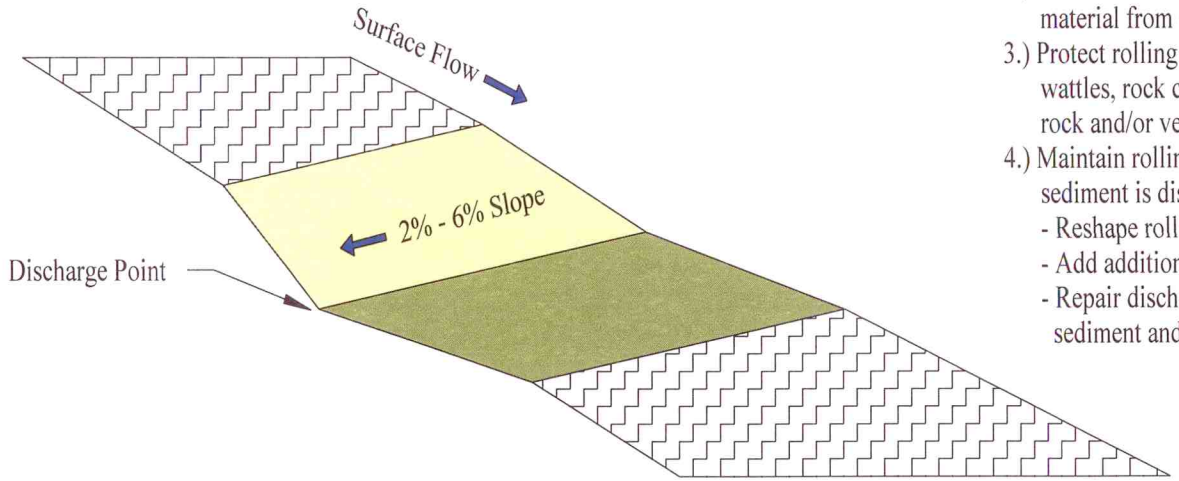


BMP Typical Drawing
Straw & Excelsior Wattle
- Surface Installation

Aspen Environmental Field Services, LLC
1685 17 Road
Loma, Colorado
81524



Cross Section View of Rolling Dip



Rolling Dip Installation and Maintenance Procedures

1.) Determine rolling dip dimensions based on anticipated flow, slope, and soil type
   - Install rolling dip with a 2% to 6% outfall slope
   - Downstream rolling dip height built above the grade of the rolling dip bottom
   - Rolling dip length determined to allow traffic to pass without dragging on the rolling dip
2.) Store soil or road material appropriately to prevent removed material from discharging
3.) Protect rolling dip discharge with silt fence, straw bales, straw wattles, rock check, or sediment trap unless protected by existing rock and/or vegetation
4.) Maintain rolling dip if water is able to flow over or around rolling dip, sediment is discharged, or directed water is producing erosion
   - Reshape rolling dip to direct water to discharge point
   - Add additional rolling dips if overwhelmed
   - Repair discharge BMPs as necessary to capture discharged sediment and to prevent erosion

Typical BMP Drawing and Mainatenance Procedures

Rolling Dip

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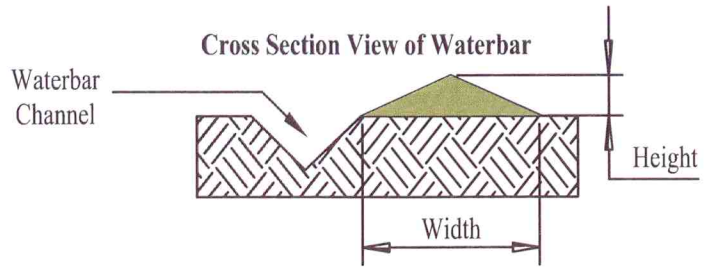
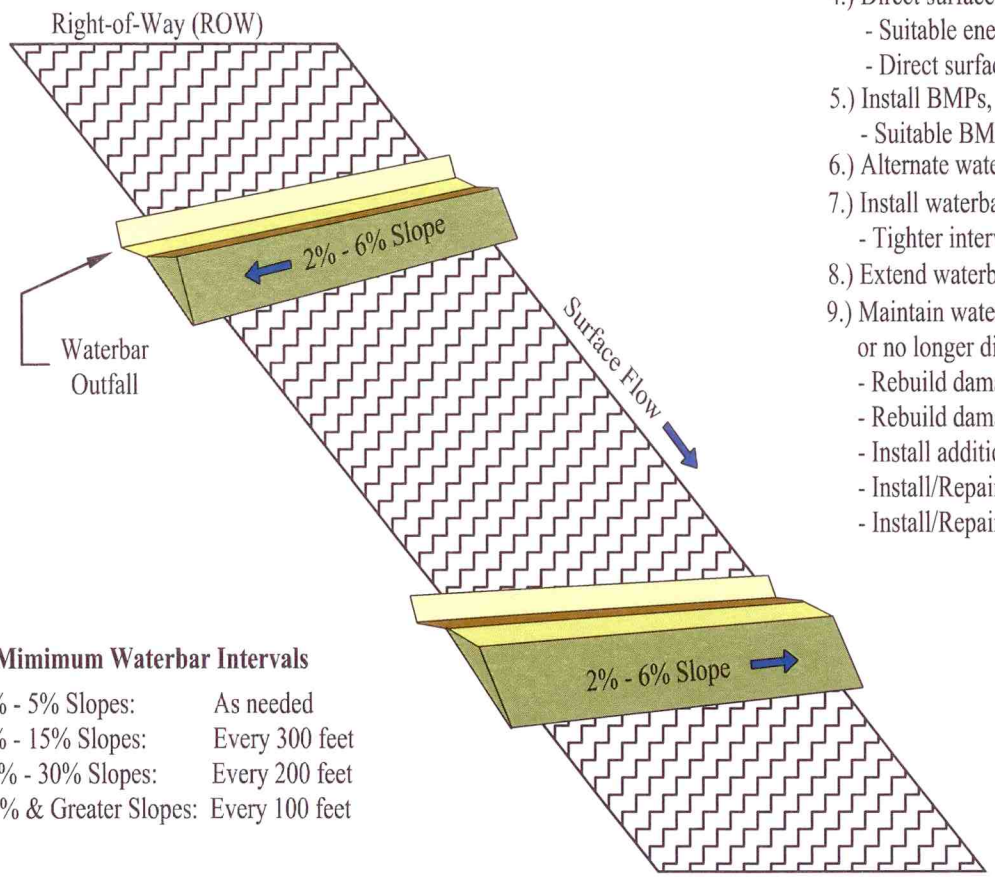
Project Compliance Management - Permitting - Site Restoration





Mimimum Waterbar Intervals

0% - 5% Slopes:	As needed
5% - 15% Slopes:	Every 300 feet
15% - 30% Slopes:	Every 200 feet
30% & Greater Slopes:	Every 100 feet

Waterbar Installation and Maintenance Procedures

1.) Determine size of waterbar based on anticipated flow, slope, and soil type
   - Install waterbar with a 2% to 6% slope
2.) The waterbar should always be at least twice as wide as it is tall
3.) Compact soil used to construct waterbar with equipment tires/tracks or similar device
4.) Direct surface flow into stable areas (rock or well vegetated) or install BMPs at outfall
   - Suitable energry dissipating BMPs include: rock aprons, straw wattles, straw bales, and silt fence
   - Direct surface flow to areas that will carry water away from the project
5.) Install BMPs, as necessary, in the waterbar channel and/or outflow to minimize sediment discharge
   - Suitable BMPs include rock checks, straw wattles, straw bales, and silt fence
6.) Alternate waterbar outfall locations to prevent concentrated flow on either side of the project ROW
7.) Install waterbars at listed minimum waterbar intervals
   - Tighter interval spacing may be required to sufficiently protect the ROW
8.) Extend waterbars 1 to 2 feet passed the edge of ROW
9.) Maintain waterbars if breached, overwhelmed, discharging sediment, causing erosion channels to form, or no longer directing water to outfall as designed.
   - Rebuild damaged waterbar with correct slope to direct water to outfall
   - Rebuild damaged waterbar to larger demensions if breached
   - Install additional waterbar(s) up slope of damaged waterbar if overwhelmed
   - Install/Repair energy dissipating BMPs if erosion channels are forming
   - Install/Repair sediment retaining BMPs if sediment is discharging

Typical BMP Drawing and Mainatenance Procedures

Waterbar

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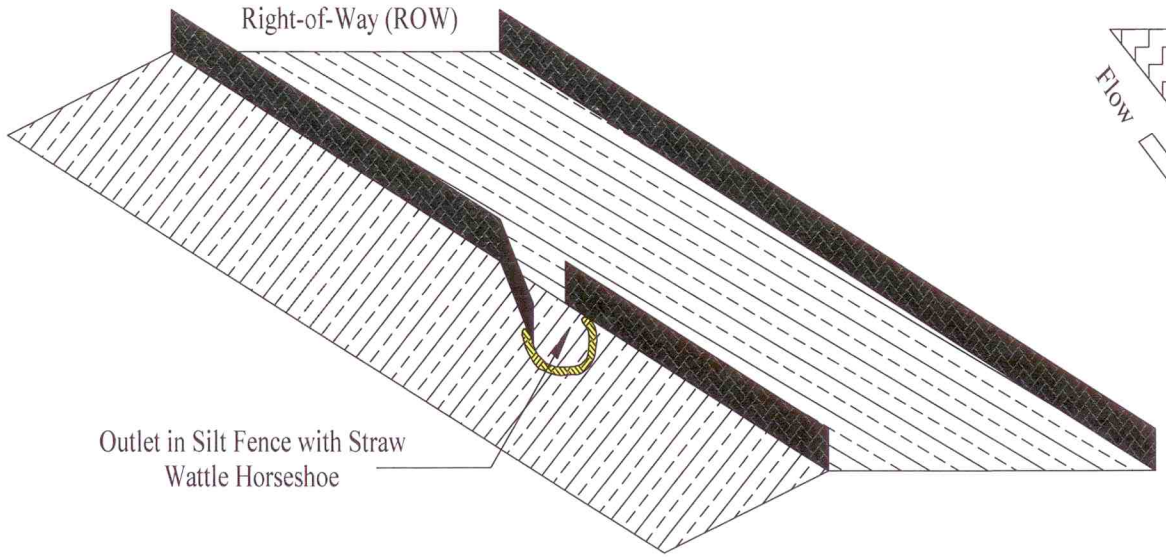
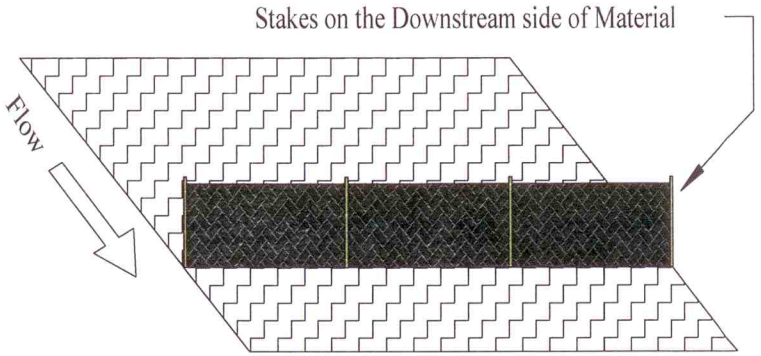
Cross Section View of Silt Fence

Silt Fence Installation and Maintenance Procedures

1.) Determine type of silt fence and type of stakes based on anticipated flow, velocity, soil type, and type of material to be retained by silt fence
2.) Dig installation trench a minimum of 6 inches deep
3.) Install silt fence in trench with the stakes on the downstream side of the fence, or wrap material around each stake 1 to 3 wraps
4.) Drive stakes until bottom 6 inches of fence is below ground level
5.) Return soil to the trench and compact by hand
6.) Roll fence together or install overlap between each roll of silt fence
7.) Maintain silt fence if damaged or 50% of its sediment retaining capacities are met
   - Remove captured sediment and store approriately to prevent discharging sediment
   - Replace broken stakes, add additional stakes as needed
   - Tie or staple loose silt fence to stakes
   - Completely replace silt fence if severely damaged





