

APPLICATION FOR CENTRALIZED E&P WASTE MANAGEMENT FACILITY PERMIT

STATE OF COLORADO OIL AND GAS CONSERVATION COMMISSION

P-32 WATER IMPOUNDMENT FACILITY



SUBMITTED BY

BERRY PETROLEUM COMPANY

NOVEMBER 2012



State of Colorado  
Oil and Gas Conservation Commission



1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303) 894-2100 Fax: (303) 894-2109

**CENTRALIZED E&P WASTE MANAGEMENT FACILITY PERMIT**

Submit this Form and accompanying documents for each facility per Rule 908. Financial Assurance in the amount of \$50,000 is required to operate each facility.

FOR OGCC USE ONLY

Surety ID: \_\_\_\_\_

<b>OGCC Operator Number:</b> 10091		<b>Contact Name and Telephone:</b>	
<b>Name of Operator:</b> Berry Petroleum Company		Bryan Burns	
<b>Address:</b> 1999 Broadway, Suite 3700		<b>No:</b> (303) 999-4245	
<b>City:</b> Denver	<b>State:</b> CO	<b>Zip:</b> 80202	<b>Fax:</b>
<b>Surface Owner (if different than above):</b> EnCana Oil & Gas USA, Inc.			
<b>Address:</b> 370 17th Street, Suite 1700			
<b>City:</b> Denver	<b>State:</b> CO	<b>Zip:</b> 80202	<b>Phone:</b> (303) 623-2300
<b>Facility Name:</b> P32 595		<b>Location (Qtr, Sec, Twp, Rng, Mer):</b>	
<b>Address:</b> N/A		SESE, Sec. 32, T5S, R95W	
<b>City:</b> N/A	<b>State:</b> CO	<b>Zip:</b>	<b>Latitude:</b> 39.565347
<b>Phone:</b>	<b>Fax:</b>	<b>Longitude:</b> -108.070178	

**Complete the Attachment Checklist**

	Oper	OGCC
Site description (topo, geol, hydro)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Adjacent land use description	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Topographic map	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Site drainage map with structures	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Scaled drawing and survey map	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Facility design & engineering	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Operating plan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Water analysis report	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Financial assurance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Closure plan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Local gov't zoning compliance	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Local gov't permits and notice	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

1. Is the site in a sensitive area? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		2. What are the average annual precipitation and evaporation rates for the site? Precipitation: 16 inches/year Evaporation: 40 inches/year	
3. Has a description of the site's general topography, geology and hydrology been attached? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N			
4. Has a description of the adjacent land use been attached? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		5. Has a 1:24,000 topographic map showing the site location been attached? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
6. Has a site plan showing drainage patterns, diversion or containment structures, roads, fencing, tanks, pits, buildings and any other pertinent construction details been attached? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N			
7. If site is not owned by the operator, is written authorization of the surface owner attached? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		8. Has a scaled drawing and survey showing the entire section(s) containing the proposed facility been attached? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
9. What measures have been implemented to limit access to the facility by wildlife, domestic animals or by members of the public? Briefly explain. <u>All vehicles must stop at the security gate at the bottom of Wheeler Gulch Road. Unauthorized public and private traffic is prohibited.</u> <u>The pit will be fenced and netted so that access to the facility by wildlife or domestic animals will not be a concern.</u>			
10. Is there a planned firelane of at least 10 feet in width around the active treatment areas and within the perimeter fence? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		11. Is there an additional buffer zone of at least 10 feet within the perimeter firelane? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
12. Have surface water diversion structures been constructed to accommodate a 100-year, 24-hour event? <input type="checkbox"/> Y <input type="checkbox"/> N		13. Has a waste profile been calculated according to Rule 908.b.6? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
14. Has facility design and engineering been provided as required by Rule 908 b.7? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		15. Has an operating plan been completed as required by Rule 908.b.8? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
16. Has ground water monitoring for the site been provided? <input type="checkbox"/> Y <input type="checkbox"/> N ***Attach Water Analysis Report, Form 25, for each monitoring well installed.***			
17. Has financial assurance been provided as required by Rule 704? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		18. Has a closure plan been provided? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	
19. Have local government requirements for zoning and construction been complied with? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N		20. Have permits and notifications required by local governments and other agencies been provided? <input checked="" type="checkbox"/> Y <input type="checkbox"/> N	

Print Name: Bryan Burns

Signed: Bryan Burns Title: Environmental Specialist Date: 10/31/12

OGCC Approved: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

CONDITIONS OF APPROVAL, IF ANY:

Facility Number: 430737

COGCC FORM 28  
CENTRALIZED E&P WASTE MANAGEMENT FACILITY  
SUPPLEMENTAL INFORMATION

P32 WATER IMPOUNDMENT FACILITY  
BERRY PETROLEUM COMPANY

November 2012

This supplement to the COGCC Form 28 for the Berry Petroleum Company's (Berry) proposed Water Impoundment provides additional information required by COGCC Rules 704 and 908. This information is defined in the following sections by reference to the applicable sections of Rules 704 and 908. This impoundment has also submitted a Limited Impact Review (LIR) with Garfield County. As noted below, information required by Garfield County for the LIR has been provided with this application, where appropriate. In addition, a COGCC Form 2A has been submitted for this impoundment.

Berry is proposing to construct and operate a permanent water storage impoundment to eliminate the need for water storage in multiple locations. This impoundment would enable reclamation of on-site evaporation pits of 3 locations within 3 miles of the proposed site. This impoundment would also decrease the risk of a produced water release from a pit, decrease the risk to wildlife populations, and would decrease overall truck and water hauling traffic on roads.

An application for a permit for air emissions from the facility will be submitted to the CDPHE Air Pollution Control Division (APCD).

Rule 704.

This site is covered by a reclamation bond with RLI Insurance Company which covers \$25,000.00 as a Blanket Surface Bond. The Bond number for this is RLB0008951. Berry will provide further financial assurance to the COGCC if requested.

Rule 908.a.

The proposed impoundment is a non-commercial, centralized E&P waste management facility for the storage, recycling, and reuse of E&P waste and will serve Berry and EnCana Oil & Gas USA, Inc. (EnCana) operations in Garfield County, Colorado. Berry and EnCana share an Operating Agreement on the North Parachute Ranch Property (Attachment B).

Rule 908.b.(1)

This impoundment will be operated for Berry Petroleum Company. The information required by this rule is as follows:

Operator Name:	Berry Petroleum Company
Address:	1999 Broadway, Suite 3700, Denver, CO 80202
Phone:	(303) 999-4245
Contact Person:	Bryan Burns

Rule 908.b.(2)

EnCana Oil & Gas USA, Inc. is the surface owner with Berry Petroleum Company as the operator, as part of the Operating Agreement. A single land use change permit application with the Garfield County Land Use Department has been submitted for the proposed water impoundment. Attached are the Operating Agreement between Berry and EnCana and a written authorization from EnCana.

EnCana Oil & Gas USA, Inc.  
370 17<sup>th</sup> Street, Suite 1700, Denver, CO 80202  
(303) 623-2300

Rule 908.b.(3)

The legal description of the site is as follows:

*A parcel of land situated in the SESE, Section 32, Township 5 South, Range 95 West of the 6<sup>th</sup> Principal Meridian, Garfield County, Colorado.*

*EnCana Oil & Gas USA, Inc.  
Parcel Number: 2135-273-00-015*

Rule 908.b.(4)

A topographic map of the location is provided in Figure 1c. A general topographic, geologic, and hydrologic description of the site, including immediately adjacent land uses, has been provided and described further below. The average annual precipitation in the area of the facility is approximately 16 inches. (Weather station data is from the Altenbern Ranch Weather Station, supplied by the Colorado Climate Center) The average annual evaporation rate in the area is approximately 40 inches. (Maps from NOAA Technical Report NWS 33) Additional details are provided in Attachment C of this submittal.

Rule 908.b.(5).A.

The site plan for the impoundment is provided in Figure 2. This site plan identifies all of the features of the impoundment. Construction and drainage details are provided in the construction and drainage plans (Attachment D).

Rule 908.b.(5).B.

Attachment E illustrates the site-specific survey for the proposed impoundment and surrounding area. The field measured distances from the nearer north or south and nearer east or west section lines have been measured at 90 degrees from the said section lines to facility boundaries and are referenced on the drawings.

Rule 908.b.(5).C.

Public access to the site will be controlled by a security station located on Wheeler Gulch Road. All vehicles entering this road must stop at the security gate. All unauthorized public and private traffic is prohibited.



The pit will be fenced and netted so that access to the impoundment by wildlife or domestic animals will not be a concern. An 8 foot wildlife fence, including wooden posts and woven wire "sheep's fence, and standard bird netting, constructed of nylon and 1 inch by 1 inch squares, will be used to restrict access. Recommendations according to Form 2A submittal have been included in Attachment F.

Rule 908.b.(5).D.

A fire lane is not planned for the site; however there will be at least 20 feet of a buffer zone surrounding the site. This buffer zone will prevent fire from moving onto or off of the pad.

Rule 908.b.(5).E.

The construction and drainage plans are included in Attachment D and provide the details of the surface water diversion structures designed to accommodate the precipitation rates prescribed by this rule. A representation of the Garfield County floodplain designations is included in Figure 4. According to the Wildlife and Vegetative Survey conducted for Berry by WestWater Engineering for the LIR (Attachment G), the proposed impoundment is located on a ridge top with no drainages crossing the area. Berry's Stormwater Management Plan (SWMP) is provided in Attachment H as part of the submittal for this impoundment.

Rule 908.b.(6)

Attachment I provides pipeline maps for the transport of produced water to the P-32 Impoundment. Water will not be treated on the P-32 site and the only other transport from the site would be by truck for either reuse or off-site disposal.

Rule 908.b.(7).A.

A comprehensive report from the Natural Resources Conservation Service (NRCS) is provided in Attachment K and a report of Geologic Hazards is provided in Attachment L. Figure 5 provides the soils map for this project. A generalized geologic map of the area is provided in Figure 6.

The location for the proposed water impoundment is primarily underlain by soils of the Parachute-Rhone loams, 5 to 30 percent slopes. Parachute loam, 25 to 65 percent slopes, Irigul channery loam, 9 to 50 percent slopes, and Silas loam, 3 to 12 percent slopes also occur in the vicinity of the proposed impoundment. The Parachute-Rhone loams, 5 to 30 percent slopes, are well drained loam to very channery sandy clay loam that extends to depths of about 52 inches. The other three soils are also well drained loams that range in depths from 17 to 60 inches.

The geology of this area is underlain by the Uinta Formation and Parachute Member of the Green River Formation. The Uinta formation consists of marlstone, sandstone, siltstone, and mudstone. The Parachute Member consists of claystone, marlstone, and shale.

As noted in the geologic hazards report, the primary limitations for shallow excavations are based on the slopes, limited depth to bedrock, and the potential for cutbanks to cave. Consideration will need to be given to the design and construction of this facility to ensure that slopes are graded appropriately to minimize the potential for cutbank caving. The suitability of the soils in the area is identified as being somewhat to very limited in regard to the construction of ponds or embankments. The limitations identified are primarily applicable to unlined water impoundments. As long as consideration is given to

design and construction issues related to the thinness of the soil layer and depth to bedrock, those limitations can be mitigated. Similarly, consideration has been given to the design and operation of a liner system for the impoundment, which will mitigate the potential for seepage and leaks.

Rule 908.b.(7).B.

A map of surface water features within two miles of the proposed impoundment is provided in Figure 7. As stated in the Wildlife and Vegetative Survey, the proposed location is on a ridge top above all tributary headwaters except Grassy Gulch to the east, which lies approximately 490 feet below the elevation of the pad. As discussed above, the area is not within an area identified as a flood hazard by FEMA. There are no surface waters subject to COGCC Rule 317B located in the vicinity of the proposed project.

According to the Ground Water Atlas of Colorado, the hydraulic conductivity for the Upper Piceance Basin Aquifer ranges from 0.8 to 1.2 feet/day. 90 percent of well yields are less than 22 gpm. The Lower Piceance Basin Aquifer, which is confined by the kerogen-containing Mahogany zone, has naturally high TDS concentrations and is not considered a drinking water source. The potentiometric surface is approximately 8,000 feet. A description of the hydrologic units and characteristics of the area are shown in Figure 12. (Ground Water Atlas of Colorado)

The location is not within an identified floodplain and is located at an elevation well above the nearest surface waters. An assessment of potential impacts to wetlands and waters of the United States according to the Army Corps of Engineering discussed in the Wildlife and Vegetative Survey determined that no jurisdictional wetlands or drainages would be affected by the project (Attachment G). An area map showing wetland and riparian locations is provided as Figure 8.

The Water Impoundment has been designed with features that significantly reduce the potential for the impoundment to impact nearby surface and groundwater. The proposed pit will have a 60 mil primary synthetic liner and a 24 mil secondary synthetic liner that will cover the bottom and interior sides of the pit with the edges secured around the pit perimeter. A leak detection system will be installed to monitor for any leaks. A water level monitor will be used to ensure the 2 feet freeboard. Springs are sampled to ensure that groundwater and surface water are not impacted by operations. Fall 2012 sampling reports are available upon request.

Rule 908.b.(7).C.

The site plan for the impoundment and the construction and drainage plans provide engineering details for the proposed liner and netting. The site plans illustrate the drainage ditches. Erosion control measures have been addressed in the SWMP. Soil stockpiles will be stabilized using Best Management Practices (BMPs), including berms surrounding the pile to prevent erosion and sediment transport.

Rule 908.b.(8)

The site will be unmanned and the Emergency Response Map for the impoundment is provided in Attachment N. All personnel on location will have radio and cellular telephone capabilities to reach other Berry employees in the event of an emergency. In order to ensure a safe and timely response to emergency situations, Berry can provide the appropriate authorities with detailed maps, detailed directions, and GPS coordinates to facilitate timely response. Roads will be well maintained and snow-plowed in the winter to facilitate vehicle access.

An Operating Plan is provided in Attachment M. An SPCC Plan has been provided in Attachment O. All submitted plans have been prepared to include site-specific conditions.

Rule 908.b.(9).A.

There are no known water wells located within one mile of the proposed impoundment; evidenced in Figure 9.

Rule 908.b.(9).B.

As discussed under Rule 908.b.(7).B., the water impoundment has been designed with a number of features that significantly reduce the potential for this impoundment to impact groundwater. Five springs on Old Mountain are sampled twice per year, in spring and fall. The locations of these samples are shown in Figure 10. The pit will be sampled monthly with test parameters following Table 910-1 guidelines, including all applicable local, state, and federal regulations and recommendations. Test results will be available upon request.

The impoundment will adhere to the applicable COGCC, CDPHE, and Garfield County noise and odor regulations.

Rule 908.b.(10)

Periodic Monitoring of the surface water will be conducted throughout the life of the impoundment to insure that no contaminants are reaching the surface waters. As mentioned in Rule 908.b.(9).B., five springs are sampled twice per year to ensure that groundwater and surface water are not impacted by operations.

Rule 908.b.(11)

An Emergency Response Map for the impoundment is included in Attachment N. The Operating Plan describes the maintenance and monitoring process and the Reclamation Plan describes the site closure process. Chemicals are tracked by Material Safety Data Sheets (MSDS) and the SPCC addresses procedures for spill and chemical responses.

Rule 908.c.

No response required.

Rule 908.d.

This site is covered by a reclamation bond with RLI Insurance Company which covers \$25,000.00 as a Blanket Surface Bond. The Bond number for this is RLB0008951. Berry will provide further financial assurance to the COGCC if requested.

Rule 908.e.

Throughout the life of the facility, Berry shall submit proposed modifications to the facility design, operating plan, permit data, or permit conditions to the Director for prior approval.

Rule 908.f.

To facilitate annual review of this impoundment by the COGCC, Berry shall submit an annual report summarizing operations, including the types and volumes of waste actually handled at the impoundment. All records will be made available to the COGCC upon request.

Rule 908.g.

A preliminary plan for reclamation and closure of the impoundment is provided in Attachment A. Cost for closure was not estimated, as the pad is covered by the blanket surface bond with RLI Insurance Company, as stated above.

Rule 908.h.

Berry has submitted a Limited Impact Review application to Garfield County.