Typical BMP Drawing and Mainatenance Procedures

Silt Fence

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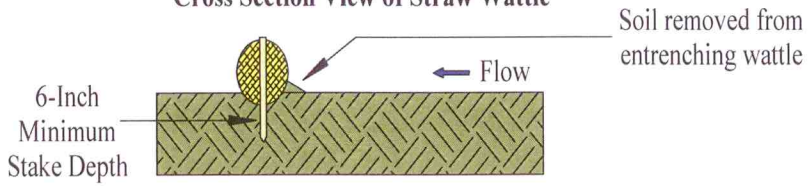
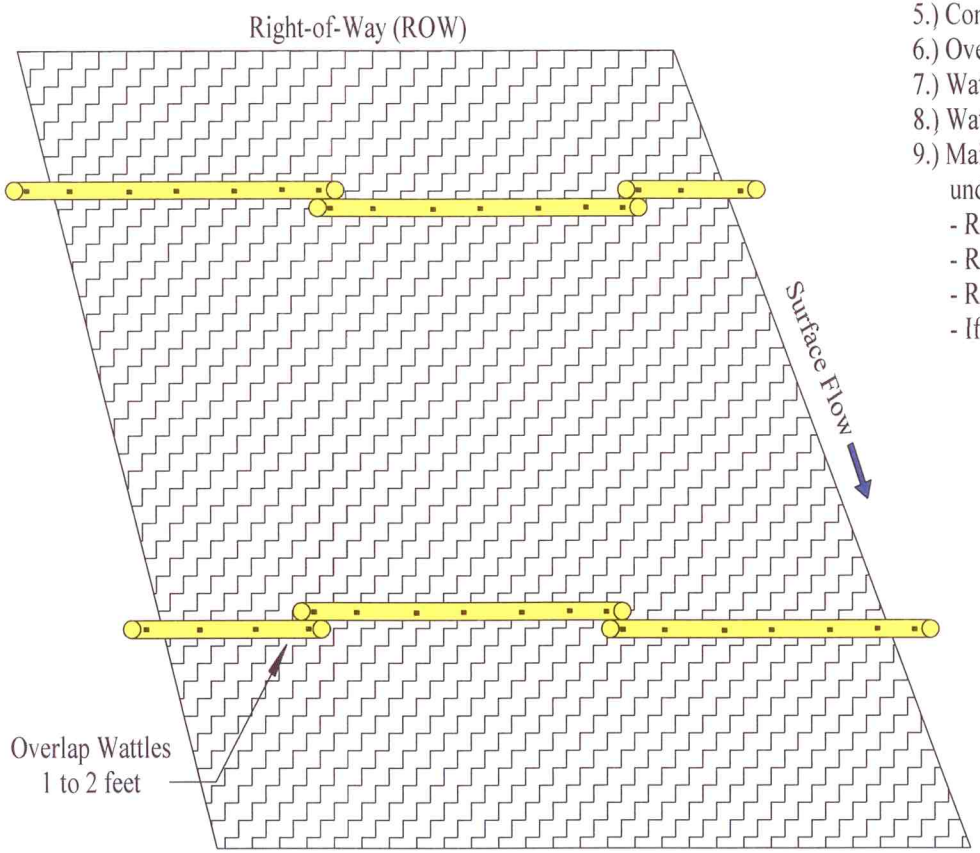
Cross Section View of Straw Wattle

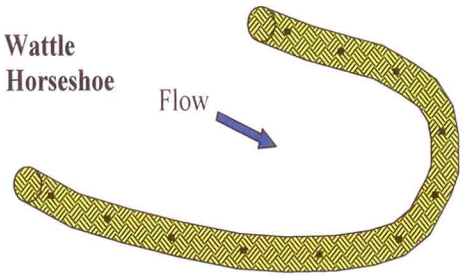




Straw Wattle Installation and Maintenance Procedures

1.) Determine diameter and interval spacing of straw wattle based on anticipated flow, slope, and soil type
2.) Entrench wattle 1 to 3 inches into the soil
3.) Secure wattle with 18 to 24-inch wood stakes measuring a minimum of 1" X 1" on the side
4.) Drive one stake through the wattle every 4 to 6 feet, perpendicular to ground
   - Drive stake until nearly flush with wattle
5.) Compact soil removed from the trench on the upslope side of the wattle
6.) Overlap wattles 1 to 2 feet when installing multiple wattles
7.) Wattles installed over curlex or other erosion control matting may be installed without trenching
8.) Wattles installed perpendicular to flow to dissipate water energy and to retain sediment
9.) Maintain wattles when 75% of the sediment retention capacity is met, when water is able to flow under the wattle, or the wattle is damaged.
   - Remove captured sediment and store accordingly to avoid discharging sediment
   - Repair channel allowing water to flow under wattle and drive additional stakes to secure wattle
   - Replace any damaged wattle with new wattle
   - If wattles are overwhelmed, add additional wattle, or replace with straw bales or other BMP

Straw Wattle Discharge Horseshoe



Typical BMP Drawing and Mainatenance Procedures

Straw Wattle

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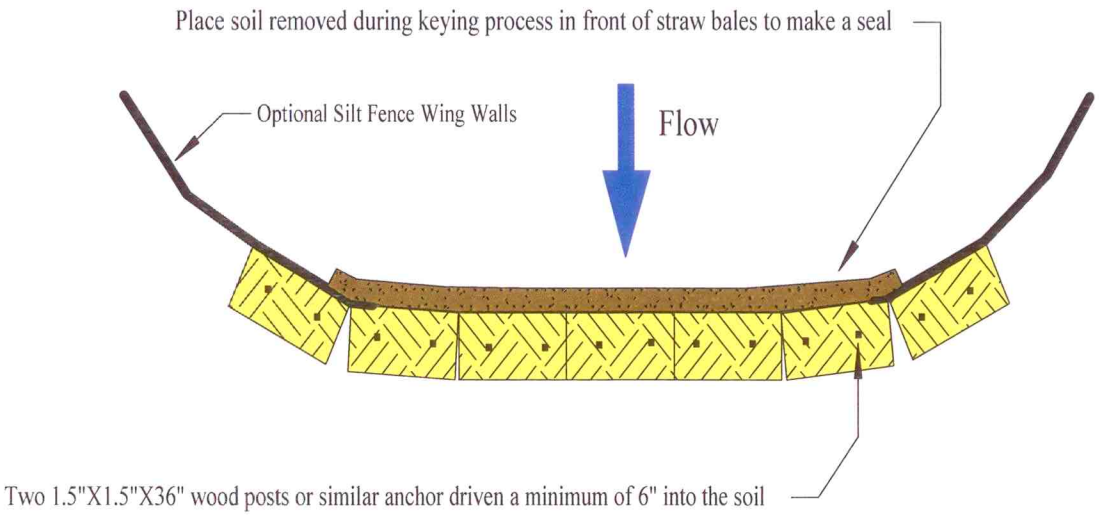
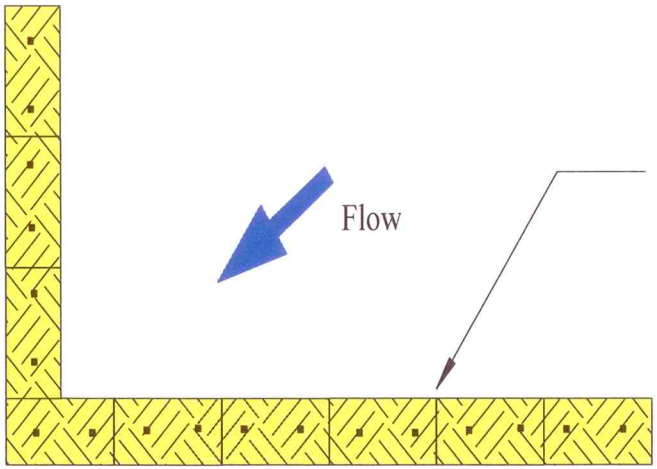
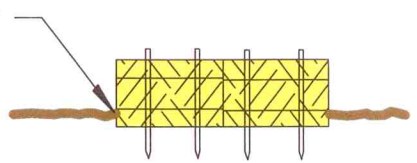
Top View of Straw Bale Barrier with Optional Silt Fence Wing Walls



Straw Bale Installation and Maintenance Procedures

1.) Select straw bale barrier size based on anticipated flow, slope, and soil type
2.) Entrench (Key) straw bales 4 to 6 inches into the soil
3.) Place soil removed to create trench on the upslope side of straw bales and compact by hand
4.) Place straw bales firmly against adjacent straw bales
5.) Drive two stakes through straw bales until nearly flush with bale
   - Drive stakes perpendicular to ground
   - Stakes should measure a mimimum of 1.5" X 1.5" X 36"
6.) Maintain straw bale barries when it has reached 50% of its sediment retention capacity, water is able to flow under or around barrier, or straw bales are damaged.
   - Remove captured sediment and store appropriately to prevent sediment discharge
   - Repair eroded channels flowing under straw bales and reinstall straw bale, compact soil on the upslope side of straw bale
   - Replace any deteriorated straw bales
   - Enlarge barrier if overwhelmed or water is flowing around straw bales





Typical BMP Drawing and Mainatenance Procedures

Straw Bale Barrier

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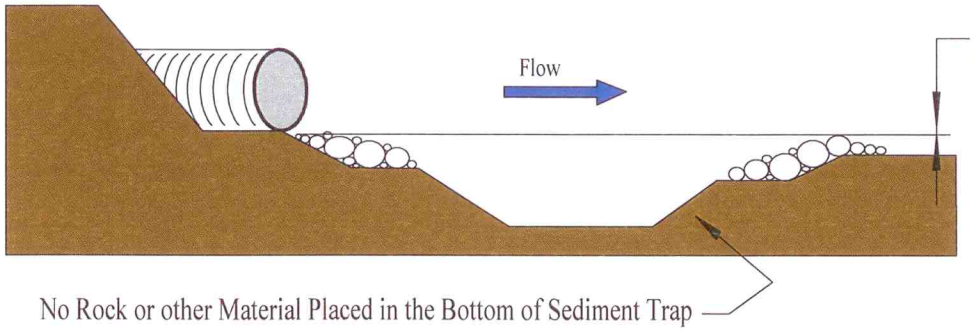
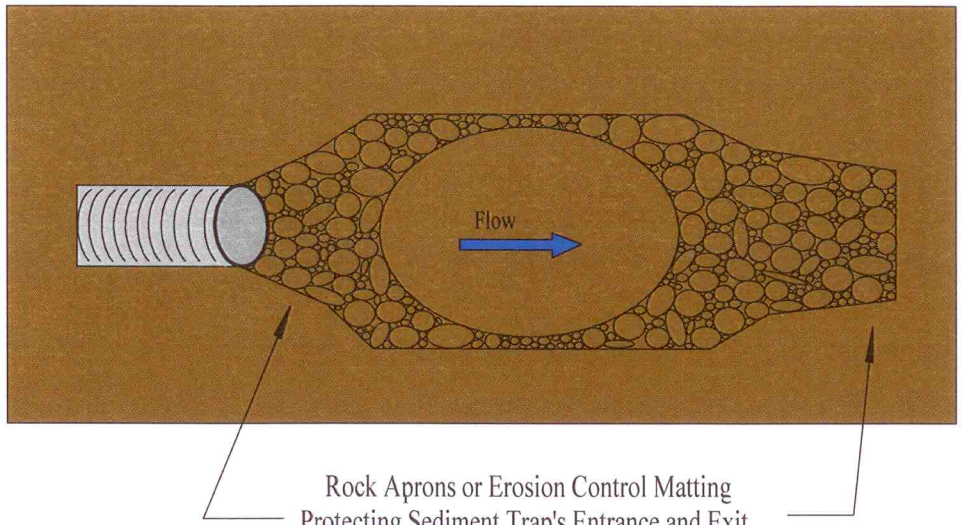
Cross Section View of Sediment Trap



Top View of Sediment Trap



Sediment Trap Installation and Maintenance Procedures

1.) Design sediment trap based on anticipated volume and velocity of water
2.) Protect against erosion on the entrance and exit of sediment trap
   - Rock or erosion control matting may be used for erosion control
3.) No rock or erosion control matting placed in the bottom of the sediment trap to facilitate the removal of collected sediment
4.) Outfall of sediment trap built below the grade of the culvert or other discharge point to prevent restricting flow
5.) Maintain sediment trap if entrance or exit of sediment trap is eroding or 50% of the sediment storage capacity is full
   - Remove captured sediment and store accordingly to prevent sediment from discharging
   - Repair rock or erosion control matting on entrance and exit if eroded channels form
   - Enlarge sediment trap or install additional sediment traps if overwhelmed

Typical BMP Drawing and Mainatenance Procedures

Sediment Trap

ASPEN ENVIRONMENTAL FIELD SERVICES, LLC
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Slope Roughening/Crimped Mulch
Installation and Maintenance Procedures

1.) Determine the type and amount of slope roughing and crimped mulch based on the anticipated flow, velocity, soil types, and slopes
2.) Install slope roughening with tracked equipment or other attachment
   - Track perpendicular to slopes
3.) Create numerous small indentations in the soil to trap sediment and slow water velocity
4.) To install crimped mulch, apply 1/2 to 2 tons of certified weed-free straw per acre then incorporate mulch into the soil by slope roughening or crimping
5.) Maintain slope roughening and/or crimped mulch by reapplying the process

Typical BMP Drawing and Mainatenance Procedures

Slope Roughening/Crimped Mulch

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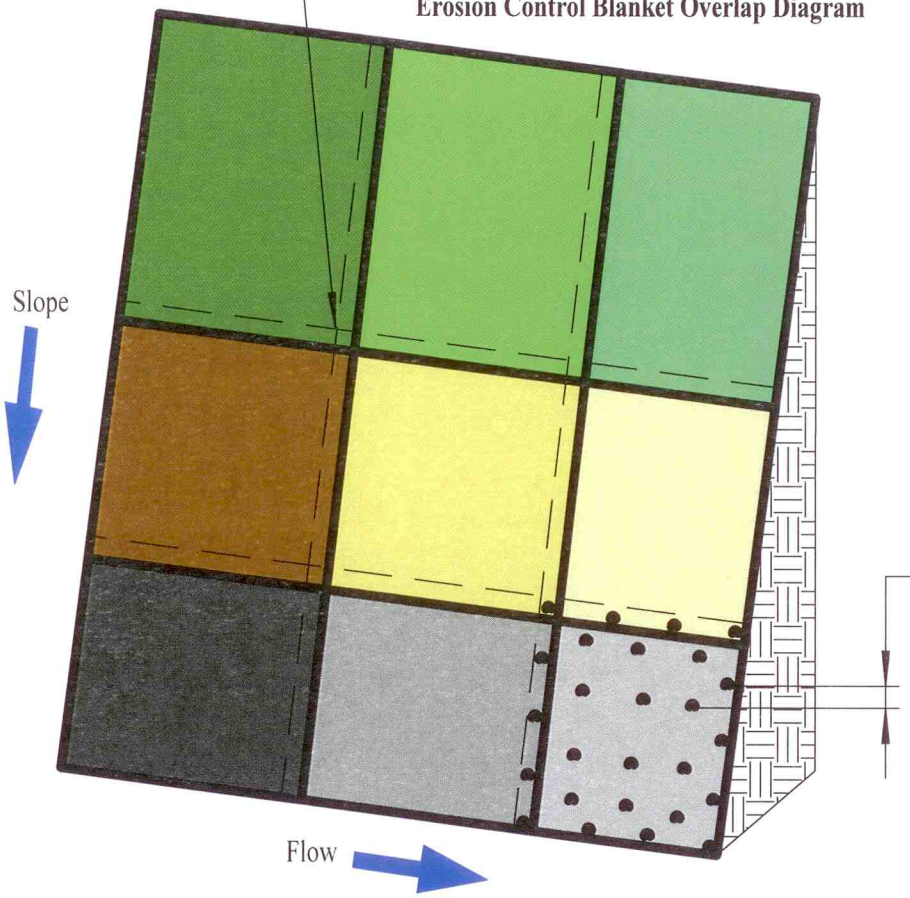
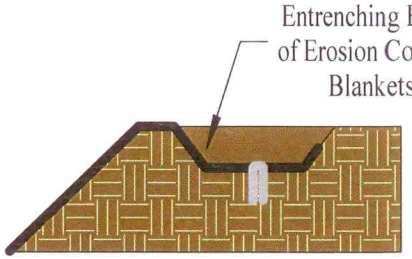
Overlap blankets a minimum of 4 inches. Upslope and upstream blankets are placed over blankets installed downslope or downstream

Erosion Control Blanket Overlap Diagram



Erosion Control Blanket Installation and Maintenance Procedures

1.) Select the type of erosion control blanket and staples based on the expected volume and water velocity, the type of soil, and the percent slope
2.) Remove rocks, logs, or other debris from installation area that may prevent the erosion control blanket from having full ground contact
3.) Smooth area to be covered by erosion control blanket and seed with temporary and/or permanent seed mix
4.) Install blankets in "shingle" pattern, with a 4-inch minimum overlap
   - Blankets installed downslope are overlapped by blankets installed upslope
   - Blankets installed downstream are overlapped by blankets installed upstream
5.) Insert 6-inch or longer staples, or functionally equivalent anchors, approximately every 2 feet on center
6.) Secure outer edges of blanket install with straw wattle and/or entrenching edges
7.) Maintain erosion control blankets if structural damage occurs
   - Replace torn blankets as needed
   - Install additional staples to secure loose blankets



Staple Blanket, then Backfill Trench and Compact Soil

Typical BMP Drawing and Mainatenance Procedures

Erosion Control Blanket

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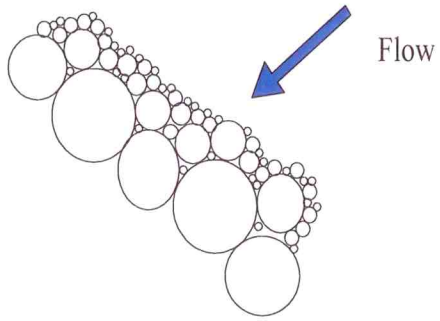
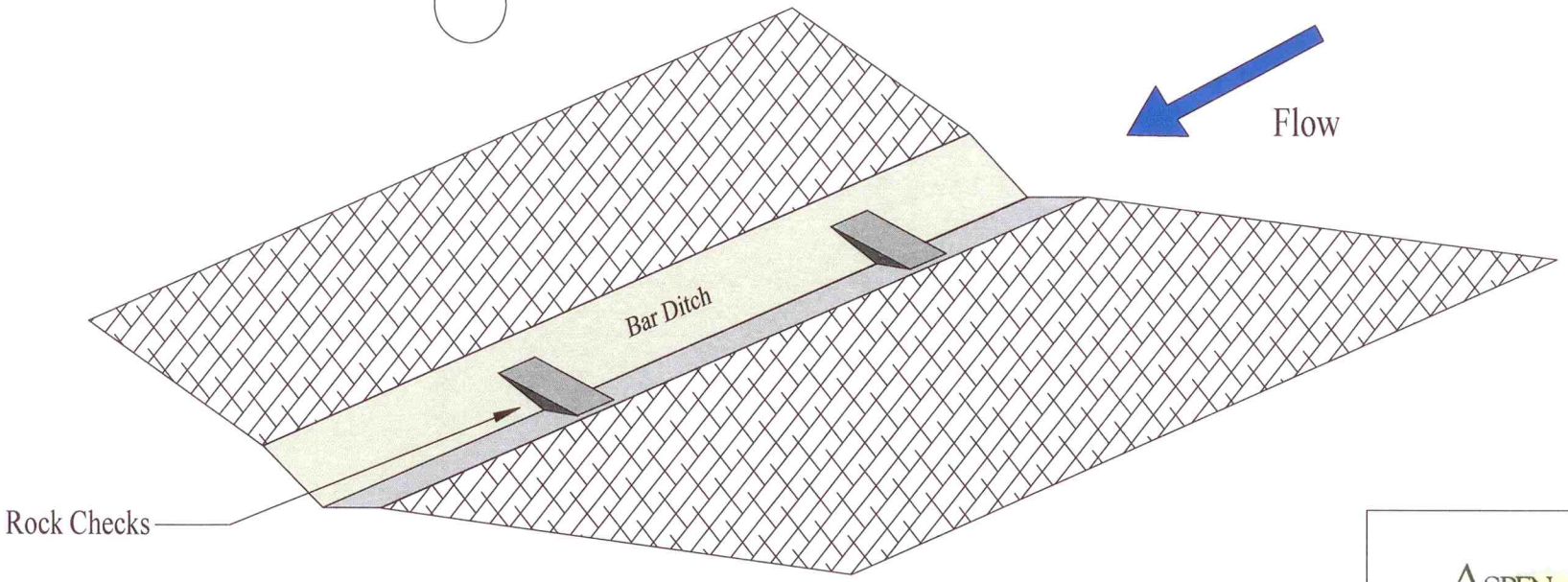
Top View of Rock Check

Place larger rock in back, smaller rock in front



Rock Check Installation and Maintenance Procedures

1.) Select rock size and rock check dimensions based on anticipated flow and velocity
2.) Construct rock checks with 1 to 12-inch diameter rock. Avoid using rock which contains fine material that could be discharged
3.) Place smaller rock upstream and in gaps between larger rock
4.) Construct rock checks below surrounding grade to direct water over the rock check.
5.) Maintain rock checks if water is flowing under or around the checks or 75% of its sediment retention capacity has been met
   - Remove captured sediment and store accordingly to prevent sediment from discharging
   - Reorganize rock or add additional rock to prevent water from flowing under or around check
   - Add additional rock checks if checks are being overwhelmed



Typical BMP Drawing and Mainatenance Procedures

Rock Check

ASPEN ENVIRONMENTAL FIELD SERVICES, LLC

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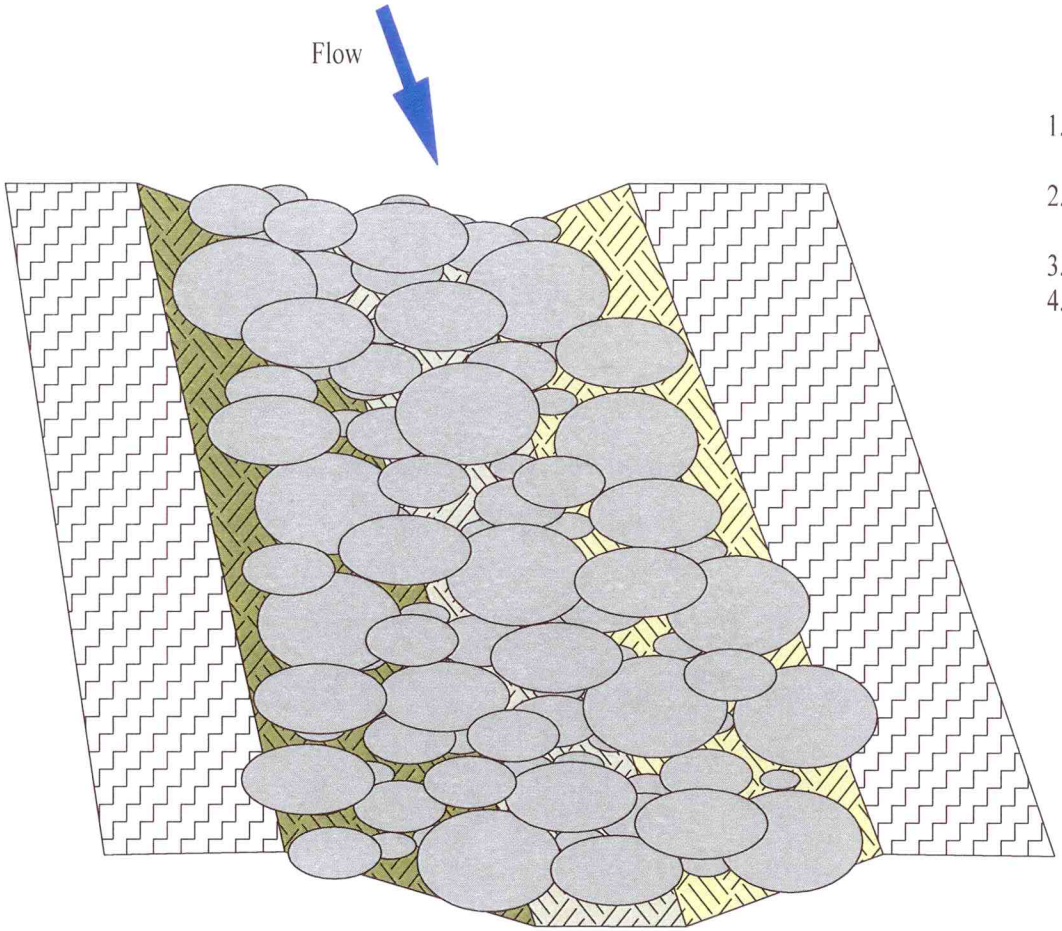