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### Figures

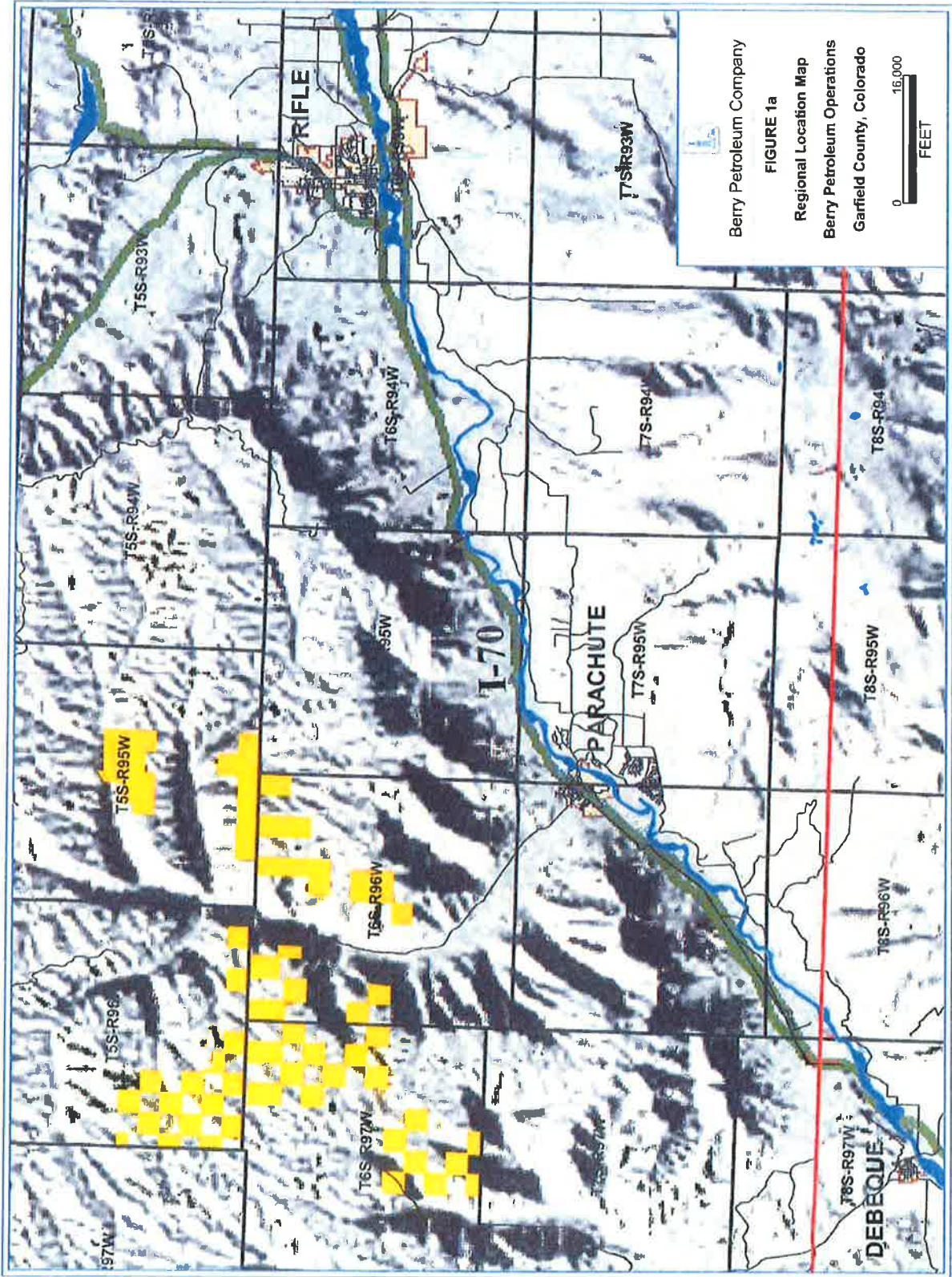
Vicinity Map	Figure 1a
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Site Hydrology Map	Figure 11
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### Attachments

Reclamation Plan	Attachment A
Operations Agreement	Attachment B
Area Climate	Attachment C
Construction Documents	Attachment D
Site-specific Location Survey	Attachment E
Location Assessment	Attachment F
Wildlife and Vegetative Survey	Attachment G
Stormwater Management Plan	Attachment H
Waste Profile	Attachment I
Source of Produced Water for Disposal	Attachment J
NRCS Soils Report	Attachment K
Geologic Hazards Report	Attachment L
Operating Plan	Attachment M
Emergency Response Plan	Attachment N
Spill Prevention Control and Countermeasure Plan	Attachment O

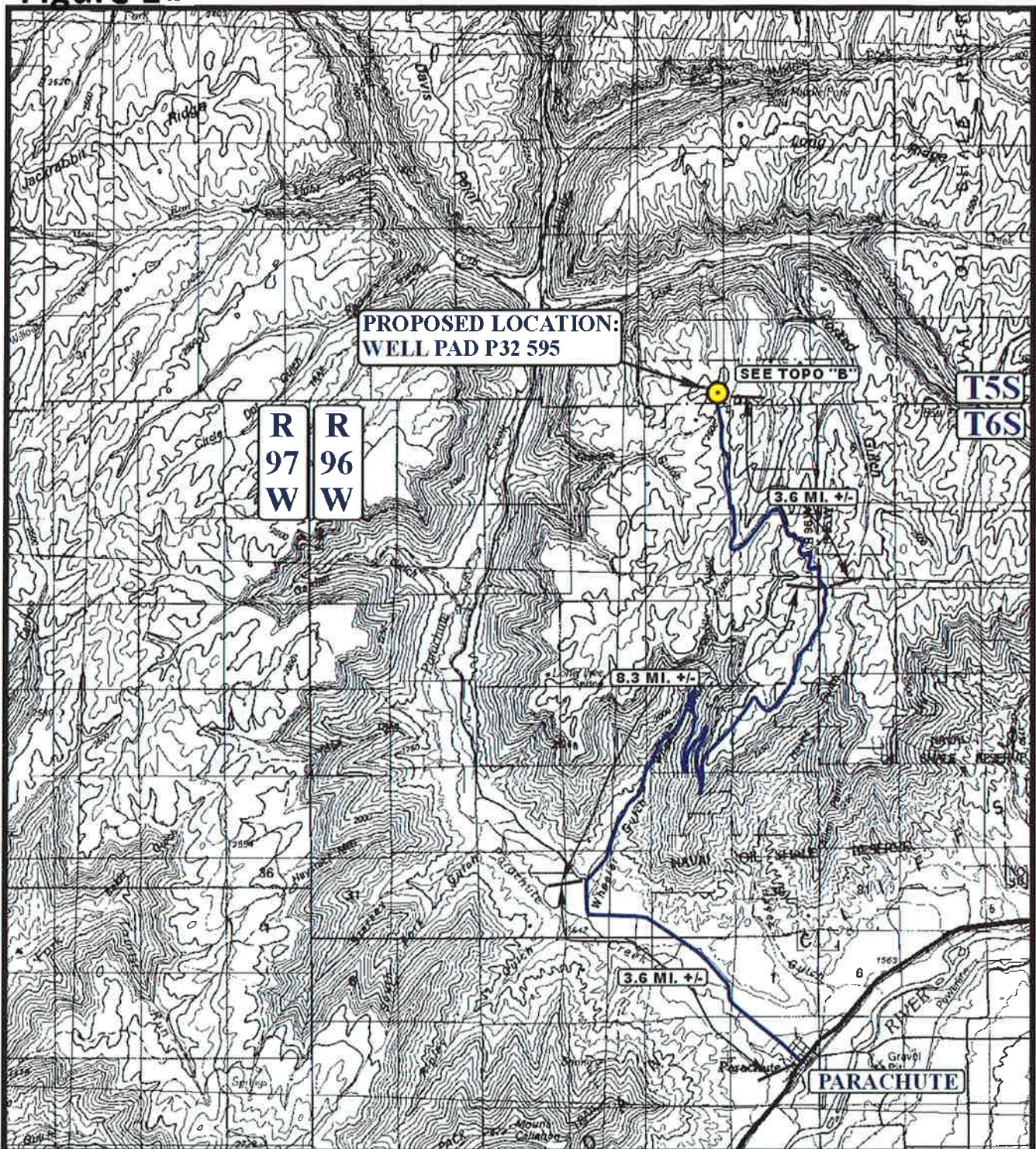


## FIGURES





**Figure 1b**



**LEGEND:**

**● PROPOSED LOCATION**

**BERRY PETROLEUM COMPANY**

**WELL PAD P32 595**  
**SECTION 32, T5S, R95W, 6th P.M.**  
**SE 1/4 SE 1/4**

**SHEET 10 of 12**



**Uintah Engineering & Land Surveying**  
**85 South 200 East Vernal, Utah 84078**  
**(435) 789-1017 \* FAX (435) 789-1813**



**ACCESS ROAD**  
**MAP**

**09 15 06**  
**MONTH DAY YEAR**



**SCALE: 1:100,000** **DRAWN BY: S.L.** **REV: 03-23-09 Z.L.**





U.S. DEPARTMENT OF THE INTERIOR  
U.S. GEOLOGICAL SURVEY



FORKED GULLY QUADRANGLE  
COLORADO  
7.5-MINUTE SERIES



Published by the United States Geological Survey  
North American Datum of 1983 (NAD83)  
Horizontal datum: North American Datum of 1983 (NAD83)  
Vertical datum: National Geodetic Vertical Datum of 1988 (NGVD 88)  
Projection: Universal Transverse Mercator (UTM)  
Zone: 12N  
Units: Meters

Map Scale: 1:24,000  
Scale: 1 inch = 2,000 feet  
Scale: 1 centimeter = 200 meters



SCALE 1:24,000  
1 inch = 2,000 feet  
1 centimeter = 200 meters

COMPASS INFORMATION: NO MAGNETIC DECLINATION  
NORTH ARROW: AN ISOTROPIC DECLINATION OF 0.000  
This map was produced in accordance with section 5.3.1.1 of the  
2010 USGS Standards for 7.5-Minute Digital Data Files.  
A coordinate file is provided with this product to assist users in  
converting the map coordinates to UTM coordinates.

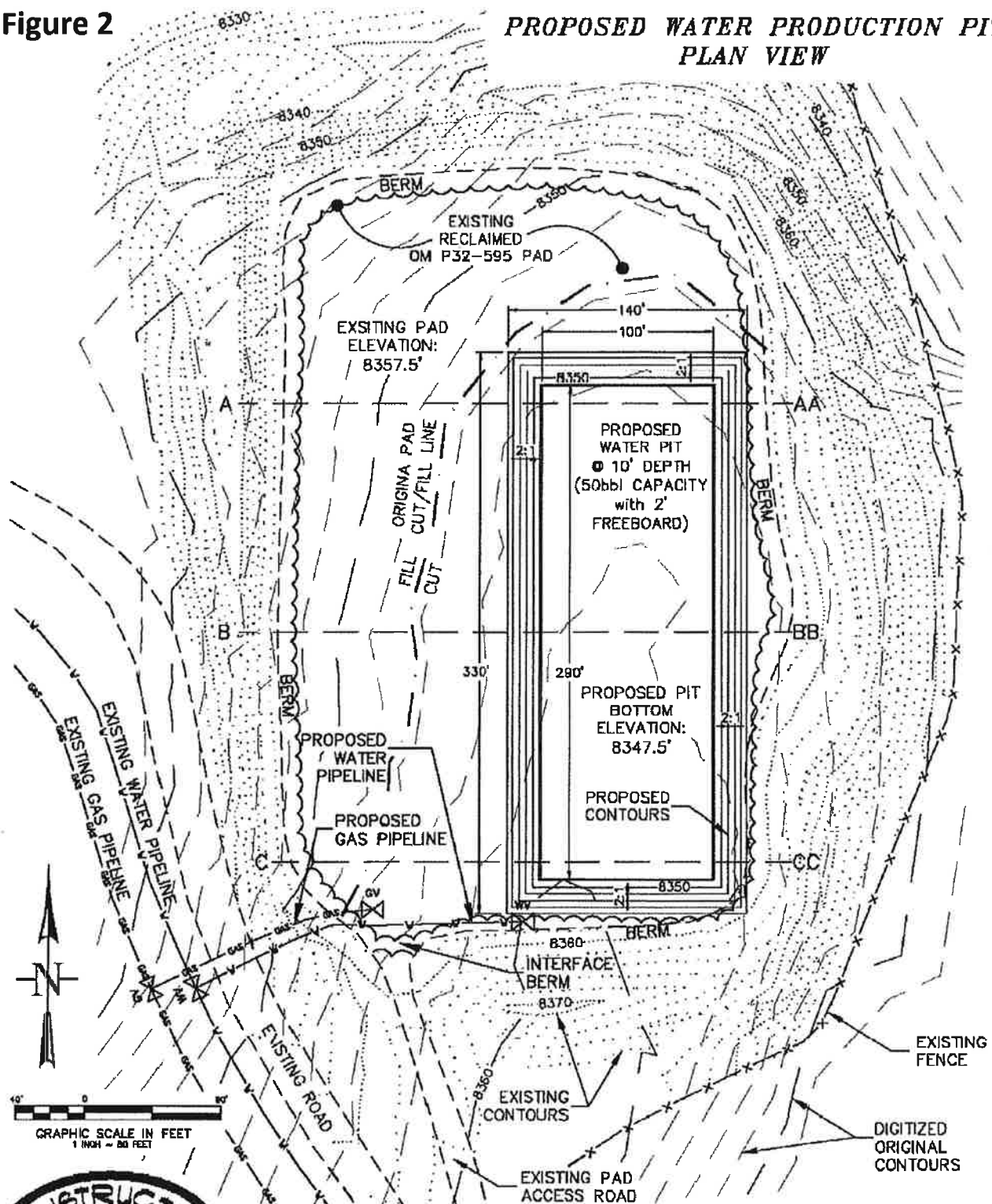


Legend  
Roads: National Highway, State Road, Local Road  
Rivers: River, Stream, Creek  
Other: Contour, Spot Elevation, Boundary

Figure 1c.  
★ indicates location of proposed project  
FORKED GULLY, CO  
2010

**Figure 2**

**PROPOSED WATER PRODUCTION PIT  
PLAN VIEW**



CONSTRUCTION SURVEYS, INC. Old Mountain P32-595  
 2012 SUNRISE BLVD. 6E1/4 6E1/4, SECTION 32, T. 5 S., R. 95 W.  
 BILT, CO 81652 BERRY PETROLEUM COMPANY  
 (970)876-5753

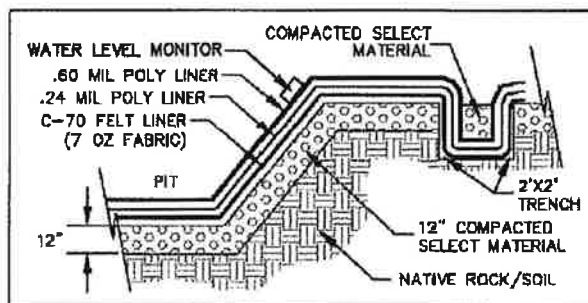
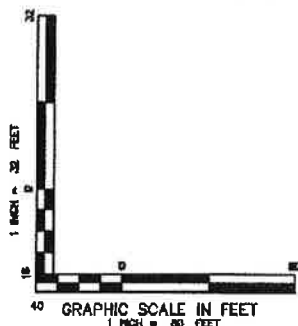
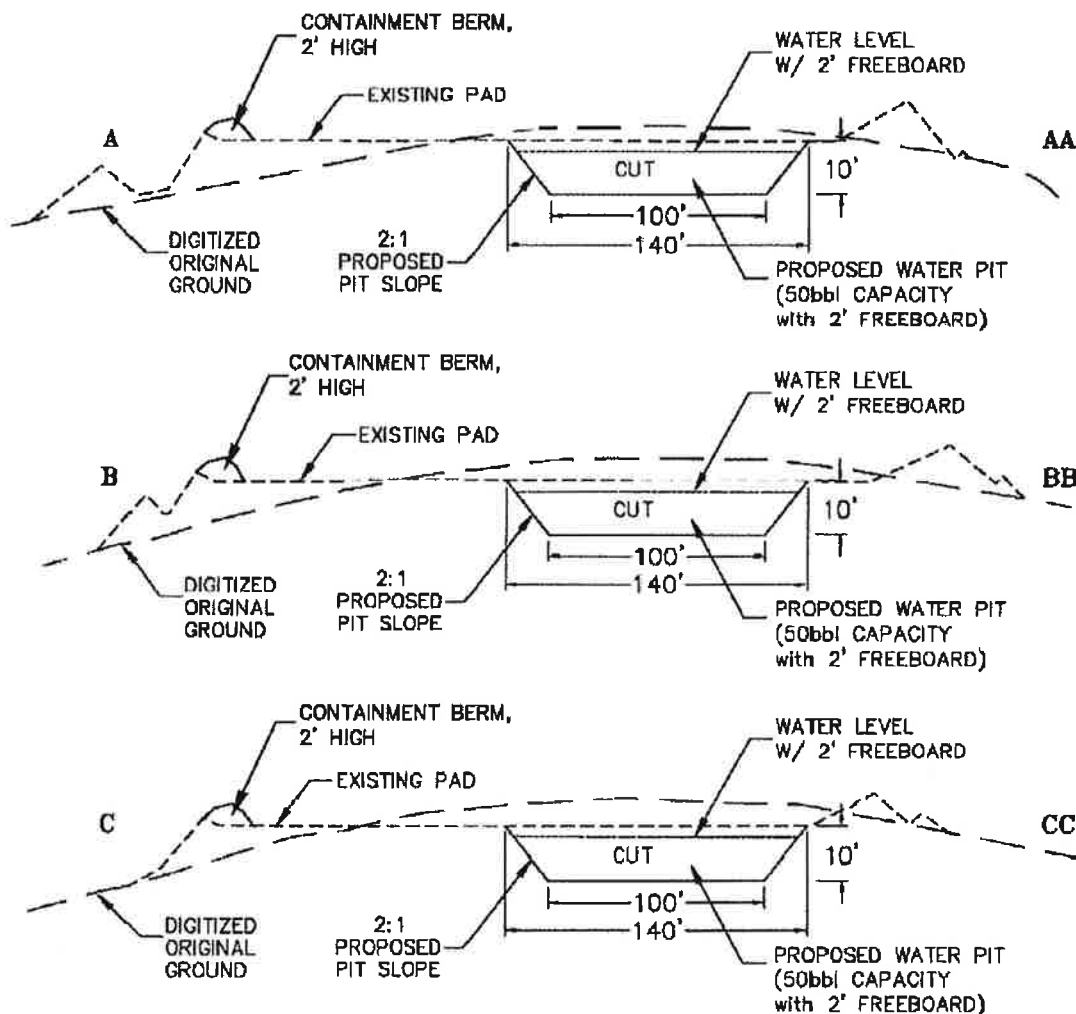
DATE: 05/03/12

SHEET: 1 OF 2



**Figure 3**

**PROPOSED WATER PRODUCTION PIT  
X-SECTIONS**



N.T.S.

**CLOSE UP X-SECTION VIEW OF BERRY TYPICAL DESIGN**

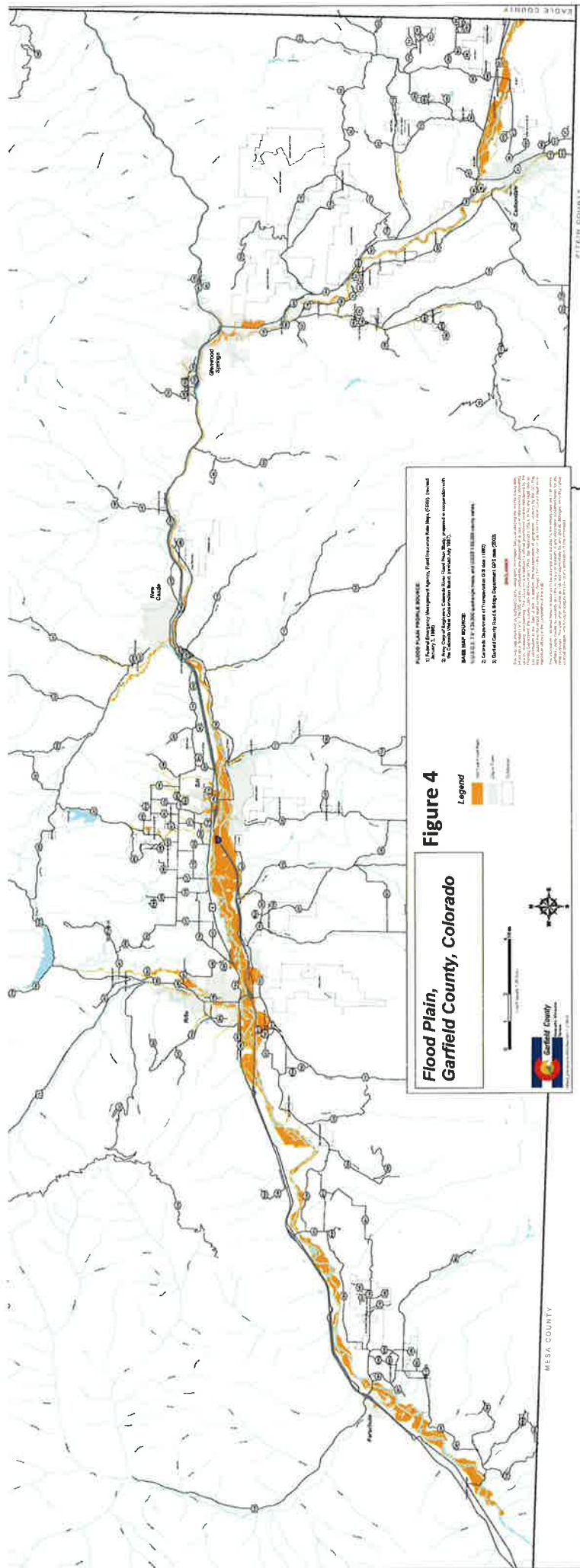


**CONSTRUCTION SURVEYS, INC.** Old Mountain P32-595  
0012 SUNRISE BLVD.  
SILT, CO 81652  
(970)876-5753

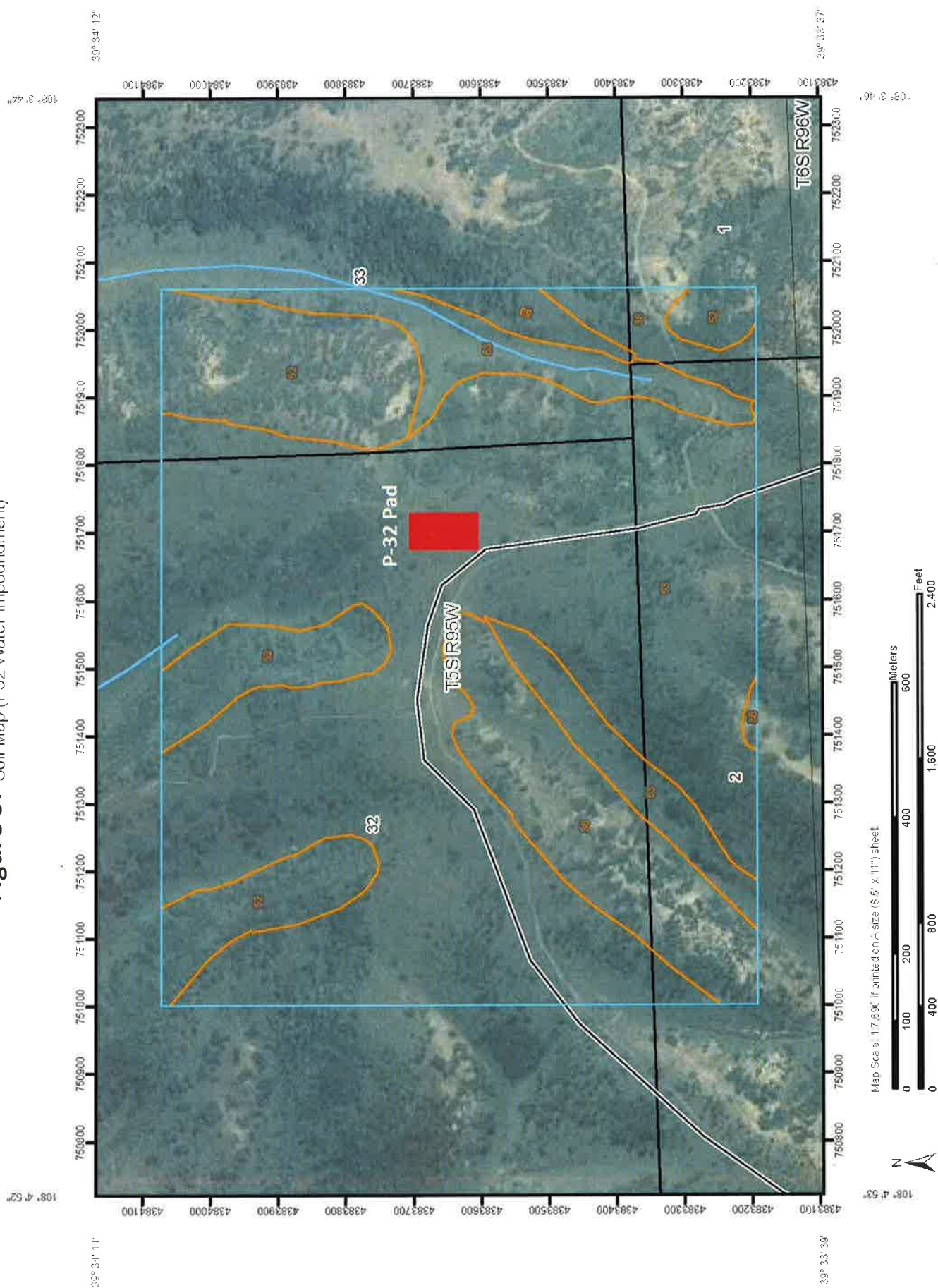
**BERRY PETROLEUM COMPANY**  
8 1/4 S 1/4, SECTION 32, T. 5 S., R. 95 W.

DATE: 05/03/12

SHEET: 2 OF 2



Custom Soil Resource Report  
**Figure 5:** Soil Map (P32 Water Impoundment)



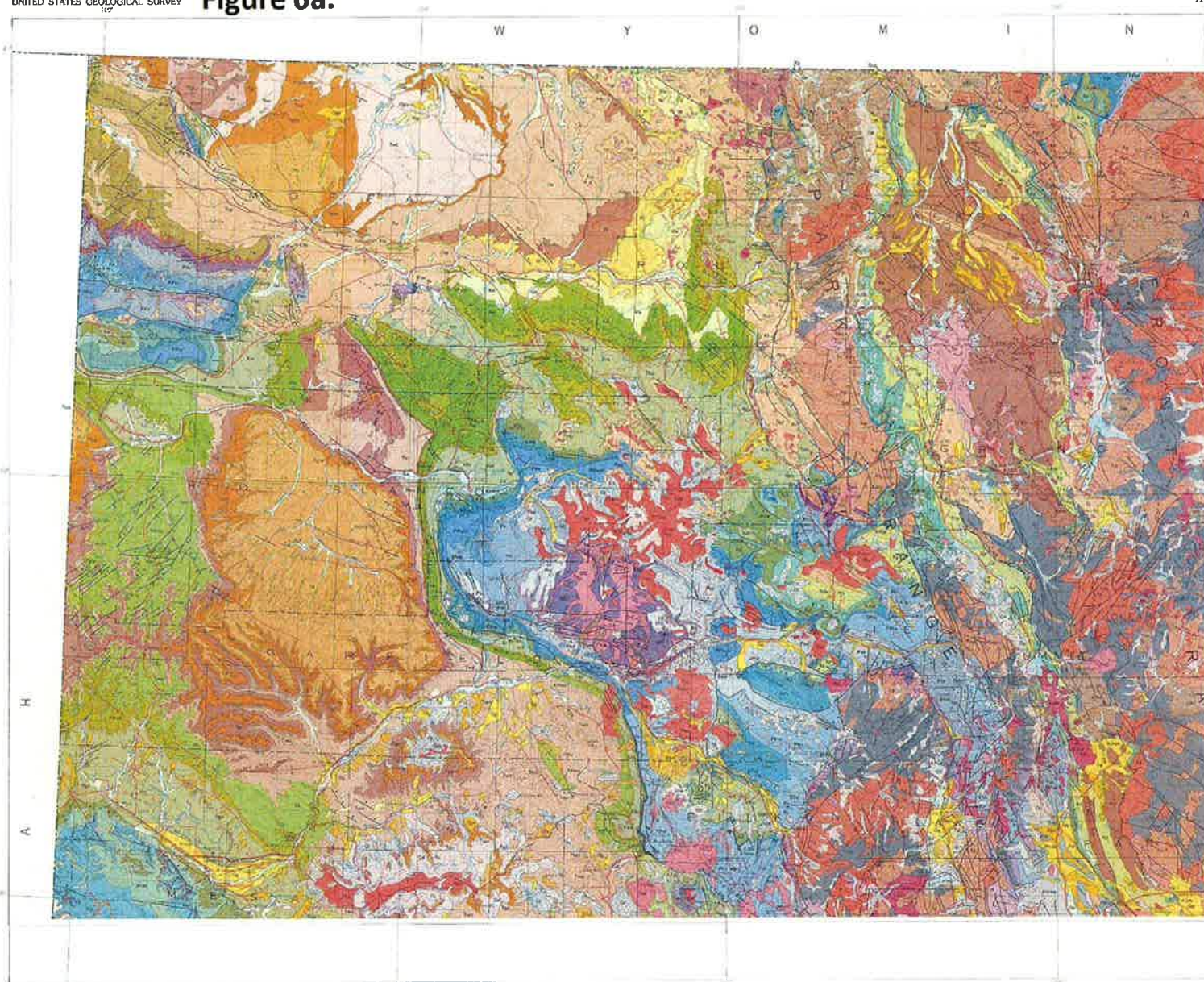
## Map Unit Legend

Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)				
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI	
36	high channery loam, 9 to 50 percent slopes	68.5	20.5%	
52	Parachute loam, 25 to 65 percent slopes	42.9	13.2%	
53	Parachute-Rhine loams, 5 to 30 percent slopes	190.7	58.7%	
63	Silt loam, 3 to 12 percent slopes	24.7	7.6%	
Totals for Area of Interest		324.7	100.0%	

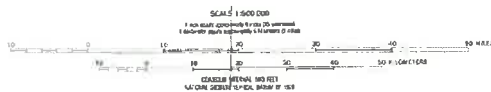


Figure 6a.