Rock Apron Installation and Maintenance Procedures

1.) Select type and diameter of rock based on the expected volume and water velocity, the type of soil, and the percent slope
2.) Install rock in channel water will travel and extend rock apron to protect soil subjected to flow
3.) Use rock with limited fine material to prevent discharging sediment
4.) Maintain rock apron if water is able to produce eroded channels
   - Rake out eroded channels
   - Reorganize or add additional rock to prevent erosion

Typical BMP Drawing and Mainatenance Procedures

Rock Apron

ASPEN ENVIRONMENTAL FIELD SERVICES, LLC

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Lower Cascade Creek Seed Mix

Updated: 01/07/2018

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

Upper Cascade Creek Seed Mix

Updated: 01/07/2018

20% - Mountain Bromegrass, *Garnet*

20% - Orchardgrass, *Pauite*

20% - Intermediate Wheatgrass, *Luna*

20% - Slender Wheatgrass, *Pryor*

20% - Western Wheatgrass, *Arriba*

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

Individual Projects within the Cascade Creek Project Area

Road/Pad/Pipeline/Facility Name	Linear Starting Point	Linear Ending Point	Acres of Disturbance
Cascade Creek 603-23-32 Pad			2.8
Cascade Creek 604-1 Pad			4.3
Cascade Creek 604-12-13 Pad			3.1
Cascade Creek 604-12-13 Road	Upper Loop Road	CC 604-12-13 Pad	0.6
Cascade Creek 604-41-32 Pad			3.0
Cascade Creek 604-41-32 Road	Upper Loop Road	CC 604-41-32 Pad	1.2
Cascade Creek 604-44 Pad			11.5
Cascade Creek 605-1 Pad			3.5
Cascade Creek 605-1 Road	Neighboring Pad	CC 605-1 Pad	2.5
Cascade Creek 605-2 Pad			1.7
Cascade Creek 605-2 Road	Upper Loop Road	CC 605-2 Pad	4.8
Cascade Creek 605-13-22 Pad			3.3
Cascade Creek 605-13-22 Road	CC 605-13-22 Pad	CC 605-23 Pad	1.5
Cascade Creek 605-23 Pad			3.6
Cascade Creek 605-23 Road	CC 605-23 Pad	North Road	0.6
Cascade Creek 608-41 Pad			10.7
Cascade Creek 608-41 Road	Upper Loop Road	CC 608-41 Pad	2.4
Cascade Creek 608-43-41 Pad			8.1
Cascade Creek 609-1 Pad			4.4
Cascade Creek 609-2 Pad			4.5
Cascade Creek 609-14 Pad & Annex			13.1
Cascade Creek 609-33 Pad			7.1
Cascade Creek 610-21-41 Pad			3.6
Cascade Creek 610-22-43 Pad			3.0
Cascade Creek 610-22-43 Road	CC 610-22-43 Pad	Upper Loop Road	0.2
Cascade Creek 610-24-43 Pad			3.3
Cascade Creek 610-24-43 Road	CC 610-24-43 Pad	Upper Loop Road	0.2
Cascade Creek 617-24 Pad			3.2
Cascade Creek 617-41 Pad			3.4
Cascade Creek 617-41 Road	CC 697-08-53 Road	CC 617-41 Pad	4.2
Cascade Creek 620-1 Pad			3.0
Cascade Creek 620-1 Road	CC 620-1 Pad	CR 213	1.8
Cascade Creek 620-21 Pad			2.9
Cascade Creek 620-24-43 Pad			6.1
Cascade Creek 620-24-43 Road	CC 620-24-43 Pad	CR 213	0.4
Cascade Creek 620-33 Pad			3.7
Cascade Creek 620-33 Road	CC 620-33 Pad	CR 213	0.0
Cascade Creek 620-43-32 Pad			4.9
Cascade Creek 620-43-32 Road	CC 620-43-32 Pad	Mountain Road	0.4
Cascade Creek 629-2 Pad			3.2
Cascade Creek 629-2 Road	CC 629-2 Pad	CR 213	1.2
Cascade Creek 629-23-42 Pad			3.8
Cascade Creek 629-23-42 Road	CC 629-23-42 Pad	CR 213	0.6
Cascade Creek 629-31-11 Pad			3.7
Cascade Creek 629-31-11 Road	CC 629-31-11 Pad	CR 213	0.6

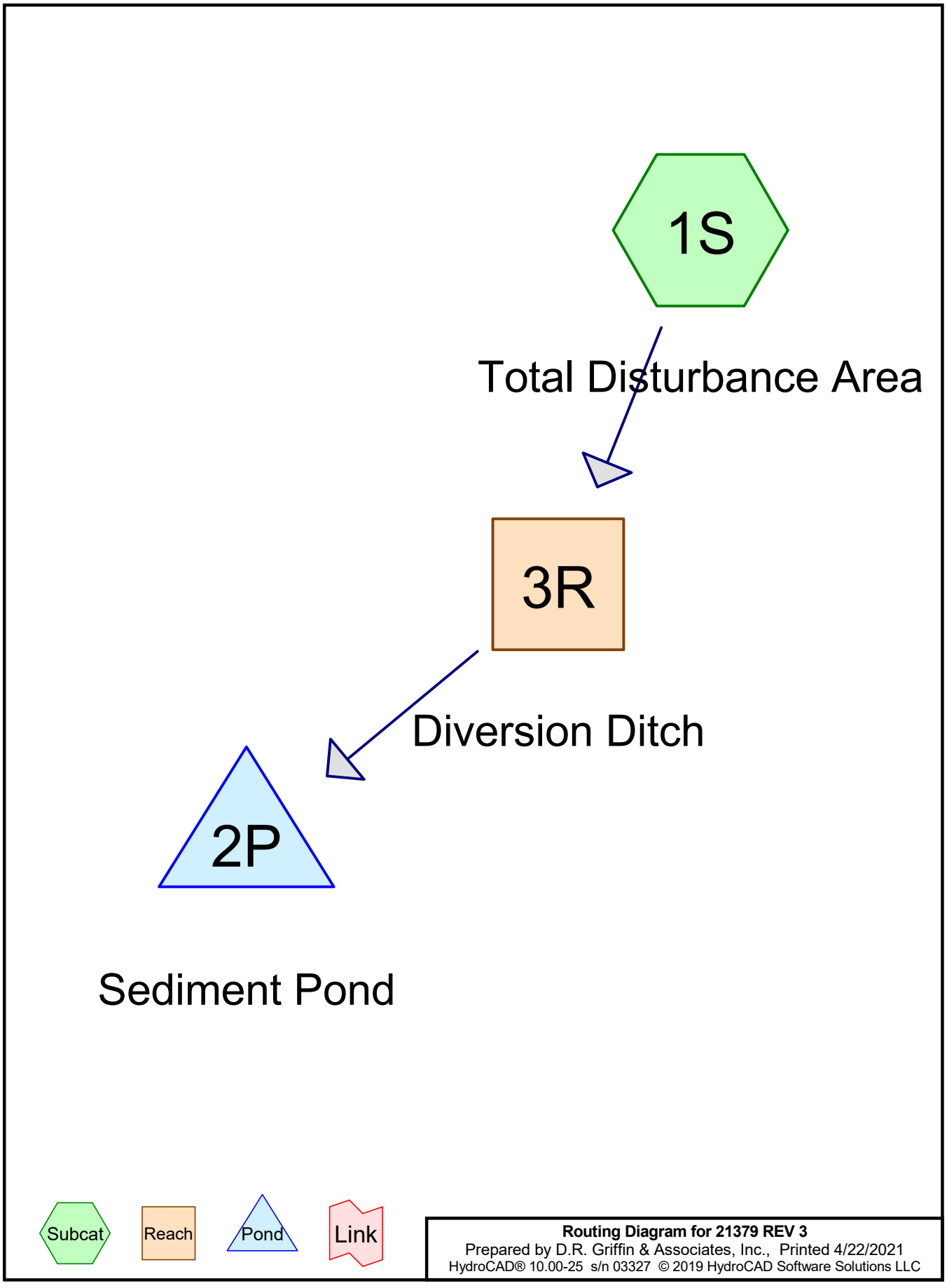
Road/Pad/Pipeline/Facility Name	Linear Starting Point	Linear Ending Point	Acres of Disturbance
Cascade Creek 632-13-22 Pad			3.7
Cascade Creek 632-13-22 Road	CC 632-13-22 Pad	CS Road	0.8
Cascade Creek 632-21-41 Pad			4.2
Cascade Creek 632-21-41 Road	CC 632-21-41 Pad	CC 629-23-42 Road	1.8
Cascade Creek 697-03-07 Pad			
Cascade Creek 697-03-07 Road	CC 697-03-07 Pad	Upper Loop Road	
Cascade Creek 697-04D Pad			9.6
Cascade Creek 697-04D Road	CC 604-1 Pad	CC 697-04D Pad	0.7
Cascade Creek 697-05C Pad			10.5
Cascade Creek 697-05C Road	CC 697-05C Pad	North Road	2.1
Cascade Creek 697-08-53 Pad			9.0
Cascade Creek 697-08-53 Road	Upper Loop Road	CC 697-08-53 Pad	0.9
Cascade Creek 697-08A			8.2
Cascade Creek 697-08A Road	CC 697-08A Pad	CC 605-13-22 Pad	2.3
Cascade Creek 697-09-61 Pad			9.9
Cascade Creek 697-09-61 Road	CC 609-33 Pad	CC 697-09-61 Pad	1.8
Cascade Creek 697-15-01 Pad			6.9
Cascade Creek 697-15-01 Annex			7.5
Cascade Creek 697-15-23 Pad			3.1
Cascade Creek 697-15-23 Road	CC 697-15-23 Pad	Mesa Storage Yard Road	0.6
Cascade Creek 697-15-54 Pad			5.9
Cascade Creek 697-15-54 Road	CC 697-15-54 Pad	Loop to Puckett Road	0.5
Cascade Creek 697-16-16 Pad			
Cascade Creek 697-16-16 Annex			
Cascade Creek 697-16D Pad			
Cascade Creek 697-16D Road	Mountain Road	CC 697-16D Pad	
Cascade Creek 697-17-50 Pad			5.2
Cascade Creek 697-17-50 Road	CC 697-17-50 Pad	CC 617-24 Pad	1.2
Cascade Creek 697-17A Pad			7.0
Cascade Creek 697-17A Road	CC 697-08-53 Pad	CC 697-17A Pad	2.1
Cascade Creek 697-20-28 Pad			6.4
Cascade Creek 697-20-28 Road	CC 697-20-28 Pad	CR 213	1.7
Cascade Creek 705-22-43 Pad			5.4
Cascade Creek 705-22-43 Road	CC 705-22-43 Pad	CC 797-05-36 Road	1.2
Federal 708-11 Pad			2.7
Federal 708-11 Road	Federal 708-11 Pad	CR 213	0.5
Cascade Creek 797-05-36 Pad			4.6
Cascade Creek 797-05-36 Road	CC 797-05-36 Pad	CR 213	3.0
Cascade Creek 797-05-52 Pad			4.6
Cascade Creek 797-05-52 Road	CC 797-05-52 Pad	CC 797-05-36 Road	0.7
Cascade Creek 797-06-07 Pad			7.1
Cascade Creek 797-06-07 Road	CC 797-06-07 Pad	CR 213	3.3
Federal 23-15 Pad			2.1
Federal 604-11 Pad			3.5
Federal 604-11 Road	Upper Loop Road	Federal 604-11 Pad	0.6