TH



Base from U.S. Geological Survey, 1968  
Lithologic symbols and colors based on standard practice 1974 and 1977



UNITED STATES GEOLOGICAL SURVEY  
Geological Survey of the United States



## GEOLOGIC MAP OF COLORADO

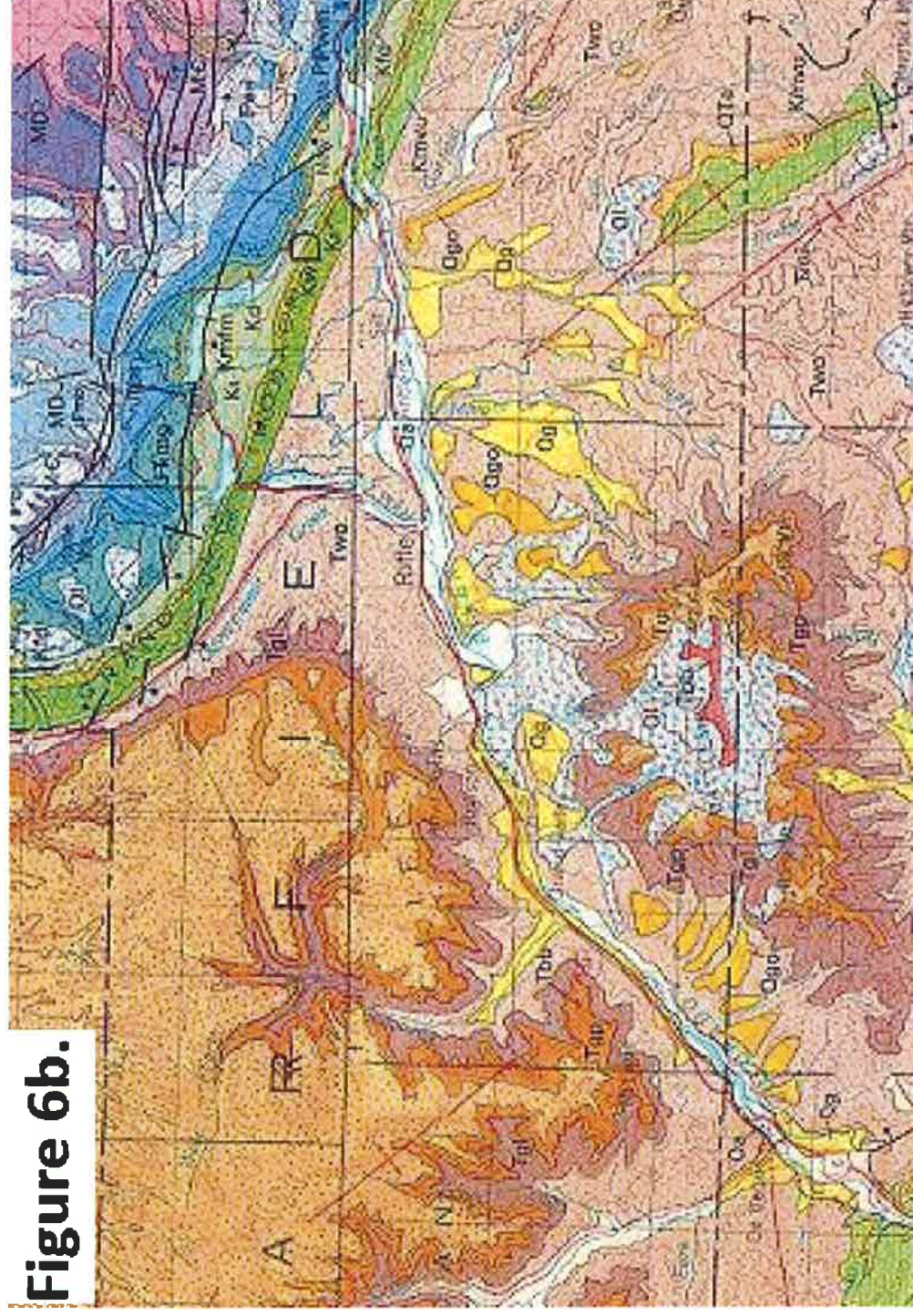
Compiled by Ogden Tweto

1979

U.S. GEOLOGICAL SURVEY  
BULLETIN 1462-A



**Figure 6b.**



**Figure 6c.**

<b>Value</b>	<b>Definition</b>
Qa	Modern alluvium
Qg	Gravels and alluviums (Pinedale and Bull Lake age)
Qgo	Older gravels and alluviums (Pre-Bull Lake age)
Qe	Eolian deposits (Quaternary)
Qeo	Older eolian deposits (Quaternary)
Qd	Glacial drift of Pinedale and Bull Lake glaciations
Qdo	Older glacial drift (Pre-Bull Lake age)
Qb	Basalt Flows (Age <1.8 M.Y.)
QTsa	Unclassified surficial deposits and underlying Alamosa Formation
QTa	Ancient Alluvium
To	Ogallala Formation
Tgv	Bouldery gravel on old erosion surfaces in front range and never summer mountains
Ta	Arikaree formation
Twr	White river formation or group
Th	Huerfano formation
Tcu	Cuchara formation
Tpc	Poison canyon formation
Tdu	Upper part of Dawson arkose
Tbp	Browns park formation
Tt	Troublesome formation
Tnp	North park formation
Tos	Oligocene sedimentary rocks
Tu	Uinta formation
Tb	Bridger formation
Tg	Green river formation
Tfp	Parachute creek memeber - Green river formation
Tgl	Lower part - Green river formation
Tglm	Laney member - Green river formation
Tgt	Tipton tongue - Green river formation
Tglu	Luman tongue - Green River formation
Tglw	Lower part of Green river formation
Tw	Wasatch formation
Twc	Cathedral bluffs tongue - Wasatch formation
Twn	Niland tongue - Wasatch formation
Two	Wasatch formation and Ohio creek formation
Tf	Fort union formation
Tc	Coalmont formation
Tm	Middle park formation exclusive of windy gap member
Td	Dry union formation
Ts	Santa Fe formation
Tos	Oligocene sedimentary rocks
Te	Eocene prevolcanic sedimentary rocks
Tsp	South park formation
Tlp	Los Pinos formation
Tsj	San Jose formation
Tn	Nacimiento formation
Tbb	Basalt flows and associated tuff, breccia, and conglomerate of late-volcanic bimodal suite
Tbbi	Basaltic intrusive rocks related to basalt flows
Tbr	Rhyolitic intrusive rocks and flows of late-volcanic bimodal suite
Tbrt	Ash-flow tuff of late-volcanic bimodal suite
Taf	Ash-flow tuff of main volcanic sequence
Tial	Intra-ash flow andesitic lavas
Tiql	Intra-ash-flow quartz latitic lavas
Tpl	Pre-ash-flow andesitic lavas, breccians, tuffs, and conglomerates

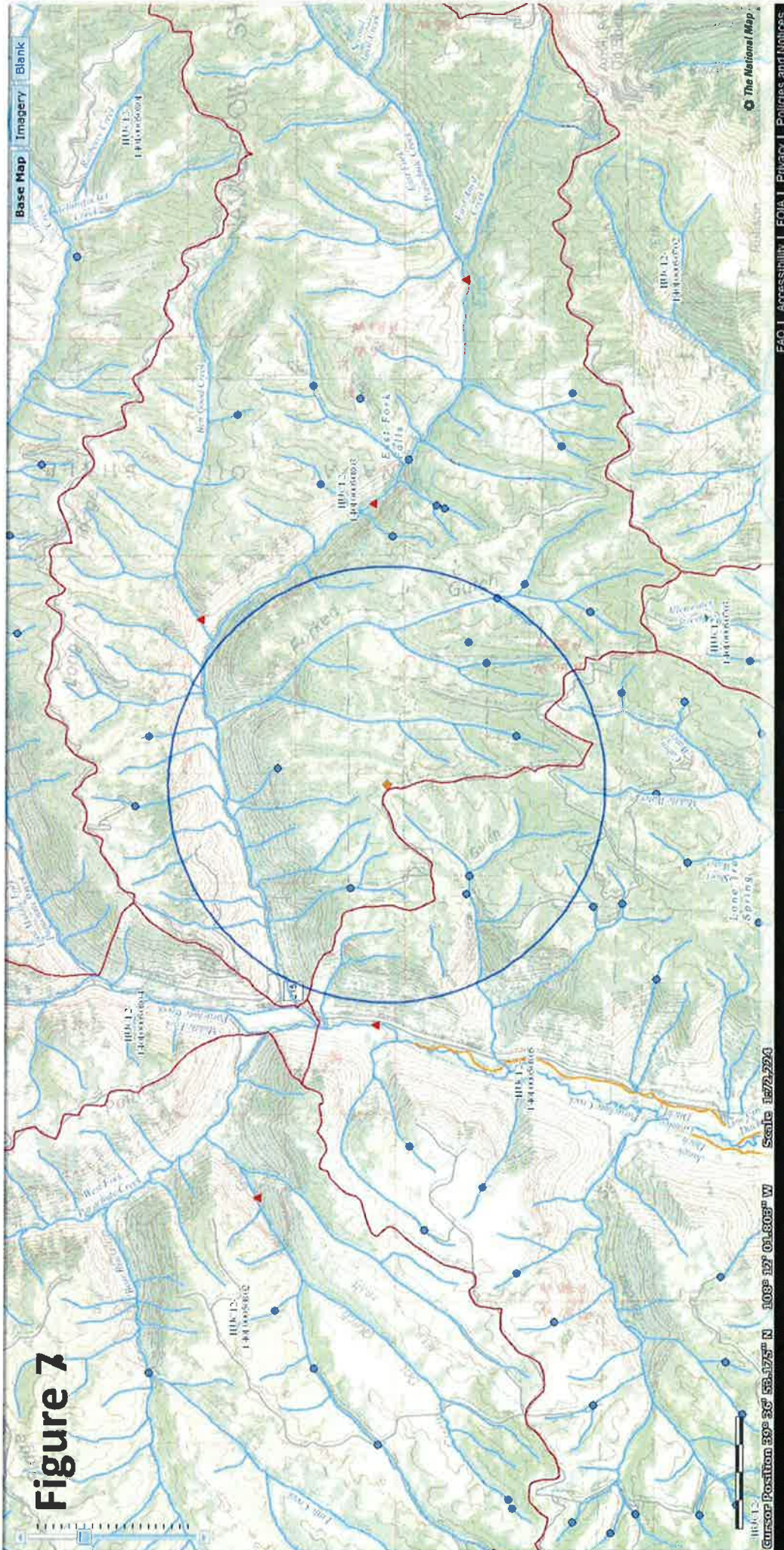
Twm	Wall mountain tuff
Tv	Volcanic rocks in northwestern Colorado
Tui	Upper Tertiary intrusive rocks
Tmi	Middle tertiary intrusive rocks
TKda	Denver and Arapahoe formations
Tdv	Basaltic flows in Denver formation near Golden
TKdl	Denver formation or lower part of Dawson arkose
TKr	Raton formation
TKa	Animas formation
TKec	Telluride conglomerate of Eocene prevolcanic sedimentary rocks and Cimarron ridge formation
TKi	Laramide intrusive rocks
Kl	Laramie formation
Kf	Fox hills sandstone
Klf	Laramie formation and fox hills sandstone
Kvt	Vermejo formation and Trinidad sandstone
Kp	Perre shale, undivided
Kpu	Upper unit - Pierre shale
Kpl	Lower unit - Pierre shale
Kn	Niobrara formation
Kcg	Carlile shale, greenhorn limestone, and graneros shale
Kc	Colorado group
Kpg	Pierre shale, Niobrara, and Carlile, Greenhorn, and Graneros formations, undivided
Kdp	Dakota sandstone and Purgatoire formation
Kd	Dakota sandstone or group
Kl	Lance formation
Kmv	Windy gap memeber
Kls	Lewis shale
Kmv	Mesaverde formation, undivided
Kmvu	Upper part - Mesaverde group
Kmvl	Lower part - Mesaverde group
Kw	Williams fork formation
Ki	Iles formation
Ksc	Sego sandstone, Buck tongue of Mancos shale, and Castlegate sandstone
Kh	Hunter canyon formation
Kmgs	Mount Garfield formation and Sego sandstone
Km	Mancos shale
Kmfm	Frontier sandstone and Mowry shale members and intervening shale zone
Kfd	Frontier sandstone and Mowry shale members of Mancos shale and Dakota sandstone
Kdb	Dakota sandstone and Burro canyon formation
Kkf	Kirtland shale and Fruitland formation
Kpcl	Pictured cliffs sandstone and Lewis shale
Kch	Cliff house sandstone
Kmp	Menefee formation and Point lookout sandstone
KJdm	Dakota and Morrison formations
KJdj	Dakota, Burro canyon, Morrison, and Junction creek formations
KJdw	Dakota, Burro Canyon, Morrison, and Wanakah formations
KJdr	Dakota group and Morrison and Ralston creek formations at mountain front between Boulder and C
KJde	Dakota and other formations depending on location
KJds	Dakota, Morrison, and Sundance formations
Jm	Morrison formation
Jmj	Morrison formation and Junction creek sandstone
Jmc	Morrison formation and curtis formation
Jmw	Morrison formation and Wanakah formation
Jmr	Morrison formation and Ralston creek formation
Jme	Morrison formation and Entrada sandstone



Jms	Morrison formation and Sundance formation
Jmse	Morrison formation, Summerville formation, and Entrada sandstone
Jmce	Morrison, Curtis, and Entrada formations
Jmre	Morrison, Ralston creek, and Entrada formations
Jmwe	Morrison, Wanakah, and Entrada formations
J@g	Glen canyon sandstone
J@gc	Glen canyon group and Chinle formation
J@mg	Morrison, Curtis, Entrada, and Glen canyon formations
J@mc	Morrison, Entrada, and Chinle formations
@kc	Kayenta formation, Wingate sandstone, and Chinle formation
@wc	Wingate sandstone and Chinle formation
@m	Moenkopi formation
@ch	Chugwater formation
@cc	Chinle and Chugwater formations
@c	Chinle formation
@d	Dolores formation
@dg	Dockum group
@Pl	Lykins formation
@Ps	State bridge formation
@Pl	Lykins formation and Lyons sandstone
@Pjs	Jelm, Lykins, Lyons, and Satanka formations
@Pcs	Chinle and State bridge formations
@Pcp	Chinle, Moenkopi, and Park City formations
@Pr	Triassic and Permian rocks
@Pdc	Dolores formation and Cutler formation
@Pmc	Moenkopi formation and Cutler formation
@&lf	Lykins, Lyons, and Fountain formations
Pp	Park city formation
Pu	Upper Permian rocks, undivided
Pc	Cutler formation
Mz	Mesozoic rocks
MzPz	Mesozoic and Paleozoic rocks
P&f	Fountain formation
P&cf	Casper formation and Lower part of Fountain formation
P&if	Ingleside formation and Fountain formation
P&s	Sangre de Cristo formation
P&m	Maroon formation
P&w	Weber sandstone
P&wm	Weber sandstone and Maroon formation
&m	Minturn formation in west-central and south-central and other units of middle Pennsylvanian age
&b	Belden formation
&mb	Minturn and Belden formations
&ee	Evaporitic facies
&mbe	Evaporitic facies of Minturn and Belden formations in South Park and southward
&h	Hermosa formation
&rh	Rico and Hermosa formations
&mr	Morgan formation and Round Valley limestone
M	Leadville limestone, Williams canyon limestone, Manitou limestone, and Sawatch quartzite
MDO	Leadville limestone, Williams canyon limestone, and one or more Ordovician formations
DO	Williams canyon limestone, Manitou Limestone, and Sawatch quartzite
O	Manitou limestone and Sawatch quartzite
Or	One or more Ordovician formations
MD	Leadville limestone, Gilman sandstone, Dyer dolomite, and parting formation
MD	Leadville, Gilman, Dyer, Parting, and Sawatch formations
DO	Parting, Fremont, and Harding formations

s	Sawatch quartzite
Mm	Madison limestone
_l	Lodore formation
M_ml	Madison limestone and Lodore formation
Md_	Leadville Limestone, Ouray Limestone, Elbert formation, and Ignacio quartzite
_am	Alkaline and mafic intrusive rocks in small plutons, and diabase dikes
Yu	Uinta mountain group
YXu	Uncompahgre formation
Xb	Biotitic gneiss, schist, and migmatite
Xfh	Felsic and hornblende gneiss
Xq	Quartzite, conglomerate, and interlayered mica schist
Wr	Red creek quartzite
Yp	Rocks of Pikes peak batholith
Yg	Granitic rocks of 1,400-M.Y. age group
Yam	Alkaline and mafic rocks in small plutons, and diabase and gabbro dikes
Xg	Granitic rocks of 1,700-M.Y. age group
Xm	Mafic rocks of 1,700-M.Y. age group
YXg	Granitic rocks of 1,400- and 1,700-M.Y. age groups