Road/Pad/Pipeline/Facility Name	Linear Starting Point	Linear Ending Point	Acres of Disturbance
Federal 797-08-19 Pad			2.5
Federal 797-08-19 Road	Federal 797-08-19 Pad	CR 213	0.6
Federal 797-08-51D Pad			2.7
Federal 797-08-51D Road	Federal 797-08-51D Pad	CR 213	0.4
LW 796-16B Pad			2.7
LW 796-16B Road	LW 796-17A Road	LW 796-16B Pad	7.2
LW 796-17A Pad			4.0
LW 796-17A Road	LW 796-17C Road	LW 796-17A Pad	3.9
LW 796-17C Pad			3.1
LW 796-17C Road	LW 796-19C Road	LW 796-17C Pad	7.2
LW 796-19C Pad			2.7
LW 796-19C Road	Puckett Trunk Road	LW 796-19C	7.9
LW 797-23A Pad			4.3
LW 797-23A Road	LW 797-23A Pad	Puckett Trunk Road	2.3
LW 797-23-45X Pad			3.6
LW 797-23-45X Road	LW 797-23-45X Pad	LW 797-23A Pad	2.7
LW 797-24-47D Pad			3.3
Logan Trail 28-10 Pad			3.5
Mesa Storage Yard & Road	Mesa Storage Yard	Loop to Puckett Road	2.8
North Road	Upper Loop Road	CC 605-23 Road	10.3
Shell 797-03A & 797-03B Pads			13.5
Shell 797-03B Road	Shell 797-03B Pad	Shell 797-09A Road	7.0
Shell 797-09A Pad			3.6
Shell 797-09A Road	CR 213	Shell 797-09A Pad	9.1
Shell 797-14-01 Road	Puckett Trunk Road	Shell 797-14-01 Pad	6.9
Shell 797-27A Pad			2.9
Shell 797-27A Road	Shell 797-27A Pad	LW 797-23-45X Road	10.1
		Total Disturbance	***292.4***

Appendix H

Hydro Calculation Report

Laramie Energy, LLC – Operator Number 10433



Routing Diagram for 21379 REV 3
Prepared by D.R. Griffin & Associates, Inc., Printed 4/22/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.642	87	Dirt roads, HSG C (1S)
1.642	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.642	HSG C	1S
0.000	HSG D	
0.000	Other	
1.642		TOTAL AREA

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.642	0.000	0.000	1.642	Dirt roads	1S
0.000	**0.000**	**1.642**	**0.000**	**0.000**	**1.642**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Total Disturbance Runoff Area=71,520 sf 0.00% Impervious Runoff Depth>0.72"
Flow Length=1,000' Slope=0.4560 '/' Tc=3.7 min CN=87 Runoff=2.45 cfs 0.098 af

Reach 3R: Diversion Ditch Avg. Flow Depth=0.16' Max Vel=4.55 fps Inflow=2.45 cfs 0.098 af
n=0.025 L=650.0' S=0.0800 '/' Capacity=408.30 cfs Outflow=2.19 cfs 0.098 af

Pond 2P: Sediment Pond Peak Elev=8,559.15' Storage=4,245 cf Inflow=2.19 cfs 0.098 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.642 ac Runoff Volume = 0.098 af Average Runoff Depth = 0.72"
100.00% Pervious = 1.642 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Total Disturbance Area

[49] Hint: Tc<2dt may require smaller dt

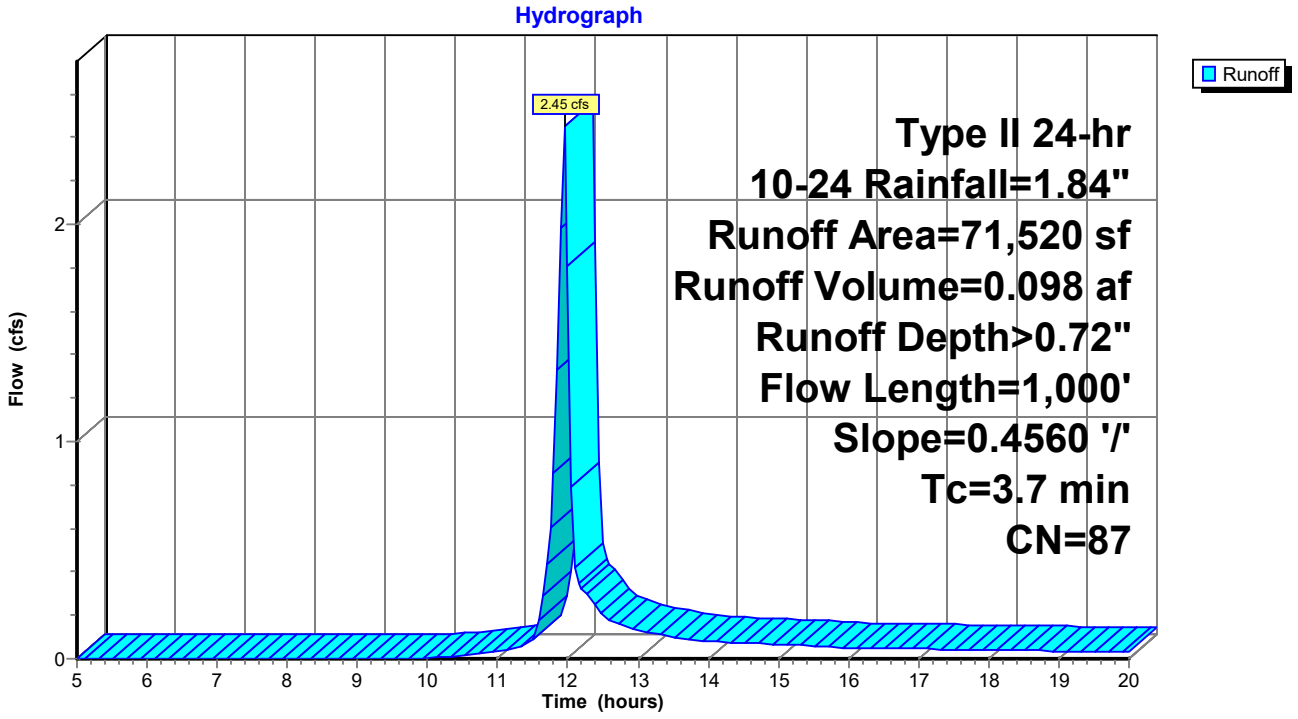
Runoff = 2.45 cfs @ 11.95 hrs, Volume= 0.098 af, Depth> 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-24 Rainfall=1.84"

Area (sf)	CN	Description
71,520	87	Dirt roads, HSG C
71,520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	1,000	0.4560	4.49		Lag/CN Method, Industrial Site w Few Structures

Subcatchment 1S: Total Disturbance Area



Summary for Reach 3R: Diversion Ditch

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 0.72" for 10-24 event
Inflow = 2.45 cfs @ 11.95 hrs, Volume= 0.098 af
Outflow = 2.19 cfs @ 12.01 hrs, Volume= 0.098 af, Atten= 11%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.55 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.71 fps, Avg. Travel Time= 6.3 min

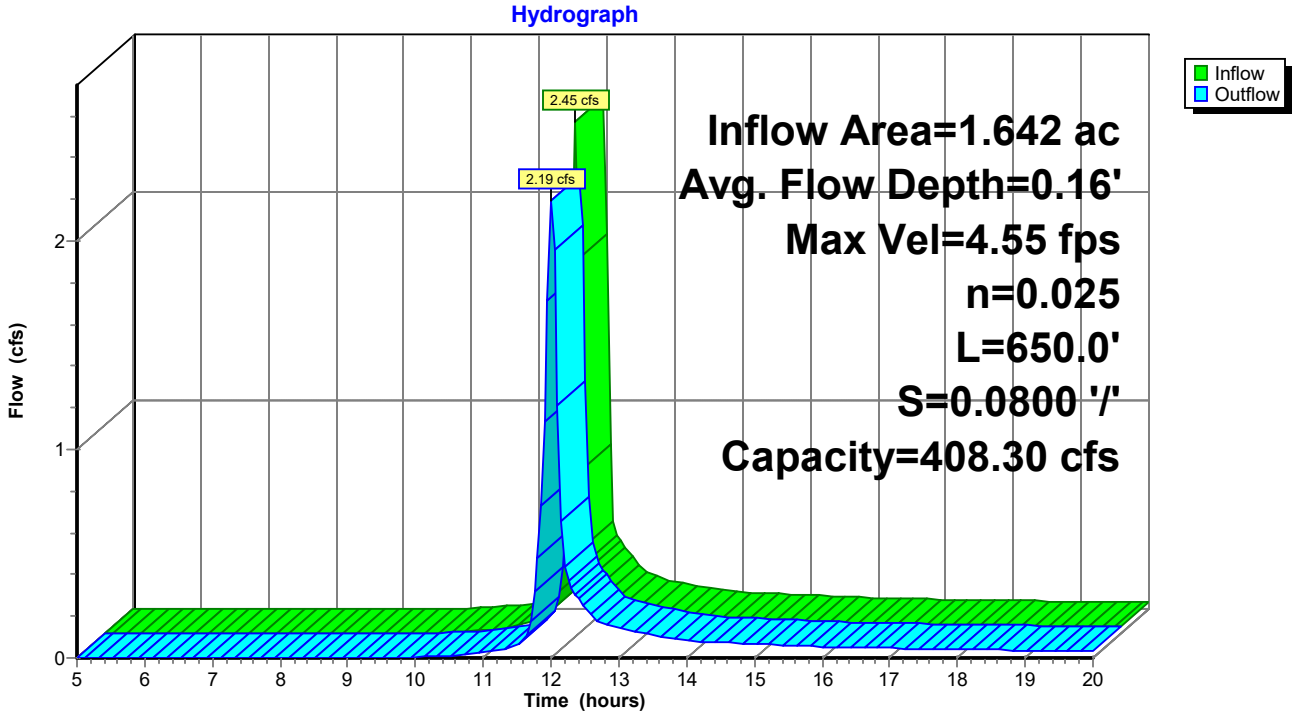
Peak Storage= 319 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 408.30 cfs

Custom cross-section, Length= 650.0' Slope= 0.0800 '/'
Constant n= 0.025 Earth, clean & winding
Inlet Invert= 8,631.00', Outlet Invert= 8,579.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	3.00	0.00
3.00	0.00	3.00
6.00	0.00	3.00
9.00	3.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	3.0	0	0.00
3.00	18.0	11.5	11,700	408.30

Reach 3R: Diversion Ditch



Summary for Pond 2P: Sediment Pond

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 0.71" for 10-24 event
Inflow = 2.19 cfs @ 12.01 hrs, Volume= 0.098 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 8,559.15' @ 20.00 hrs Surf.Area= 1,656 sf Storage= 4,245 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

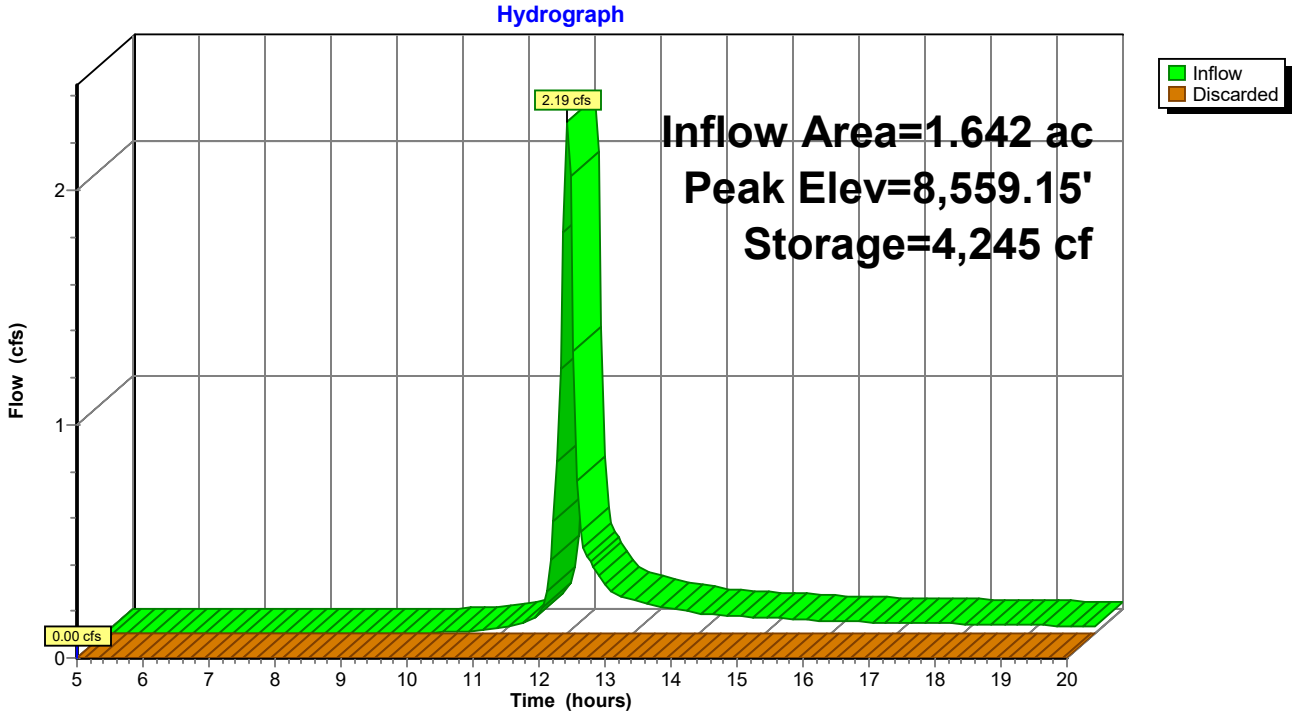
Volume	Invert	Avail.Storage	Storage Description
#1	8,555.00'	25,334 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8,555.00	472	0	0
8,556.00	711	592	592
8,557.00	980	846	1,437
8,558.00	1,276	1,128	2,565
8,559.00	1,603	1,440	4,005
8,560.00	1,961	1,782	5,787
8,561.00	2,350	2,156	7,942
8,562.00	2,767	2,559	10,501
8,563.00	3,212	2,990	13,490
8,564.00	3,685	3,449	16,939
8,565.00	4,190	3,938	20,876
8,566.00	4,726	4,458	25,334

Device	Routing	Invert	Outlet Devices
#1	Discarded	8,563.00'	**Custom Weir/Orifice X 0.00, Cv= 2.62 (C= 3.28)** Elev. (feet) 8,563.00 8,564.00 8,565.00 Width (feet) 4.00 6.00 8.00

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=8,555.00' (Free Discharge)
↑**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Sediment Pond



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Total Disturbance Runoff Area=71,520 sf 0.00% Impervious Runoff Depth>0.98"
Flow Length=1,000' Slope=0.4560 '/' Tc=3.7 min CN=87 Runoff=3.32 cfs 0.134 af

Reach 3R: Diversion Ditch Avg. Flow Depth=0.19' Max Vel=5.13 fps Inflow=3.32 cfs 0.134 af
n=0.025 L=650.0' S=0.0800 '/' Capacity=408.30 cfs Outflow=2.99 cfs 0.134 af

Pond 2P: Sediment Pond Peak Elev=8,560.01' Storage=5,812 cf Inflow=2.99 cfs 0.134 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.642 ac Runoff Volume = 0.134 af Average Runoff Depth = 0.98"
100.00% Pervious = 1.642 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Total Disturbance Area

[49] Hint: Tc<2dt may require smaller dt

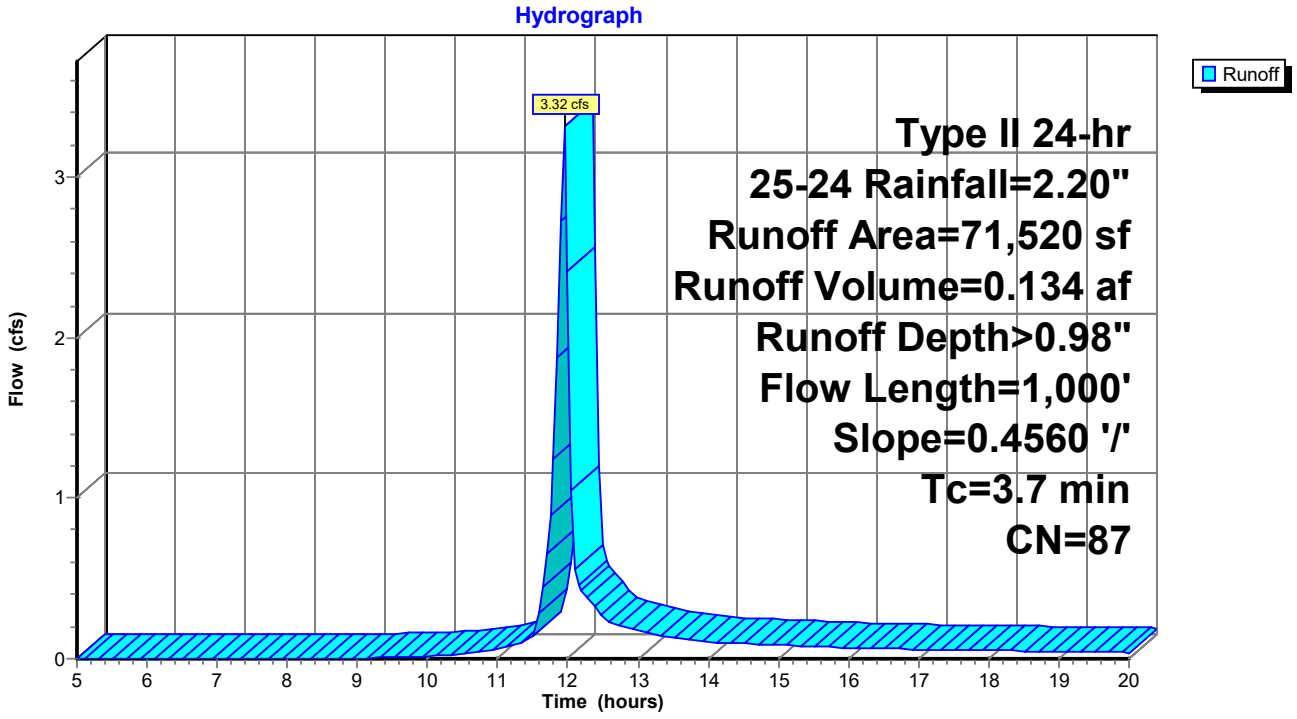
Runoff = 3.32 cfs @ 11.94 hrs, Volume= 0.134 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-24 Rainfall=2.20"

Area (sf)	CN	Description
71,520	87	Dirt roads, HSG C
71,520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	1,000	0.4560	4.49		Lag/CN Method, Industrial Site w Few Structures

Subcatchment 1S: Total Disturbance Area



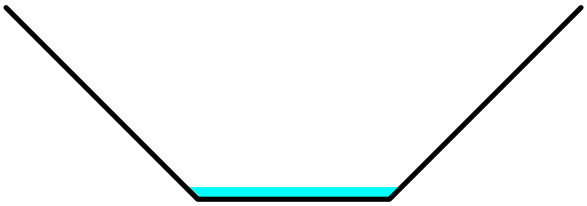
Summary for Reach 3R: Diversion Ditch

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 0.98" for 25-24 event
Inflow = 3.32 cfs @ 11.94 hrs, Volume= 0.134 af
Outflow = 2.99 cfs @ 12.00 hrs, Volume= 0.134 af, Atten= 10%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.13 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.74 fps, Avg. Travel Time= 6.2 min

Peak Storage= 389 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 408.30 cfs

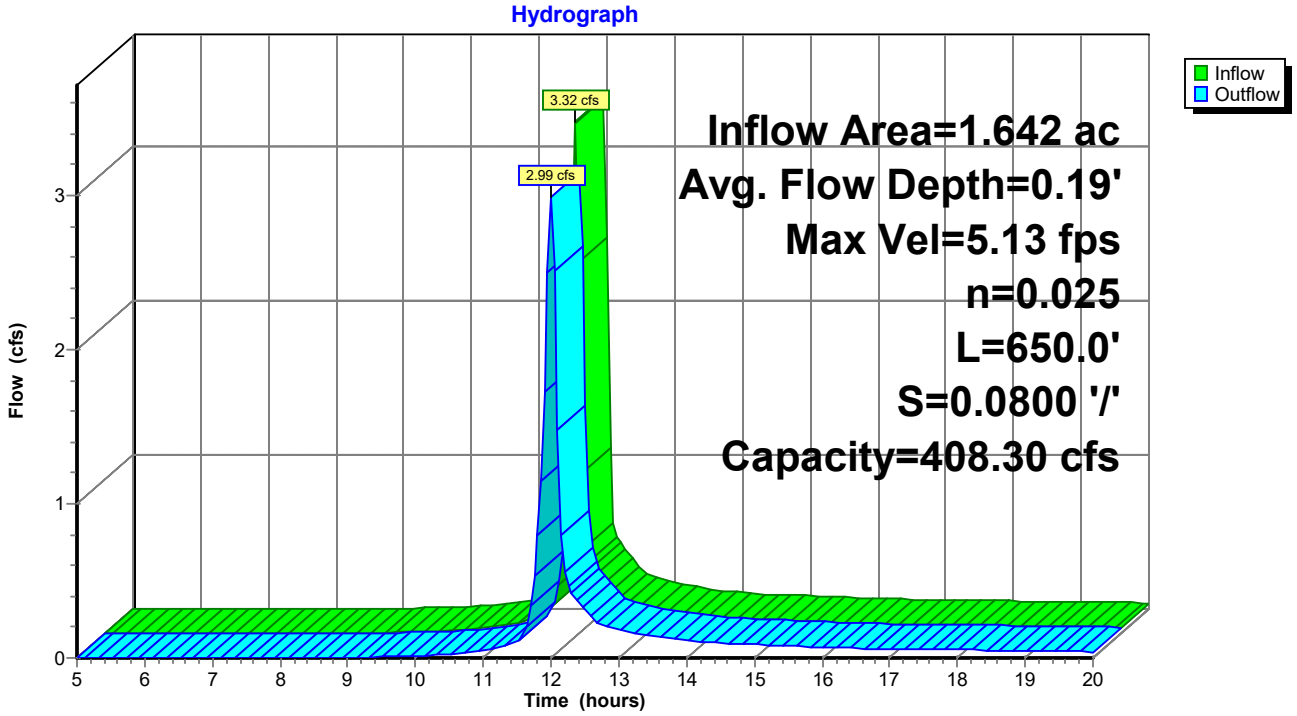
Custom cross-section, Length= 650.0' Slope= 0.0800 '/'
Constant n= 0.025 Earth, clean & winding
Inlet Invert= 8,631.00', Outlet Invert= 8,579.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	3.00	0.00
3.00	0.00	3.00
6.00	0.00	3.00
9.00	3.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	3.0	0	0.00
3.00	18.0	11.5	11,700	408.30

Reach 3R: Diversion Ditch



Summary for Pond 2P: Sediment Pond

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 0.98" for 25-24 event
Inflow = 2.99 cfs @ 12.00 hrs, Volume= 0.134 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 8,560.01' @ 20.00 hrs Surf.Area= 1,966 sf Storage= 5,812 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