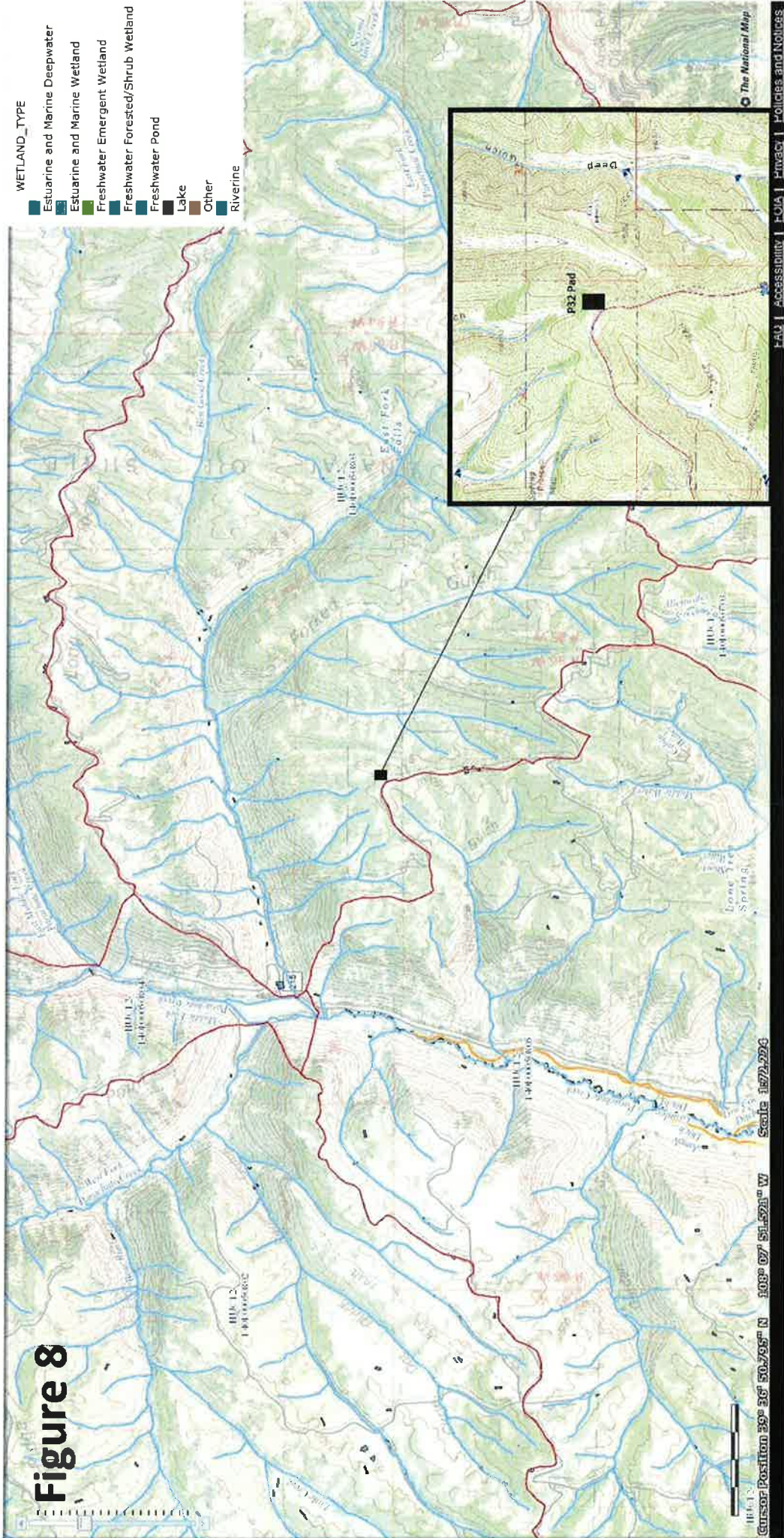


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The National Map

Cursor Position 39° 30' 53.175" N 108° 12' 01.805" W Scale 1:272,293

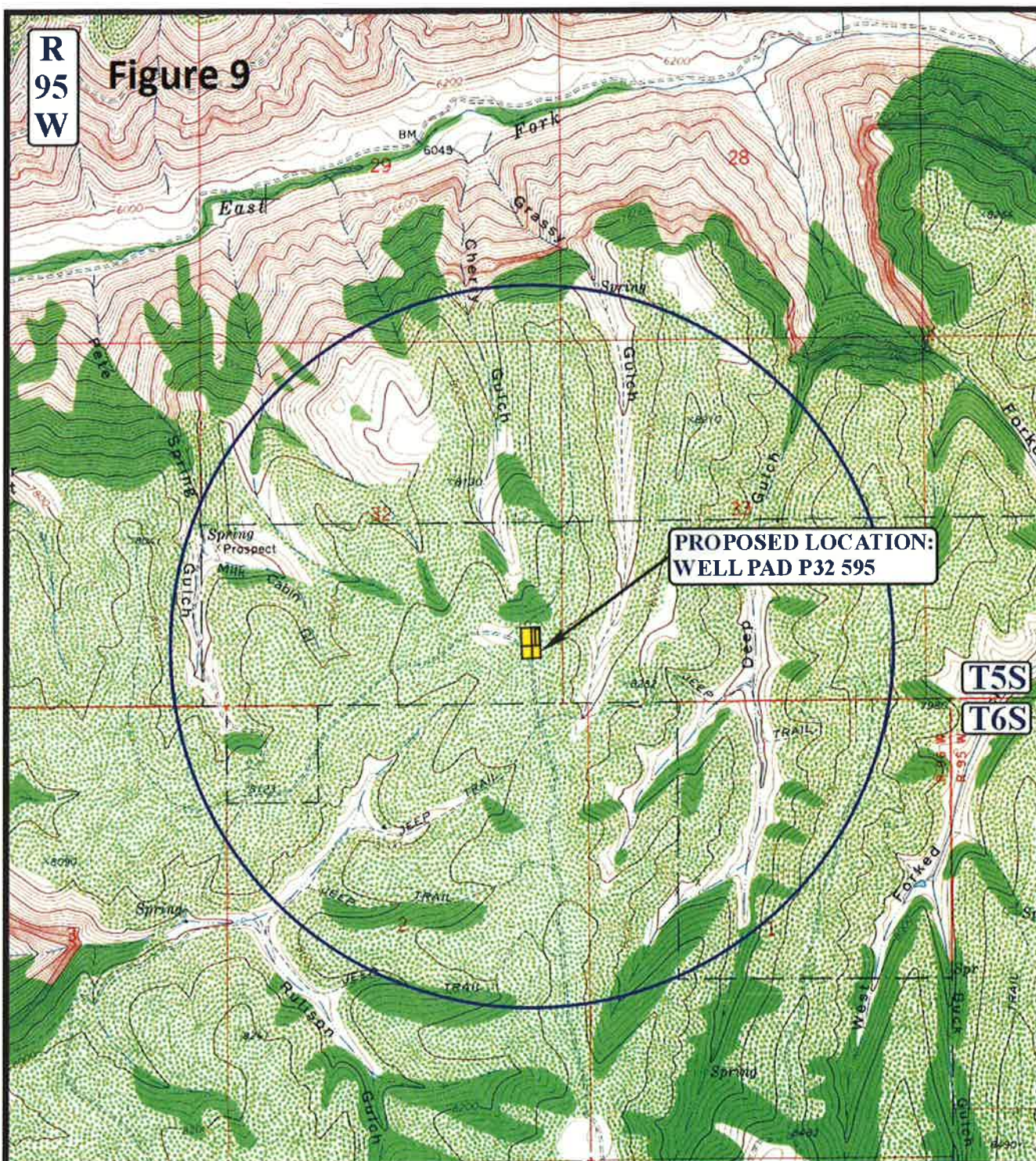






R  
95  
W

Figure 9



**LEGEND:**

- |                   |                         |
|-------------------|-------------------------|
| ⊗ DISPOSAL WELLS  | ⊗ WATER WELLS           |
| ● PRODUCING WELLS | ⊗ ABANDONED WELLS       |
| ⊙ SHUT IN WELLS   | ⊗ TEMPORARILY ABANDONED |



**BERRY PETROLEUM COMPANY**

**WELL PAD P32 595**  
**SECTION 32, T5S, R95W, 6th P.M.**  
**SE 1/4 SE 1/4** SHEET 11 of 12



Utah Engineering & Land Surveying  
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**TOPOGRAPHIC**  
**MAP**

**09** **15** **06**  
MONTH DAY YEAR

SCALE: 1" = 2000' DRAWN BY: S.L. REV: 03-23-09 Z.L.





# Figure 10

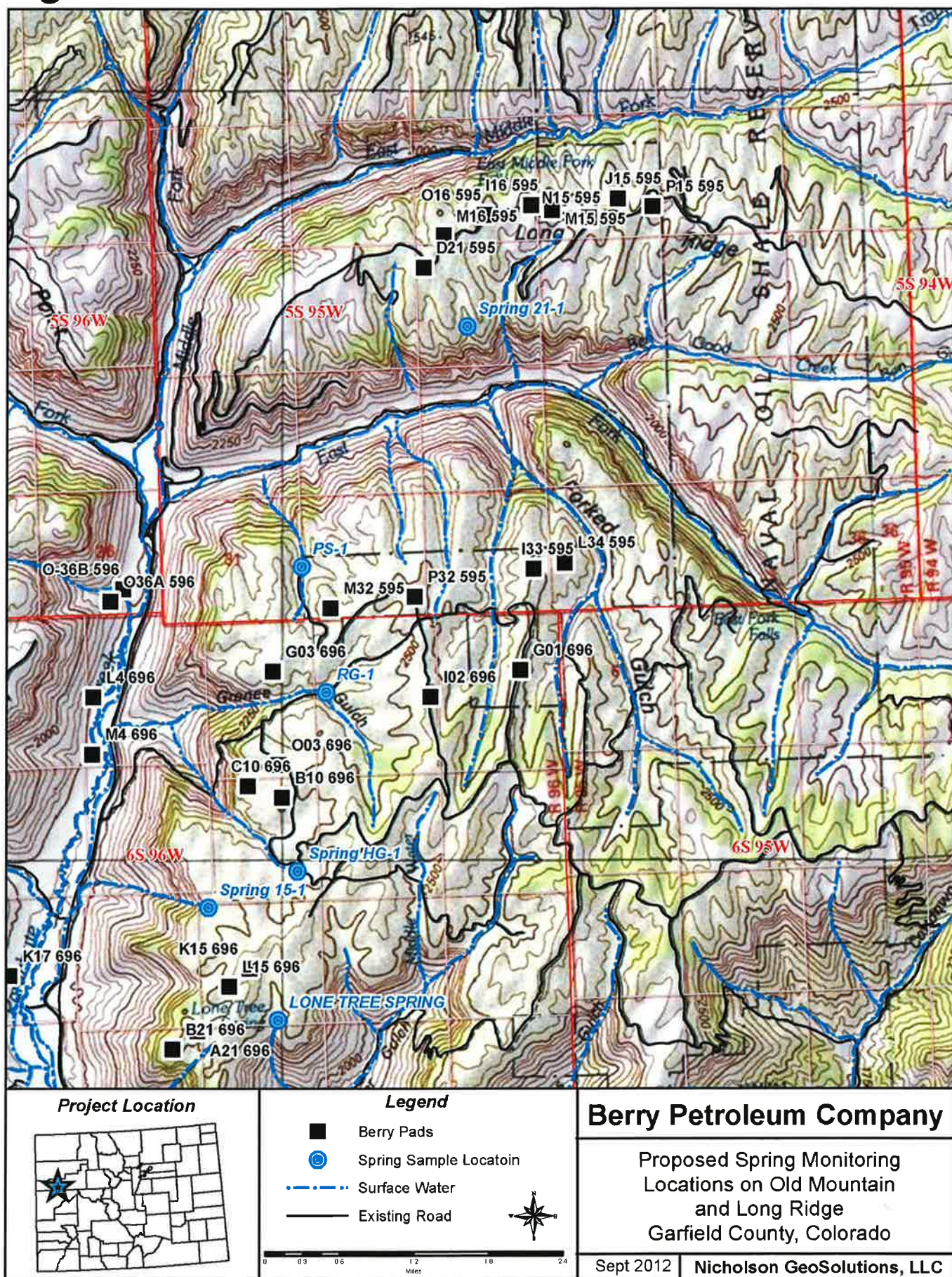




Figure 11

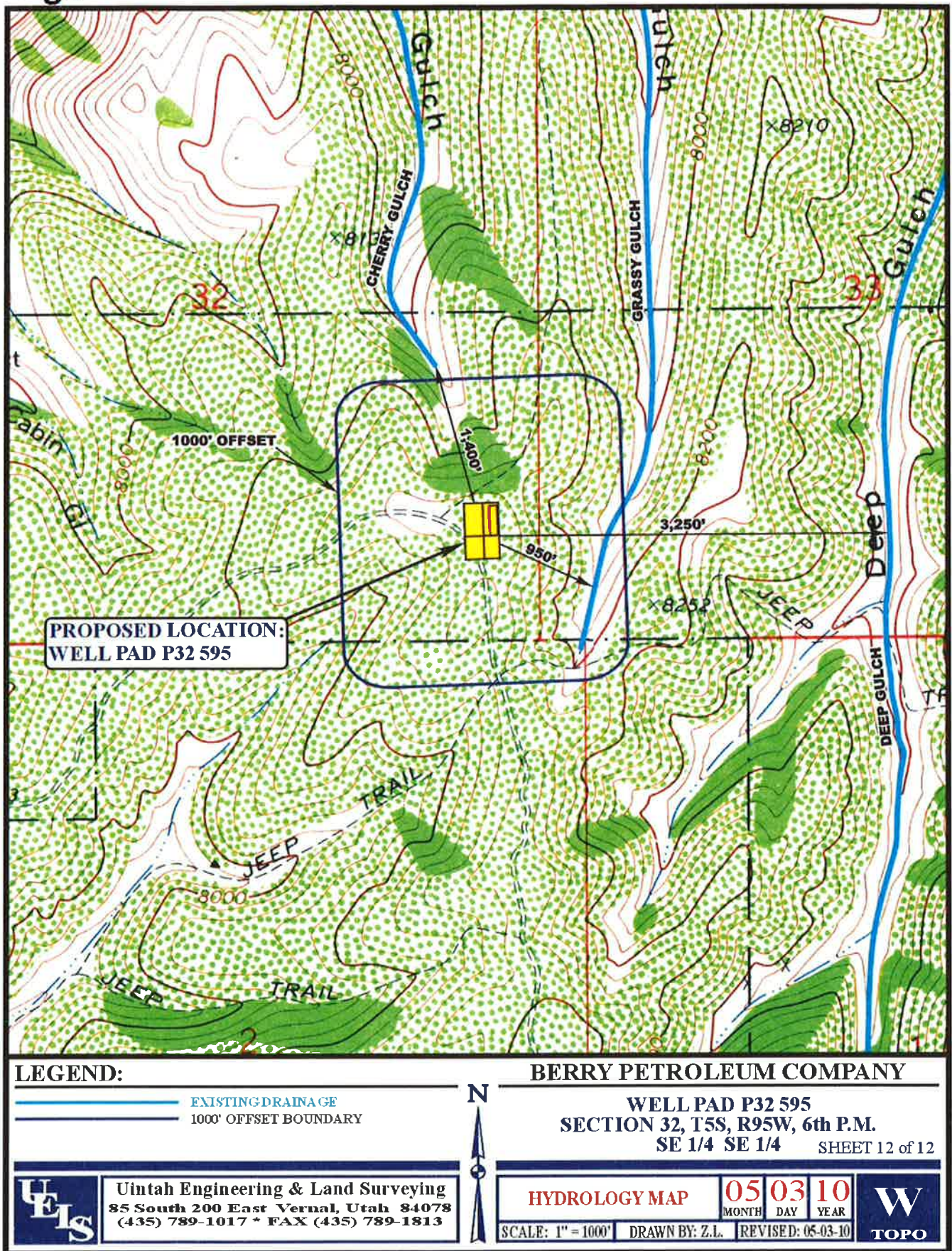
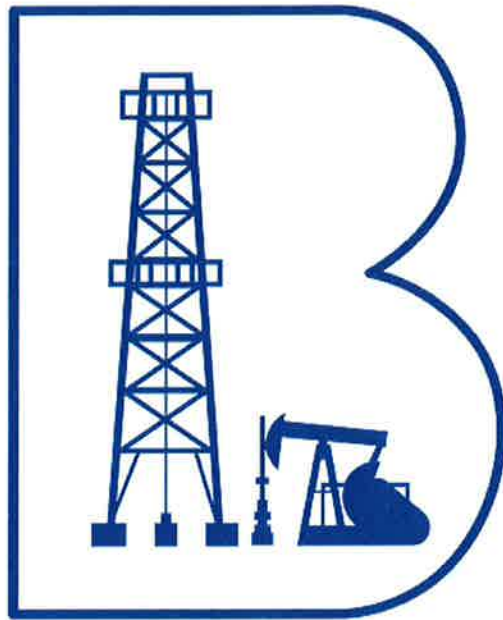




Figure 1.