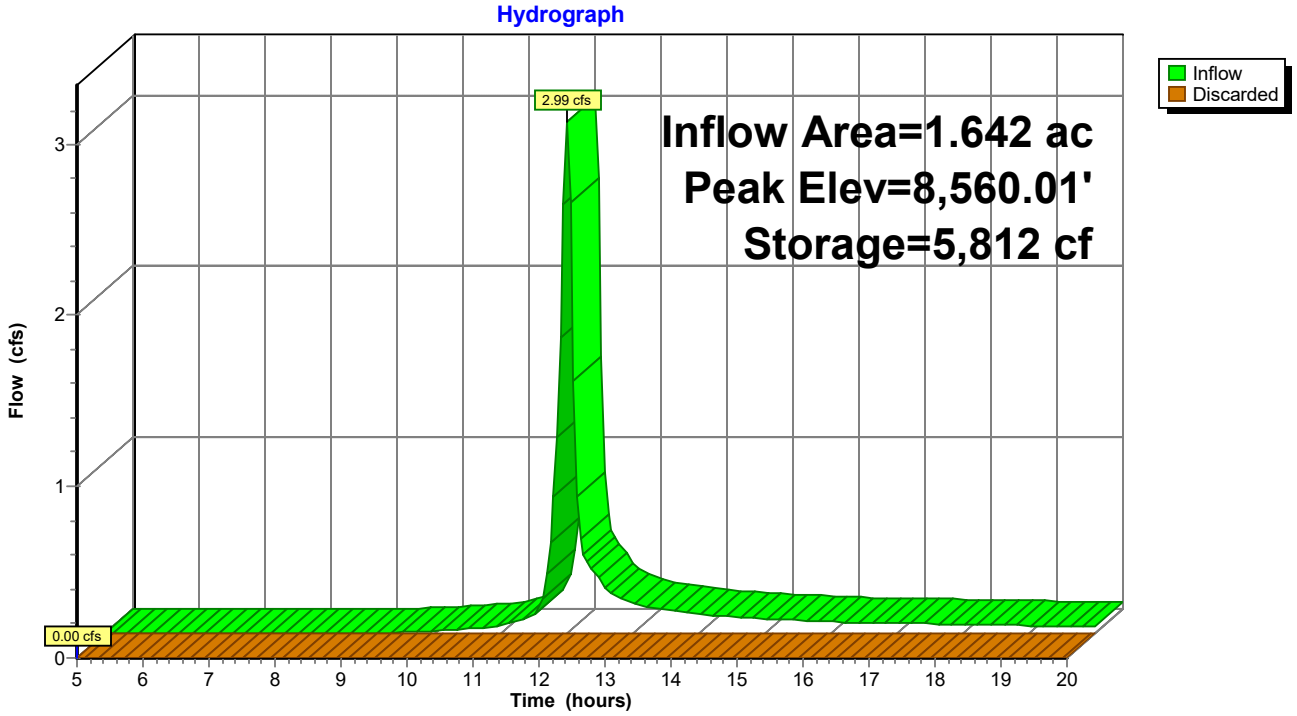
Volume	Invert	Avail.Storage	Storage Description
#1	8,555.00'	25,334 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8,555.00	472	0	0
8,556.00	711	592	592
8,557.00	980	846	1,437
8,558.00	1,276	1,128	2,565
8,559.00	1,603	1,440	4,005
8,560.00	1,961	1,782	5,787
8,561.00	2,350	2,156	7,942
8,562.00	2,767	2,559	10,501
8,563.00	3,212	2,990	13,490
8,564.00	3,685	3,449	16,939
8,565.00	4,190	3,938	20,876
8,566.00	4,726	4,458	25,334

Device	Routing	Invert	Outlet Devices
#1	Discarded	8,563.00'	**Custom Weir/Orifice X 0.00, Cv= 2.62 (C= 3.28)** Elev. (feet) 8,563.00 8,564.00 8,565.00 Width (feet) 4.00 6.00 8.00

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=8,555.00' (Free Discharge)
↑**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Sediment Pond



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Total Disturbance Runoff Area=71,520 sf 0.00% Impervious Runoff Depth>1.21"
Flow Length=1,000' Slope=0.4560 '/' Tc=3.7 min CN=87 Runoff=4.07 cfs 0.166 af

Reach 3R: Diversion Ditch Avg. Flow Depth=0.21' Max Vel=5.55 fps Inflow=4.07 cfs 0.166 af
n=0.025 L=650.0' S=0.0800 '/' Capacity=408.30 cfs Outflow=3.67 cfs 0.165 af

Pond 2P: Sediment Pond Peak Elev=8,560.67' Storage=7,186 cf Inflow=3.67 cfs 0.165 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.642 ac Runoff Volume = 0.166 af Average Runoff Depth = 1.21"
100.00% Pervious = 1.642 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Total Disturbance Area

[49] Hint: Tc<2dt may require smaller dt

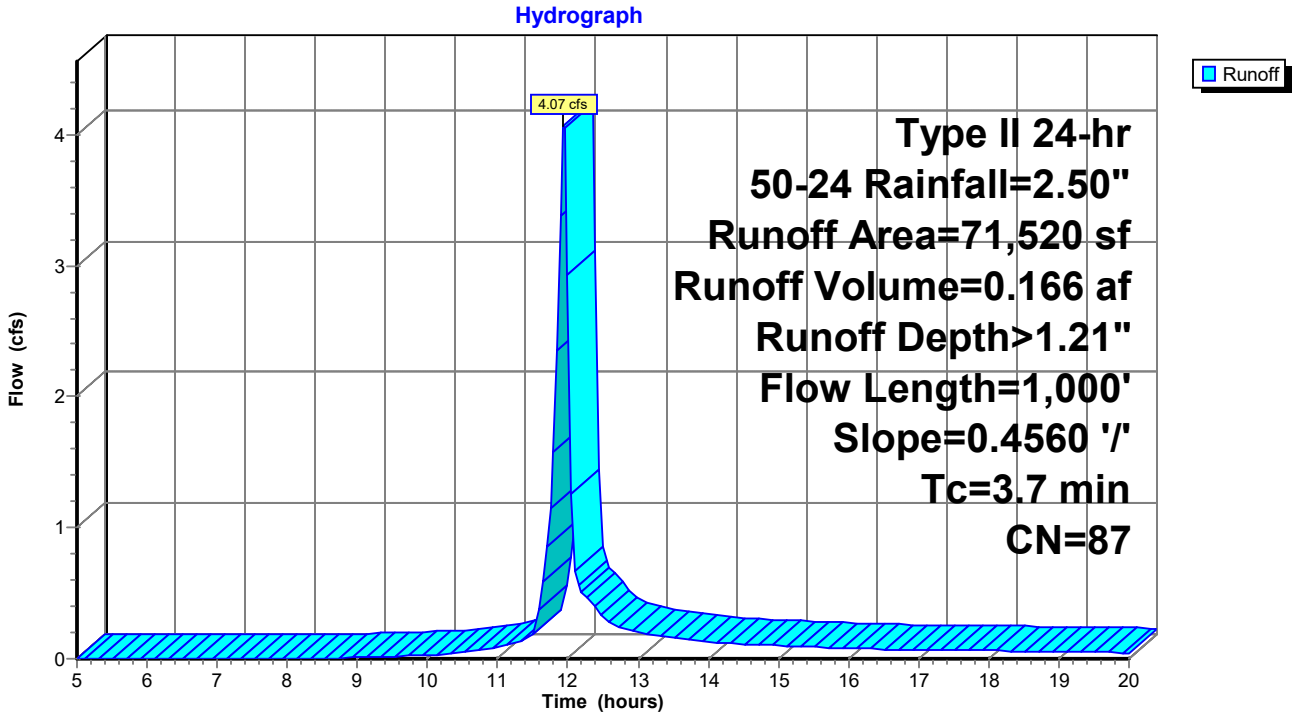
Runoff = 4.07 cfs @ 11.94 hrs, Volume= 0.166 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-24 Rainfall=2.50"

Area (sf)	CN	Description
71,520	87	Dirt roads, HSG C
71,520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	1,000	0.4560	4.49		Lag/CN Method, Industrial Site w Few Structures

Subcatchment 1S: Total Disturbance Area



Summary for Reach 3R: Diversion Ditch

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 1.21" for 50-24 event
Inflow = 4.07 cfs @ 11.94 hrs, Volume= 0.166 af
Outflow = 3.67 cfs @ 12.00 hrs, Volume= 0.165 af, Atten= 10%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.55 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 6.1 min

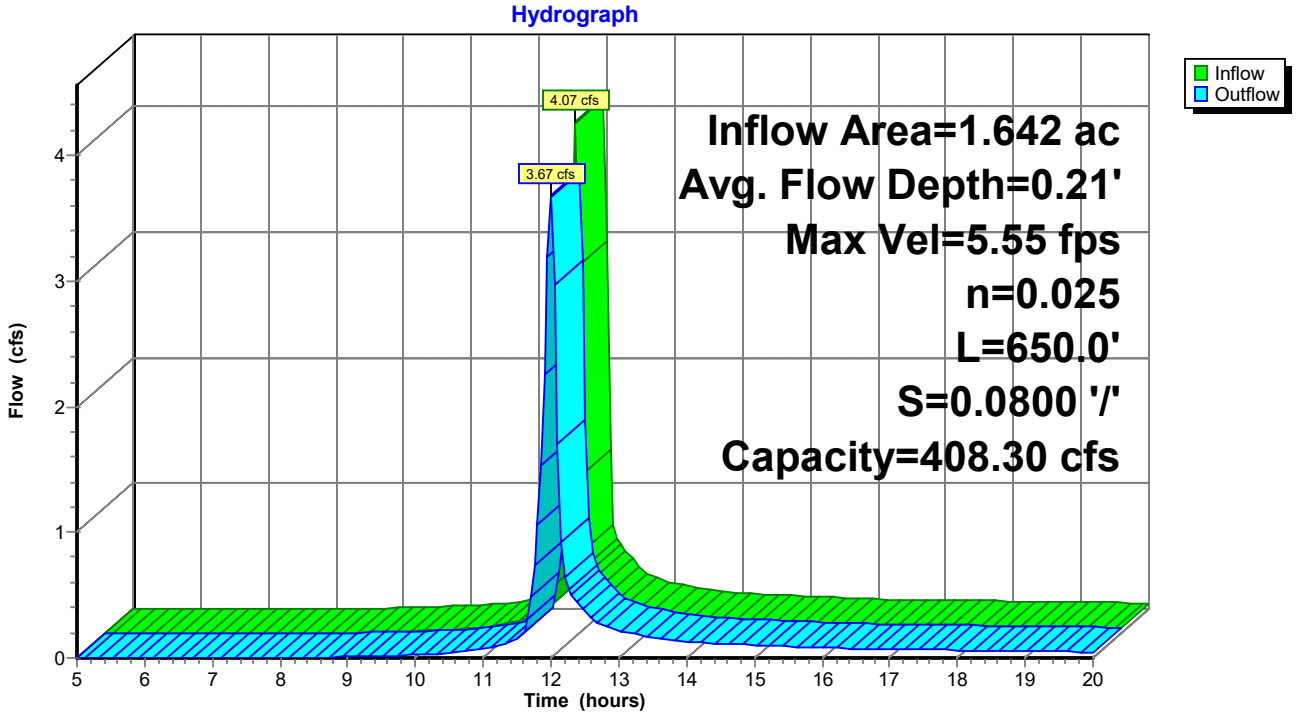
Peak Storage= 446 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 408.30 cfs

Custom cross-section, Length= 650.0' Slope= 0.0800 '/'
Constant n= 0.025 Earth, clean & winding
Inlet Invert= 8,631.00', Outlet Invert= 8,579.00'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	3.00	0.00
3.00	0.00	3.00
6.00	0.00	3.00
9.00	3.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	3.0	0	0.00
3.00	18.0	11.5	11,700	408.30

Reach 3R: Diversion Ditch



Summary for Pond 2P: Sediment Pond

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 1.21" for 50-24 event
Inflow = 3.67 cfs @ 12.00 hrs, Volume= 0.165 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 8,560.67' @ 20.00 hrs Surf.Area= 2,221 sf Storage= 7,186 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

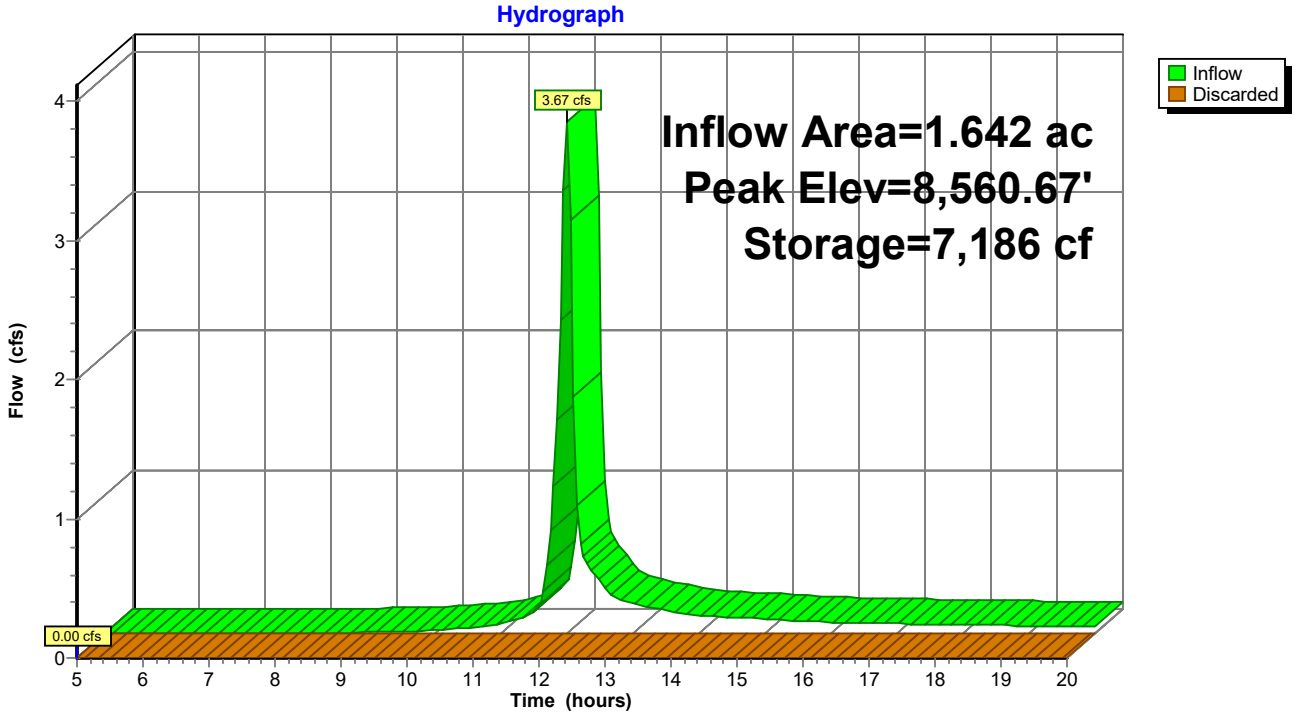
Volume	Invert	Avail.Storage	Storage Description
#1	8,555.00'	25,334 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8,555.00	472	0	0
8,556.00	711	592	592
8,557.00	980	846	1,437
8,558.00	1,276	1,128	2,565
8,559.00	1,603	1,440	4,005
8,560.00	1,961	1,782	5,787
8,561.00	2,350	2,156	7,942
8,562.00	2,767	2,559	10,501
8,563.00	3,212	2,990	13,490
8,564.00	3,685	3,449	16,939
8,565.00	4,190	3,938	20,876
8,566.00	4,726	4,458	25,334

Device	Routing	Invert	Outlet Devices
#1	Discarded	8,563.00'	**Custom Weir/Orifice X 0.00, Cv= 2.62 (C= 3.28)** Elev. (feet) 8,563.00 8,564.00 8,565.00 Width (feet) 4.00 6.00 8.00

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=8,555.00' (Free Discharge)
↑**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Sediment Pond



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Total Disturbance Runoff Area=71,520 sf 0.00% Impervious Runoff Depth>1.47"
Flow Length=1,000' Slope=0.4560 '/' Tc=3.7 min CN=87 Runoff=4.88 cfs 0.201 af

Reach 3R: Diversion Ditch Avg. Flow Depth=0.24' Max Vel=5.94 fps Inflow=4.88 cfs 0.201 af
n=0.025 L=650.0' S=0.0800 '/' Capacity=408.30 cfs Outflow=4.42 cfs 0.200 af

Pond 2P: Sediment Pond Peak Elev=8,561.32' Storage=8,704 cf Inflow=4.42 cfs 0.200 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.642 ac Runoff Volume = 0.201 af Average Runoff Depth = 1.47"
100.00% Pervious = 1.642 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Total Disturbance Area

[49] Hint: Tc<2dt may require smaller dt

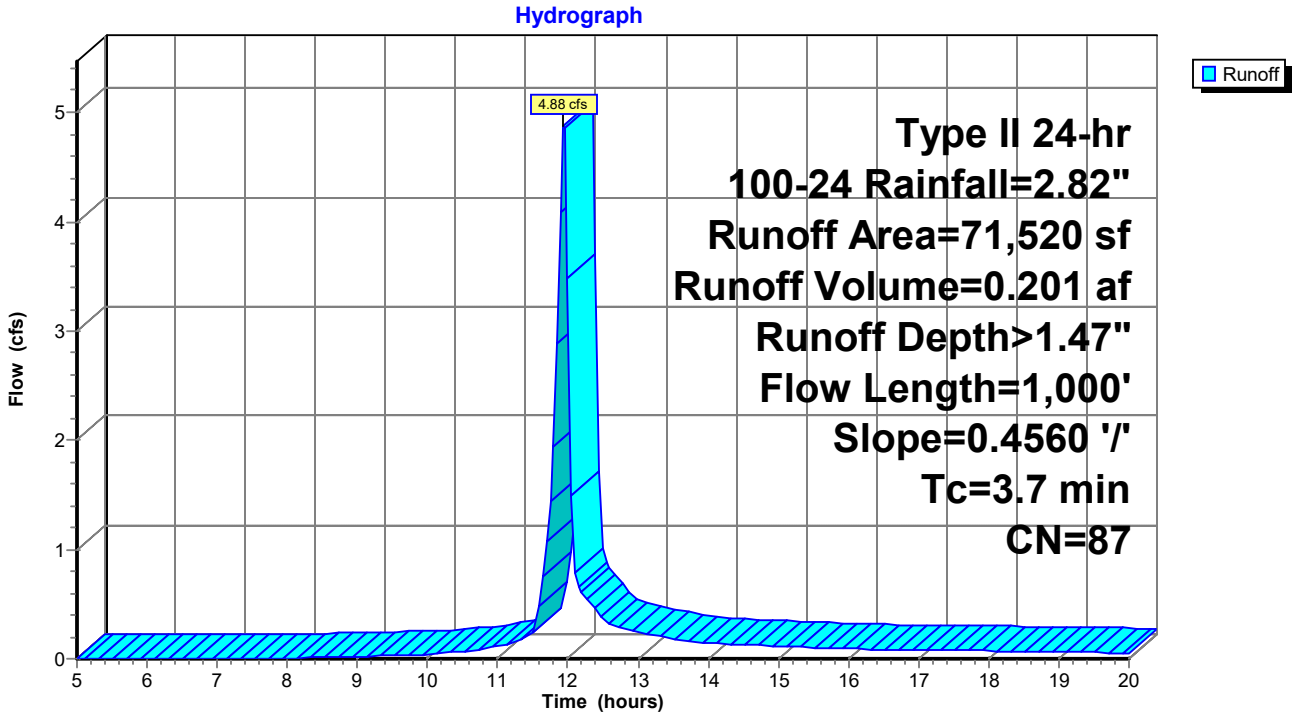
Runoff = 4.88 cfs @ 11.94 hrs, Volume= 0.201 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-24 Rainfall=2.82"

Area (sf)	CN	Description
71,520	87	Dirt roads, HSG C
71,520		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	1,000	0.4560	4.49		Lag/CN Method, Industrial Site w Few Structures

Subcatchment 1S: Total Disturbance Area



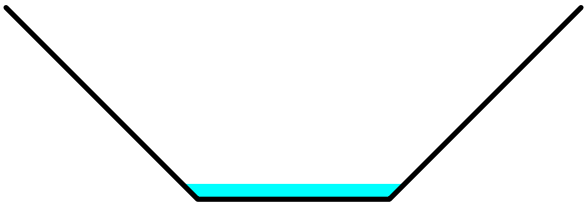
Summary for Reach 3R: Diversion Ditch

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 1.47" for 100-24 event
Inflow = 4.88 cfs @ 11.94 hrs, Volume= 0.201 af
Outflow = 4.42 cfs @ 11.99 hrs, Volume= 0.200 af, Atten= 9%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.94 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 6.0 min

Peak Storage= 503 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 3.00' Flow Area= 18.0 sf, Capacity= 408.30 cfs

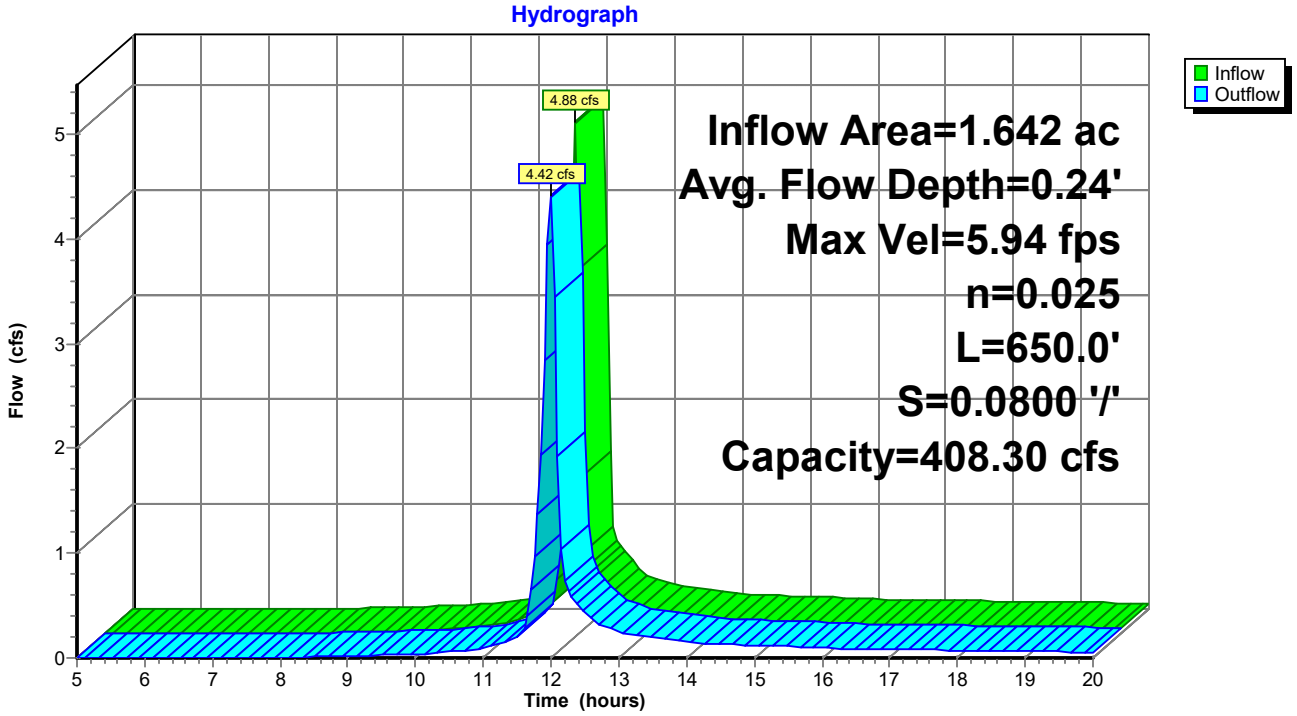
Custom cross-section, Length= 650.0' Slope= 0.0800 '/'
Constant n= 0.025 Earth, clean & winding
Inlet Invert= 8,631.00', Outlet Invert= 8,579.00'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	3.00	0.00
3.00	0.00	3.00
6.00	0.00	3.00
9.00	3.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	3.0	0	0.00
3.00	18.0	11.5	11,700	408.30

Reach 3R: Diversion Ditch



Summary for Pond 2P: Sediment Pond

Inflow Area = 1.642 ac, 0.00% Impervious, Inflow Depth > 1.46" for 100-24 event
Inflow = 4.42 cfs @ 11.99 hrs, Volume= 0.200 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 8,561.32' @ 20.00 hrs Surf.Area= 2,482 sf Storage= 8,704 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	8,555.00'	25,334 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8,555.00	472	0	0
8,556.00	711	592	592
8,557.00	980	846	1,437
8,558.00	1,276	1,128	2,565
8,559.00	1,603	1,440	4,005
8,560.00	1,961	1,782	5,787
8,561.00	2,350	2,156	7,942
8,562.00	2,767	2,559	10,501
8,563.00	3,212	2,990	13,490
8,564.00	3,685	3,449	16,939
8,565.00	4,190	3,938	20,876
8,566.00	4,726	4,458	25,334

Device	Routing	Invert	Outlet Devices
#1	Discarded	8,563.00'	**Custom Weir/Orifice X 0.00, Cv= 2.62 (C= 3.28)** Elev. (feet) 8,563.00 8,564.00 8,565.00 Width (feet) 4.00 6.00 8.00

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=8,555.00' (Free Discharge)
↑**1=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Sediment Pond