Figure 1.								
Era	System	Series	Stratigraphic Unit	Thickness (feet)	Physical Description	Hydro-geologic Unit	Saturated Thickness (feet)	Hydrologic Characteristics
Cenozoic	Tertiary	Eocene	Uinta Formation	0–1,400	Silty sandstone, siltstone and marlstone	Upper Piceance Basin aquifer		Conductivity range <0.2 to >1.6 ft/day; yield 1 to 900 gpm; transmissivity 610–770 ft <sup>2</sup> /day  Conductivity range <0.1 to >1.2 ft/day; yield 1 to 1,000 gpm; transmissivity 260–380 ft <sup>2</sup> /d
			Green River Formation	As much as 5,000	<i>Parachute Creek Member</i> kergenuous, dolomitic marlstone and shale 500–1,800 ft	Mahogany confining unit		
					<i>Anvil Points Member</i> shale, fine-grained sandstone and marlstone 0–1,870 ft	Lower Piceance Basin aquifer		
					<i>Garden Gulch Member</i> claystone, siltstone, clay-rich oil shale and marlstone 0–900 ft	Confining unit		
					<i>Douglas Creek Member</i> siltstone, shale and channel sandstone 0–900 ft			
Mesozoic	Cretaceous	Paleocene	Wasatch Formation	About 5,000	Shale and lenticular sandstone	Fort Union aquifer		
			Fort Union Formation	Very thin	Coarse-grained sandstone			
		Mesaverde Group	Averages 3,000 may be >7,000	<i>Fox-Hills Sandstone</i> , <i>Lewis Shale</i> , <i>Williams Fork Formation</i> , <i>Iles Formation</i> ; sandstone interbedded shale and coal	Mesaverde aquifer	<500–2,000		
		Mancos Shale	More than 7,000	Mainly shale but Frontier Sandstone may be local aquifer	Mancos confining unit			

## **ATTACHMENT A**



# **Berry Petroleum Company**

## **Master Reclamation Plan**

### **Piceance Basin Operations**



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- 5.0 SITE STABILIZATION DURING CONSTRUCTION**
  - 5.1 Well Pad and Facility Site Construction**
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  - 5.3 Pipelines**
  - 5.4 Soil Salvage**
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## **1.0 INTRODUCTION**

Berry Petroleum Company (Berry) has prepared this Master Reclamation Plan to describe the various stages of the reclamation process at its well pad locations in its Piceance Basin natural gas fields, Garfield County, Colorado. In brief, the reclamation activities covered include preliminary planning, pad construction, soil salvage, soil stockpiling, backfilling and grading, re-topsoiling, soil amendments/fertilization, seeding, seed mixtures, Best Management Practices (BMPs), fencing, weed control, revegetation inspections and revegetation monitoring. The Plan covers all of Berry's well pads both in the bottom of Parachute Canyon and on the plateau tops to the east (Long Ridge and Old Mountain) and west (Garden Gulch).

It is important to note that all of Berry's well pads, roads, and pipelines are located on non-cropland areas. Accordingly, COGCC reclamation requirements that apply to cropland areas are not addressed in this Plan.

## **2.0 RECLAMATION OBJECTIVES**

In general, a successful reclamation program will accomplish the following primary objectives:

- The segregation and proper handling of undesirable materials (e.g., poor-quality subsoil, contaminated soil) to protect the reclaimed landscape from contamination and poor reclamation performance;
- Re-contouring and implementation of other soil conservation, surface manipulation, and water management techniques to establish stable slopes, water courses, and drainage features to minimize erosion and sedimentation;
- Revegetation of reclaimed areas to stabilize soils and establish a self-sustaining vegetation cover integrated with the surrounding ecosystems; and
- Minimization of visual contrasts to promote the long-term aesthetic quality of reclaimed sites and their surroundings.

The reclamation process in this Plan has been divided into four major phases: 1) pre-disturbance planning and site preparation, 2) site stabilization during well construction, 3) interim reclamation and monitoring, and 4) final reclamation and success monitoring.

By minimizing the amount of land disturbed through pre-disturbance planning and initially preparing the site for construction activities with the understanding that the area will eventually be reclaimed (e.g., topsoil stripping and stockpiling for later use during site reconstruction, minimizing cut-and-fill slopes, and disturbing as small an area as possible), the acreage requiring disturbance will be reduced and reclamation success will be facilitated.

Site stabilization during well construction consists of salvage of all usable topsoil and subsoil, immediate vegetation of all topsoil and subsoil stockpiles, and immediate stabilization of disturbed areas to control erosion and provide protection from adjacent undisturbed areas from

unnecessary degradation. Erosion will be considered controlled when water naturally infiltrates into the soil; gullyng, head cutting, or slumping is not observed; and rills are less than 6 inches deep. Specific measures to attain these goals are discussed in Section 6.5 (BMPs).

Interim reclamation involves the reclamation of those areas disturbed during well construction, but not needed during the production life of the well. These items consist of final grading, relieving of compaction, subsoil and topsoil replacement, seeding, mulching and fence installation to prevent future activity on the interim reclamation areas. Interim reclamation may also include roads leading to well sites. Depending on the location of the well pad, road, or pipeline, seeding will utilize either the valley bottom mix or the plateau mix to establish ground cover. These mixes are identified in Tables 6-1 and 6-2. Interim sites will be monitored for reclamation success on an annual basis. Interim reclamation shall occur no later than 12 months after completion the last well on a pad and will last for the life of well production.

Final reclamation includes the removal of all remaining production equipment, tanks and structures at the well pad after the wells have been plugged and abandoned, final backfilling of remaining disturbed areas, and revegetation of disturbed areas not reclaimed during interim reclamation. The same reclamation procedures described for interim reclamation will be employed. The seed mixes for final reclamation are the same as those for interim reclamation (Tables 6-1 and 6-2). Non-producing well locations and associated access roads would undergo final reclamation within 12-months after drilling ceases. Upon project completion, all disturbed areas except roads to be retained for other land uses will be reclaimed as designated by the landowner. Reclamation success monitoring involves assessing the status of reclaimed areas to ensure they meet desired site stability and productivity standards. Reclamation monitoring will include an evaluation of plant cover, density, and diversity as well as erosion and weed control. Given the reclamation objectives of providing vegetation that is integrated with the surrounding ecosystems and minimization of long-term visual impacts, revegetation will be expected to contain a diverse mixture of grasses, forbs, and shrubs as described in Tables 6-1 and 6-2.

### **3.0 AFFECTED PLANT COMMUNITIES AND SOILS**

#### **3.1 Plant Communities in the Project Area**

There are two distinct geographic areas where Berry Petroleum Company's well pads are located in Garfield County: well pads in the valley bottom of Parachute Canyon, and well pad locations on top of the plateaus east and west of the canyon. Each of these geographic areas has its own vegetative communities and soil characteristics.

On the valley bottom of Parachute Canyon, the predominate plant community that is present at Berry's well pad locations is the steep-slope xeric shrub. The steep-slope xeric shrub community contains primarily warm weather annual grasses, rabbitbrush, and some antelope bitterbrush.

On the plateau tops, the predominate plant communities are sagebrush-shrub and mountain shrub, with scattered aspen woodlands in the north-facing drainages. In general, the sagebrush-shrub community is present along the open ridge tops. The mountain shrub community is found on other ridge tops and on virtually all of the side slopes. Vegetative cover is moderate to dense



in many portions of the plateau areas, and consists of grasses and sagebrush in the more open areas and serviceberry, snowberry, and chokecherry in the mountain shrub areas. Some Gambel oak brush woodlands are also present on the plateau top. As mentioned previously, groves of quaking aspen are present in the wetter, north-facing drainages.

### **3.2 Soils in the Project Area**

The soils in the bottom of Parachute Canyon/Grand Valley tend to be shallow soils derived from alluvial and colluvial material. Restrictive features for plant growth result from high coarse fragment content, alkalinity, lack of carbonaceous material and poor soil texture. Existing sparse vegetative cover and the lack of desirable plant species in undisturbed areas reflects the shallow nature of in-situ soils. In some cases, overgrazing has enhanced the presence of invasive species (noxious weeds). For Berry Petroleum Company, the bottom lands of the parachute Canyon/Grand Valley make up a very small minority of the company's total leased area. A total of just 7 well pads will be constructed in the valley bottom.

The soils of the plateau areas adjacent to Parachute Canyon, which make up the vast majority of Berry's leasehold, tend to be loamy and well-drained. They are generally derived from parent material consisting of marl and/or weathered sandstone. Soil depths range from 5 inches on the ridge tops, to as much as 60 inches in swales. The loamy soil types present on the plateaus, combined with greater amounts of annual precipitation, provide for denser vegetation growth than in the valley bottom.

## **4.0 PREDISTURBANCE INVENTORY AND SITE PLANNING**

Berry personnel and their reclamation contractors will review locations of well pads, access roads, and pipelines prior to actual construction activities. The following items will be evaluated and/or inventoried.

- Suitability of slopes steeper than 2:1 for construction activities with special erosion control and slope stability measures as needed.
- Evaluation of true riparian/wetland areas for exclusion from construction disturbance vs. fringe areas that can be properly reclaimed without long-term damage to true wetlands and as agreed to by land owners.
- Identify an appropriate buffer from intermittent and ephemeral streams.
- Inventory any noxious weeds listed in the Colorado Noxious Weed Act (Colorado Department of Agriculture, 1996) and Garfield County Noxious Weed Management Plan (Garfield County Vegetation Management, 2000).
- Prepare a preliminary list of BMPs to be utilized during construction and as a part of interim reclamation efforts. The list of actual BMPs may be refined immediately prior to completion of construction activities.

## **5.0 SITE STABILIZATION DURING AND AFTER CONSTRUCTION**

A comprehensive description of site stabilization and erosion control techniques is described in each of the following sections of this Plan.

### **5.1 Well Pad and Facility Site Construction**

Prior to construction, proposed pad and facility site locations will be surveyed and staked. Locations will be designed to parallel the contour in most cases with reserve pits on the uphill/"cut" side of pads whenever possible. Well pads will be designed and constructed to disturb the smallest area necessary to provide for efficient and safe operations.

Excess cut material will be incorporated into fill slopes or placed in designated areas and stabilized. Backsloping will be necessary only in areas of steep terrain (>3:1 slopes). This material shall be utilized during the reclamation process.

During construction, interceptor ditches will be installed above cuts and around reserve pits, as necessary. Collector ditches and sediment control structures constructed for a storm event will be installed below fill areas. Smaller flows will be diverted and/or collected before being discharged from the disturbed area. Qualified personnel will supervise the installation of all erosion control structures, including berms, dikes and trenches.

### **5.2 Roads**

New roads generally will follow natural contours and will be constructed in accordance with industry road standards. For roads on slopes of less than 15%, available strippable/useable topsoil will be stripped from the construction area and placed in windrows within the construction ROW by side casting with a grader. Where roads must be constructed on slopes greater than 15%, and significant topsoil is present, topsoil will be transported to a more level terrain for storage. After road construction, strippable/useable topsoil, if any, will be replaced on road cut and fill slopes, and these areas will be reseeded, as described in Section 6.0.

### **5.3 Pipelines**

When constructing and reclaiming pipelines, existing crowned-and-ditched roads will be used for access, where practical, to minimize surface disturbance. Pipeline trenches will not be placed in access road borrow ditches unless other reasonable locations are unavailable. Gathering pipelines may be installed on the surface in areas where slopes are greater than 25% and/or where rock outcrops are crossed; when possible, they will be built perpendicular to the contour to minimize the area required for construction.

Vegetation will be removed from pipeline ROWs so as to leave the root systems intact and the removed vegetation will be spread over disturbed areas to provide protection, nutrient recycling, and a natural seed source. If pipelines are trenched rather than plowed in, trenches will be excavated with a backhoe to minimize disturbance.

Frozen soils, vegetation, and snow will not be used to backfill pipeline trenches. This action will reduce trench compaction needs. In no event will backfill berms in excess of 6 inches in height be placed over backfilled trenches.

Construction of pipelines in wetlands will comply with U.S. Army Corps of Engineers (COE) permit requirements. Silt fences or other sediment control devices will also be installed along channel banks where sedimentation is excessive and at the bases of slopes adjacent to wetland/riparian areas (as necessary to control sediment).

Temporary sediment barriers will remain in place until final revegetation measures have been successfully implemented.

#### **5.4 Soil Salvage**

Site-specific topsoil salvage will range from 0" to 12" based on observed topsoil depth. Research indicates that it is better to replace a shallower layer of topsoil than to co-mingle it with deeper subsoil with undesirable physical and chemical properties.

Any surplus topsoil material that is generated during the topsoil stripping operation will be stockpiled in a safe location on the property from which it was taken and utilized for other well site reclamation activities where a deficiency may exist. A deficiency in topsoil cover is defined as less than 3 inches of suitable un-amended topsoil.

Care will be taken to avoid stripping soils with coarse fragments greater than 35% in volume as severe rooting restrictions may result in areas containing higher amounts of rock fragments. If high coarse fragments are encountered, Berry's reclamation contractor may recommend rock picking, rock screening, or import of topsoil material. Screened or picked rock material will be buried in cuts, or placed deep enough below the soil surface to avoid rooting restrictions for reclamation efforts.

Alternate site preparation procedures may be applied in some areas to facilitate reclamation; however, it is assumed that most, if not all, of these areas can be avoided. In potential wetland areas, vegetation will be cut to ground level, leaving existing root systems intact. Grading activities will be limited to areas directly over pipeline trenches and road surface areas, and at least 12 inches of topsoil will be salvaged and replaced except in areas with standing water or saturated soils. Construction when the ground is frozen may be implemented as an alternative to minimize damage. Use of construction equipment will be limited, and if standing water or saturated soils are present, wide-track or balloon-tire construction equipment or normal construction equipment operated on equipment pads or geotextile fabric overlain with gravel fill may be used. Equipment pads will be removed immediately following the completion of construction activities. Trench spoil will be placed at least 10 feet from drainage channel banks. All operations within jurisdictional wetlands areas will comply with COE permit stipulations as necessary.



### Topsoil Stockpiling

Topsoil will be stockpiled in such a manner that it can be readily recovered for reclamation purposes. Topsoil stockpiles will be located away from natural drainage courses. Stockpiles should be constructed with no greater than 3:1 side slopes and with a height of three to six feet where possible, given the flexibility needed in confined areas for stockpiles on drill sites. By constructing stockpiles in this manner, valuable soil fungi and bacteria will not be lost.

### Subsoil Handling

During the installation of well pad sites, subsoil materials will be utilized to construct well pads. Poor quality subsoil materials may consist of calcareous, alkaline, and high coarse fragments soils, etc. Poor quality subsoil materials will be kept lower in the profile of well pads so as not to interfere with future plant growth.

### Pit Soil Stockpiling

Drilling pits are constructed by removing adequate subsoil and overburden materials to accommodate drilling fluids generated during the actual drilling process. The subsoil material will be stockpiled in an easily accessible area. Pit soils will be stockpiled in such a manner so as to avoid co-mingling with topsoil stockpiles.

## **5.5 Temporary Revegetation Efforts for Topsoil Stockpiles**

Topsoil stockpiles will be seeded immediately after placement with a quick germinating cover of Winter Triticale, a sterile cover crop which is a cross between winter wheat and rye. Topsoil stockpiles will be dozer tracked on the contour to create cleat marks that will serve as erosion basins. Also, a continuous berm will be placed around any down slope sides of the topsoil stockpile to prevent additional runoff and potential erosion.

### Soil Amendments

At the advice of our reclamation consultant, Berry may elect to use one or more soil amendments to overcome poor chemical and physical conditions in existing surface soils. Poor soil conditions typically involve shallow depth or low nutrient/organic matter content.

Berry's reclamation consultant will determine the well sites that may benefit from soil amendments and their application rates. One or both of the following amendments may be utilized where 12 inches of favorable growth media cannot be salvaged and replaced at each well site and poor growth performance is observed.

- Humates, consisting of humic and fulvic acids, help create soil aggregation. These materials will be mixed with the existing soil material on site. They will be applied at the rate of 800-2,000 pounds per acre.

- Fertilizers will be applied to the soil surface as determined by soil test results indicating the need for nitrogen, phosphorous, or potassium fertilizers. Nitrogen fertilizer may not be added in many cases at the time of seeding because of its influence on rapid weed invasion at the expense of more desirable species. The revegetation specialist will make the final determination on the need for fertilizer applications and their application rates. Any application of fertilizer will be followed by soil tillage to incorporate the material properly.

## **5.6 Best Management Practices**

A number of different BMPs may be used on the various future well pad sites. They are listed and described below.

### Continuous Berms, Ditches, and Diversions

These types of controls use ditches, berms of soil, or both (diversions) to convey surface runoff from disturbed areas to a stabilized outlet or to divert surface runoff away from disturbed areas. A stabilized outlet can be any kind of sediment trapping device or simply a well-vegetated and stabilized area.

Continuous berms, ditches and diversions are useful for erosion and sediment control around the perimeter of construction sites. The berms either detain and pond sediment laden storm water, or direct it to a stabilized outlet.

### Sediment Basins or Traps

Sediment basins or traps are used to either detain storm water by slowing the flow of water and/or storing water behind an embankment. These pond-like structures reduce the velocity of storm water flow and allow sediments and suspended solids to settle out of the storm water. Water remains in the sediment basin until evaporation occurs, water seeps into the subsurface, or the water reaches the level of a stabilized outflow and is discharged. Since sediment basins are temporary, they must be maintained until the disturbance area is permanently stabilized.

### Check Dams

Check dams are small temporary dams constructed of rock, sandbags, or wattles across a diversion or roadside ditch. Check dams are used to slow the velocity of runoff, reduce erosion, and capture sediment.

### Riprap

Riprap is a permanent, erosion-resistant layer of rock, it is intended to stabilize areas subject to erosion, such as fill slopes, and protect against scour of the soil caused by concentrated, high velocity flows.

### Straw Bale Dikes

Straw bale dikes intercept and detain small amounts of sediment transported by sheet and rill type runoff. The dikes trap sediment by ponding water and allowing sediment to settle out. Straw bale dikes also slow runoff velocities acting to reduce sheet, rill and cully erosion. Straw bale dikes may also be used when installed to reduce erosion and sedimentations around the disturbance area perimeter. All straw bales will consist of certified weed-free materials. Given the presence of grazing cattle within Berry's lease areas, the use of straw bales is less favorable than the structural BMPs described above.

### Wattles

A wattle (also called a fiber roll) consists of a tight tubular roll of straw, flax, or other similar materials. Wattles can be used along slopes, as check dams in ditches, or at outlets of sediment basins/traps to reduce erosion, reduce runoff velocity, and capture sediment.

### Silt Fence

Silt fence is a temporary polypropylene sediment barrier placed on the slope contour to trap sediment by ponding water behind it and allowing sediment to settle out. Silt fence can effectively trap sheet and rill erosion within small drainage areas and on slopes with gradients up to 2:1. Silt fence is the most cost effective when used for sediment and erosion control around the perimeter of a disturbance area. Given the presence of cattle in much of Berry's leasehold and the need to frequent maintenance of silt fence, this BMP is also considered to be less favorable, relative to the structural BMPs listed above.

## **6.0 INTERIM RECLAMATION AND MONITORING**

Disturbed areas subject to interim reclamation include portions of each well pad not needed for long-term production-related activities, road cut-and-fill areas, and pipeline corridors. In general, reserve pits and portions of well pads not needed for production will undergo interim reclamation and the size of the operating well pads will be substantially reduced to simply accommodate routine operations and periodic workovers (COGCC Rule 1003).

Interim reclamation and stabilization objectives include:

- Stabilization of disturbed areas by providing wind and water erosion control to reduce soil loss and the chance of slope failure. This will primarily involve establishment of non-intrusive plant communities to protect soil resources;
- Minimization of surface runoff to prevent the degradation of downstream receiving waters through the use of stormwater management techniques (e.g., facility sites will be required to approach zero runoff from the location using BMPs); and
- Minimization of visual impacts.



## **6.1 Surface Preparation**

Surface preparation includes backfilling, grading, and ripping of compacted soils in the areas subject to interim reclamation.

### Removal of Waste Materials

In accordance with COGCC Rule 1003(a), all debris and waste materials including concrete, bentonite and other drilling additives, sand, plastic, pipe, cable, trash, and drilling and completion-related equipment will be removed from the well pad.

### Drilling Pit Closure

In accordance with COGCC Rule 1003(d)(2 and 3), all drilling fluids shall be disposed of as required in the 900 series rules. Once the pits are dry, they will be backfilled. Pit materials will be covered with at least 3 feet of subsoil material and then a final layer of topsoil. All pit-related muds and solids will be confined to the pit and will not be squeezed out and incorporated into surface soils.

### Backfilling and Grading

Immediately following well drilling and completion on a pad, all pits, cellars, rat holes, and other boreholes not necessary for lease operations will be filled.

Within 12 months after drilling operations have been completed on a pad, interim reclamation of pad areas not needed for production and along roads will be conducted in accordance with COGCC Rule 1003 (these are non-croplands). Interim reclamation will be conducted in a manner to minimize any additional disturbance of previously reclaimed areas. Where possible, disturbed areas will be graded and contoured to slopes of 3:1 (horizontal: vertical) or less, or as required to stabilize the area and provide a suitable seedbed. Grading will be conducted as necessary to provide a surface suitable for the replacement of a uniform depth of topsoil, while promoting cohesion between subsoil and topsoil layers, reducing wind erosion, and facilitating moisture capture.

Specialized grading techniques at well pads will be applied as necessary and may include slope rounding, benching grading, stair-step grading, and/or contour furrowing. Equipment selection will be determined on a site-specific basis, depending upon the material to be graded, the size of the area, on-site operating conditions, and equipment availability.

No visible soil berm (i.e., in excess of 3 inches) will be allowed above pipeline trenches. Berry contract reclamation specialists will ensure that backfilling and grading operations are conducted so as to provide a landscape suitable for successful reclamation. Ripping of the subsoil material will occur to a depth of 16 inches (where the nature of the material permits) to relieve compaction of the subsoil and provide better rooting medium for later plant growth. No heavy equipment will be moved over the prepared surface once it has been ripped. Small dozers will be used to replace subsoil and topsoil.

## **6.2 Soil Replacement**

In accordance with COGCC Rule 1003(e)(2), all segregated soil horizons will be replaced to their original positions.

### Topsoil Replacement

Following backfilling and grading, Berry will rip the existing subsoil surface to a depth of 18 inches (or that allowable if large rock fragments are present). Topsoil will then be replaced evenly over all disturbed areas using small dozers to prevent re-compaction of the growth medium. Topsoil will not be replaced in extremely wet or frozen conditions. As described in Section 5.5, soil amendments may be added to enhance the fertility of the replaced topsoil to ensure greater revegetation success. The decision to use soil amendments will be made on a case-by-case basis.

### Wetland Soils

All operations within jurisdictional wetland areas will comply with COE permit stipulations as necessary.

### Seedbed Preparation/Soil Tillage

If the re-topsoiled surface is not loose and friable after topsoil application, soil tillage will be performed. Acceptable methods of soil tillage will consist of disking, chisel plowing, or harrowing to a depth of 4 inches. No more than 10% of the reclaimed area will contain rocks greater than 8" in diameter. The only exception to this condition will be in-situ soils that naturally contain greater amounts of rock material.

## **6.3 Seeding Methods**

### Seeding Times

Seeding shall be completed at any time of year except during ground freeze conditions and except from May 31 to August 15.

### Seeding Methods

On slopes of 3:1 or flatter, drill seeding shall be utilized. Drill seeders shall be capable of handling a variety of different seed textures. Drill rows shall be no greater than 12 inches on center. All drilling shall be completed on the parallel to the contour of the land where practical. Seed will be drilled to a depth of .25 to .50 inches.

Steeper slope areas will be broadcast seeded or seeded with other methods. Broadcast seeding will be accomplished with hand held, ATV mounted, or tractor mounted spreaders and will be capable of spreading seed uniformly. All seed will be raked or harrowed to lightly cover seed with soil.

### Seed Mixtures

Based on the fact that Berry has well pads and other facilities both on the valley bottom and on the plateau tops, two distinct seed mixes will be used for interim and final reclamation, as described below.

**Table 6-1. Valley Bottom Seed Mix**

Species
Lincoln Smooth Brome
Hycrest Crested Wheatgrass
Dahurian Wildrye
Full Throttle Tetraploid Perennial Ryegrass
Renegade Orchardgrass
Oahe Intermediate Wheatgrass

<sup>1</sup> To be applied at the rate of 15-25 pounds per acre when drilled

<sup>2</sup> To be applied at the rate of 30-50 pounds per acre when broadcast

**Table 6-2. Plateau Seed Mix**

Species
Slender Wheatgrass
Mountain Brome
Nodding Brome
Idaho Fescue
Letterman's Needlegrass
Rocky Mountain Penstemon
Cicer Milkvetch
Utah Sweetvetch
Western Yarrow
American Vetch
Antelope Bitterbrush

<sup>1</sup> To be applied at the rate of 18 pounds per acre when drilled

<sup>2</sup> To be applied at the rate of 36 pounds per acre when broadcast

Areas that have been seeded will be visually monitored for seedling establishment and the presence of erosional features and will be re-stabilized and reseeded, as necessary, until adequate vegetation establishment and site stability is achieved. To minimize sedimentation of drainage channels and wetlands during the interim reclamation process, BMPs, as described in Section 5.6 will be utilized. BMPs will be maintained in functional condition until revegetation/reclamation efforts yield a stable vegetation cover.

In general, the annual reclamation success monitoring and revegetation inspection procedures specified in Section 7.0 will also be applied at interim reclamation sites until revegetation success has been achieved.

#### **6.4 Fencing**

A four-strand barbed wire fence will be erected around the largest possible portion of the well site during interim reclamation to exclude cattle from entering the reclaimed area and grazing on the new vegetation. Adequate access will be left open to the actual wellhead and ancillary facilities.

T-posts will be placed every 16 feet with line braces installed for every 1,300 feet of run. Steel corner sets will be placed on every corner and either compacted in-place or cemented in. Fences will be inspected on a regular basis and repaired as needed. Fences will be kept in-place as necessary to allow vegetation in reclaimed areas to reach a self-sustaining cover.

#### **6.5 Weed Control**

The Colorado Noxious Weed Management Act (Colorado Department of Agriculture-1996) and the Garfield County Weed Management Plan (Garfield County Vegetation Management- 2000) provide for control of noxious weeds on all unincorporated lands within the county. Berry will comply with state and county policies. There are 21 noxious weeds listed in the county list and 68 plants on the state list.

##### Post Revegetation Weed Inspections

A third party reclamation/revegetation specialist will conduct a reclamation and revegetation success inspection annually, after green up of vegetation. If during these inspections it is determined that the noxious weed species presence and densities represent a threat to the revegetated areas or surrounding lands, mechanical or chemical control measures will be employed.

##### Weed Control Implementation

During the first growing season of native grasses, forbs, and shrubs, use of chemical herbicides will not be feasible. Until newly reseeded species reach a height of 3-6 inches they are susceptible to damage from herbicides. Therefore, mechanical weed control is proposed for the first growing season if re-seeded species are not determined to be mature enough to withstand herbicide spray. Brush Hog mowers, weed eaters, and/or hand pulling of weeds will be employed as mechanical control devices. During subsequent years, herbicide applications will be utilized when weed densities are determined to pose a threat to revegetation success or spread to surrounding lands.

The county weed management specialist will be consulted to determine what chemical herbicides will be the most beneficial for controlling noxious weeds. It is anticipated that an aggressive revegetation and weed management program will result in weed control only needing to be performed during the first three years after re-seeding efforts. A self-sustaining native species cover is the best mechanism for discouraging weed growth and spread to surrounding land areas.



## **7.0 FINAL RECLAMATION AND SUCCESS MONITORING**

Final reclamation will be completed as soon as practical, within 12 months after plugging the last well on a pad. Permanent reclamation objectives include all those listed for interim reclamation (Section 6.0), plus the following:

- The re-establishment of desirable self-sustaining vegetation communities that approximate pre-disturbance parameters for cover, density, and diversity, as measure at adjacent undisturbed areas;
- The development of hydrologically stable landforms that meet future land uses including wildlife habitat, livestock grazing, and mineral exploration; and
- Establish conditions for the further restoration of the visual quality of the area.

### **7.1 Facility and Structure Removal**

All gas wells will be abandoned according to Colorado Oil and Gas Conservation Commission (COGCC) regulations. All above ground well pad, pipeline, and water disposal facilities, including buildings, structures, tanks, and associated hardware, will be closed or dismantled and removed from the site. These materials will be salvaged and re-used or disposed of at approved sites.

Any concrete foundations, pads, or footings will be adequately broken up and covered or removed. All aggregate used for well pad, road, and/or ancillary facility site construction also will be removed or suitably buried.

Road reclamation will be conducted as deemed appropriate by COGCC and the surface landowners; some roads may remain after project completion. Road reclamation will include the removal of bridges, culverts, cattle guards, sediment control structures, and signs. Drainage-crossing side slopes will be reduced in order to minimize bank erosion and produce stable side slopes. In addition, road barriers or signs may be used to discourage travel on reclaimed road surfaces.

### **7.2 Reclamation Success Monitoring and Revegetation Inspections**

#### **Inspections**

On an annual basis, inspections will be performed on each well pad site. Observations will be made for weed species presence, fence damage, erosion problems, and bare ground resulting from revegetation failure. Evaluation of the vegetation will include estimates of species type, diversity, and ground cover. Reclamation success monitoring will commence during the first growing season and continue until interim and final reclamation and revegetation efforts meet or exceed 70% of the desirable plant cover found on the adjacent reference areas. Reference areas are adjacent areas that best represent the original pad site before disturbance.

The reclamation specialist will estimate the percent live cover of the reclaimed area and make a comparison to the reference area(s). A report of this data as well as other inspection data, such as presence of noxious weeds, erosion, fence status, grazing, etc. will be incorporated into the annual inspection report for the specified well sites.

### **Follow Up Revegetation**

Observations of any problems will result in additional revegetation/reclamation efforts. Erosional features will be repaired by filling-in wash outs greater than 6 inches deep and re-grading. Areas containing less than 2 desirable species per square foot and/or areas greater than 2 square feet will result in touch-up hand seeding and raking. Larger areas exhibiting revegetation failure will be re-tilled and seeded as described above in corresponding sections of the Plan.

**BERRY PETROLEUM COMPANY**  
**RECLAMATION PAD & PROD. EQUIPMENT LAYOUT**

WELL NAME P32 595  
SECTION 32, T5S, R95W, 6th P.M.  
SE 1/4 SE 1/4

50' 25' 0' 50'

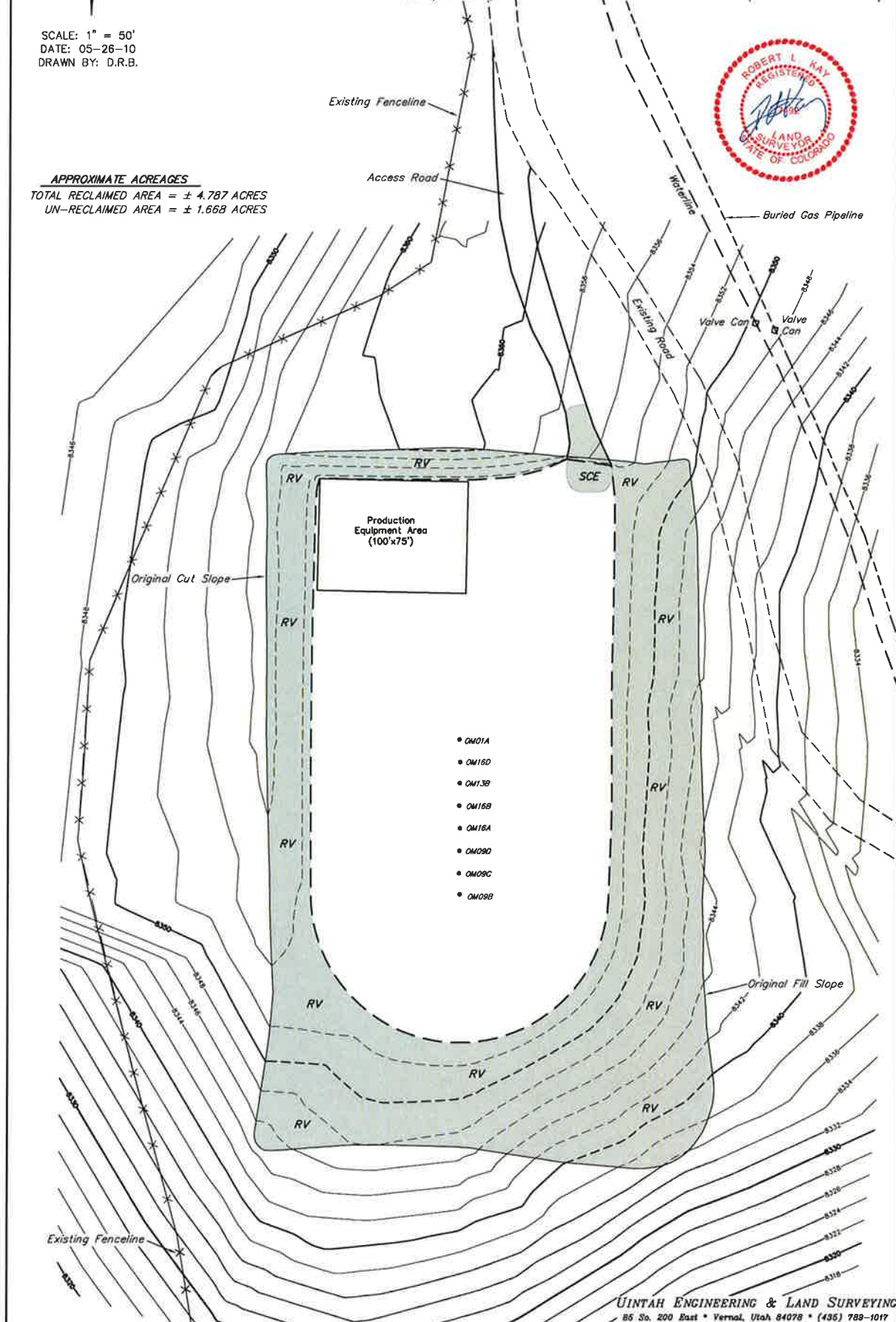
SCALE

Sheet 7 of 11

SCALE: 1" = 50'  
DATE: 05-26-10  
DRAWN BY: D.R.B.



APPROXIMATE ACREAGES  
TOTAL RECLAIMED AREA = ± 4.787 ACRES  
UN-RECLAIMED AREA = ± 1.668 ACRES



BERRY PETROLEUM COMPANY

FINAL RECLAMATION PAD

WELL NAME P32 595

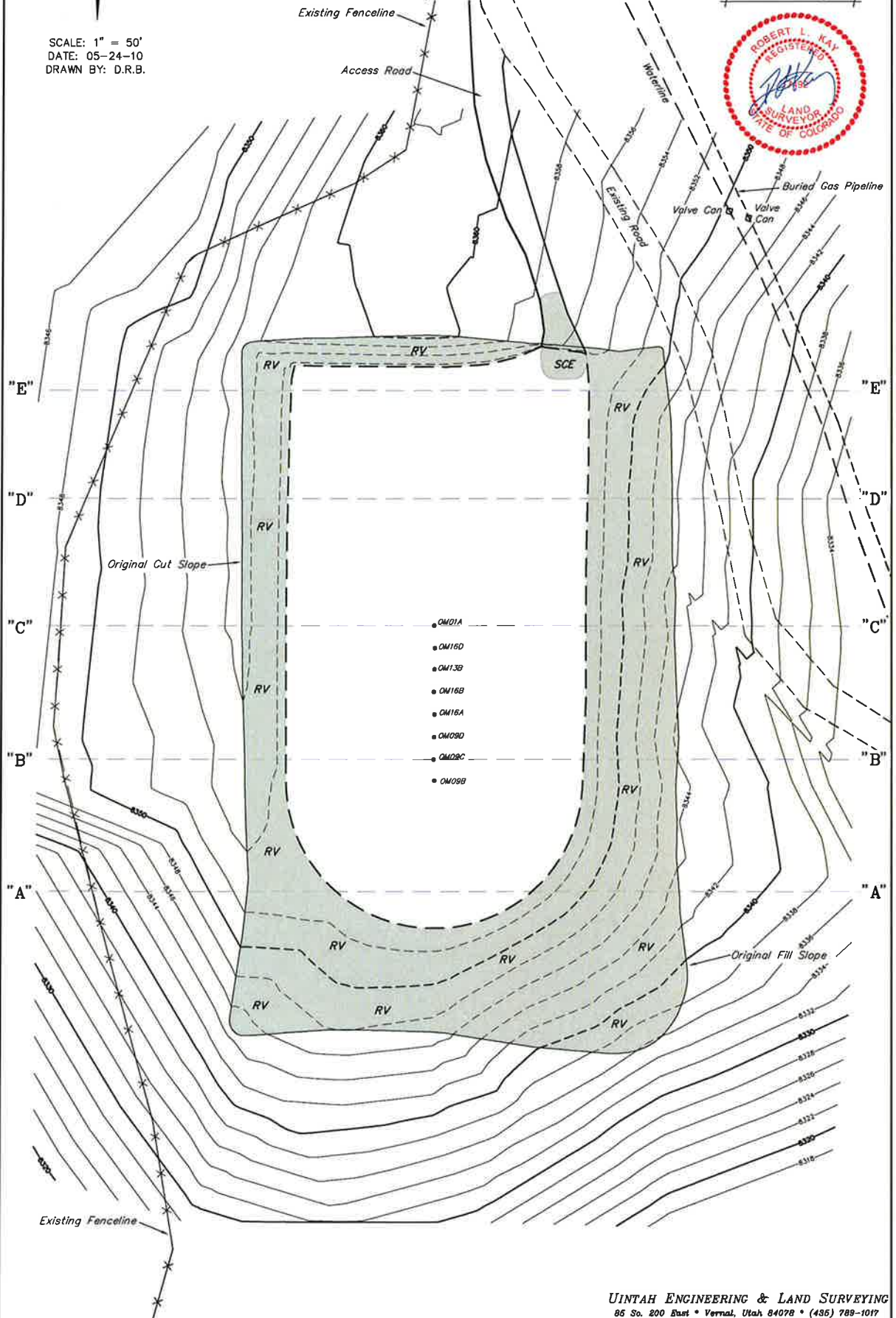
SECTION 32, T5S, R95W, 6th P.M.

SE 1/4 SE 1/4

SCALE: 1" = 50'  
DATE: 05-24-10  
DRAWN BY: D.R.B.

50' 25' 0' 50'  
SCALE

Sheet 8 of 11





1" = 40'  
X-Section  
Scale  
1" = 100'

DATE: 05-24-10  
DRAWN BY: D.R.B.

# BERRY PETROLEUM COMPANY

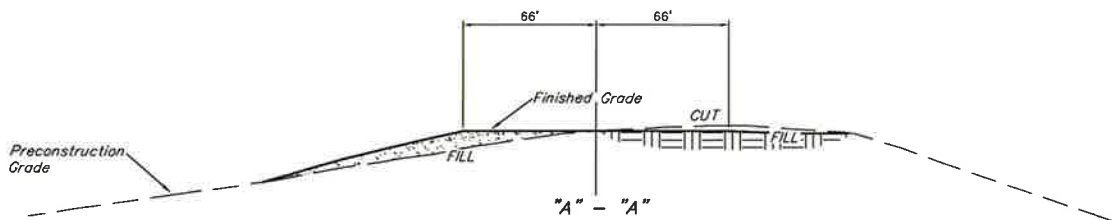
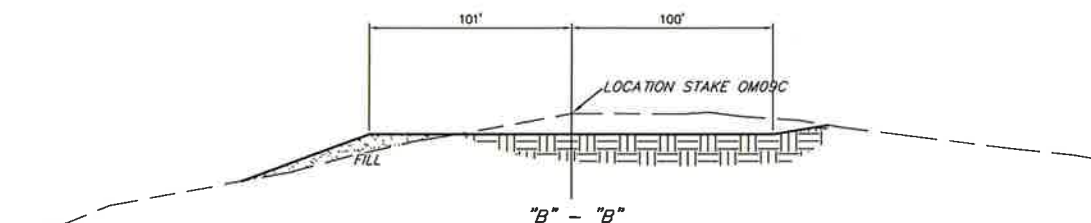
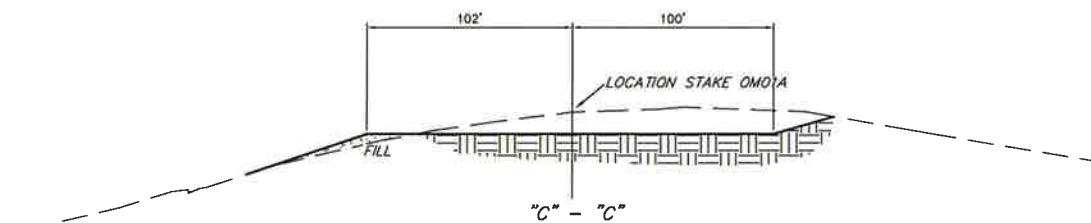
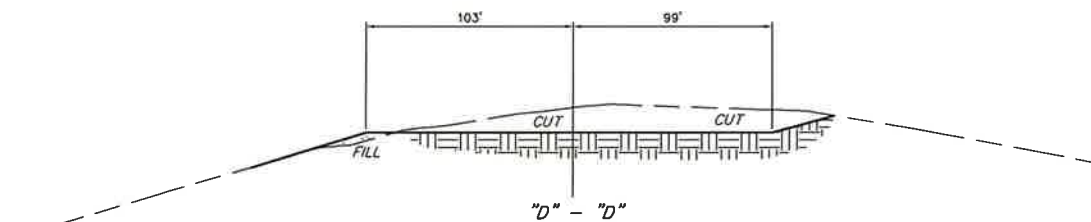
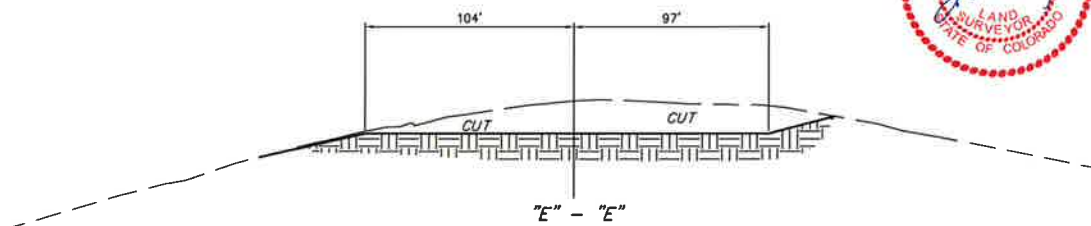
## CROSS SECTION FINAL RECLAMATION

WELL NAME P32 595

SECTION 32, T5S, R95W, 6th P.M.

SE 1/4 SE 1/4

Sheet 9 of 11



# BERRY PETROLEUM COMPANY

## WELL PAD #P32 595

LOCATED IN GARFIELD COUNTY, COLORADO

SECTION 32, T5S, R95W, 6th P.M.

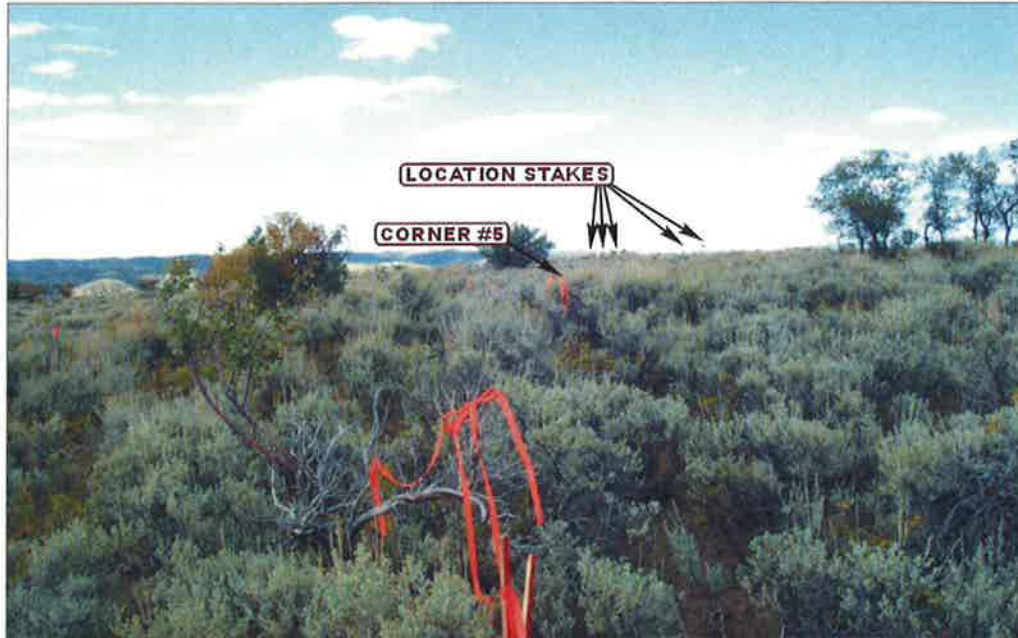


PHOTO: VIEW FROM CORNER #5 TO LOCATION STAKES

CAMERA ANGLE: SOUTHWESTERLY



PHOTO: VIEW FROM BEGINNING OF PROPOSED ACCESS

CAMERA ANGLE: NORTHERLY



- Since 1964 -



Uintah Engineering & Land Surveying

85 South 200 East Vernal, Utah 84078

(435) 789-1017 \* FAX (435) 789-1813

LOCATION PHOTOS

09 15 06  
MONTH DAY YEAR

PHOTO

P1

TAKEN BY: G.O. DRAWN BY: S.L. REV: 05-03-10 Z.L.



# BERRY PETROLEUM COMPANY

## WELL PAD P32 595

LOCATED IN GARFIELD COUNTY, COLORADO  
SECTION 32, T5S, R95W, 6th P.M.



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: NORTHERLY



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: EASTERLY



• Since 1964 •

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Uintah Engineering & Land Surveying

85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

**LOCATION PHOTOS**

**02 23 09**  
MONTH DAY YEAR

TAKEN BY: G.O.

DRAWN BY: Z.L.

REV: J.H. 05-21-10

PHOTO

**P2**

# BERRY PETROLEUM COMPANY

## WELL PAD P32 595

LOCATED IN GARFIELD COUNTY, COLORADO  
SECTION 32, T5S, R95W, 6th P.M.



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: SOUTHERLY



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: WESTERLY



• Since 1964 •



Uintah Engineering & Land Surveying  
85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

### LOCATION PHOTOS

02 23 09  
MONTH DAY YEAR

TAKEN BY: G.O.

DRAWN BY: Z.L.

REV: J.H. 05-21-10

PHOTO  
**P3**



# BERRY PETROLEUM COMPANY

## WELL PAD P32 595

LOCATED IN GARFIELD COUNTY, COLORADO  
SECTION 32, T5S, R95W, 6th P.M.



PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: SOUTHERLY



PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: WESTERLY



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Uintah Engineering & Land Surveying  
85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

**REFERENCE AREA  
PHOTOS**

**05 21 10**  
MONTH DAY YEAR

**PHOTO  
REF 1**

TAKEN BY: G.O. DRAWN BY: J.H. REVISED: 00-00-00



# BERRY PETROLEUM COMPANY

## WELL PAD P32 595

LOCATED IN GARFIELD COUNTY, COLORADO  
SECTION 32, T5S, R95W, 6th P.M.



PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: NORTHERLY



PHOTO: VIEW OF REFERENCE AREA

CAMERA ANGLE: EASTERLY



• Since 1964 •

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Uintah Engineering & Land Surveying

85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

**REFERENCE AREA  
PHOTOS**

**05 21 10**  
MONTH DAY YEAR

TAKEN BY: G.O. DRAWN BY: J.H. REVISED: 00-00-00

**PHOTO  
REF2**

## **ATTACHMENT B**



# Berry Petroleum Company

1999 Broadway, Suite 3700

Denver, CO 80202

Main (303) 999-4400

Fax (303) 999-4401

[www.bry.com](http://www.bry.com)

June 27, 2012

Encana Oil & Gas (USA) Inc.  
Attn: Judy Tatham, Landman  
370 17<sup>th</sup> Street  
Suite #1700  
Denver, CO 80202

**Re: Garfield County Limited Impact Review Permit Application  
P-32 Central Water Storage Impoundment  
SESE of Sec. 32 -T6S-R96W  
Garfield County, Colorado**

Dear Ms. Tatham:

Berry Petroleum Company is applying for a Garfield County Limited Impact Review Permit for Material Handling related to the proposed P-32 Well Pad Produced Water Storage Impoundment. As the landowner of the subject parcel, Berry requests EnCana's assistance in pursuing this Permit.

The proposed facility will enable Berry to transport water produced during the drilling, completion and production of natural gas wells to be stored in a central location for reuse in operations or disposal. In addition, another benefit of the proposed facility is that it will also serve as a storage area for fresh water during initial drilling operations. This project will allow Berry to permanently close pits located on other pads in the area.

Should you have any questions or concerns, please contact me at (303) 999-4214. If you have no objections to our proposal, please execute in the space provided below and return to my attention at the above letterhead address.

Regards,

Elizabeth Brian  
Area Landman – Piceance & Business Development

ENCANA CONCURS WITH BERRY'S APPLICATION FOR A LIMITED IMPACT REVIEW PERMIT FOR A CENTRAL WATER STORAGE FACILITY ON THE LANDS DESCRIBED ABOVE.

By:

Name & Title:

JUDY M. TATHAM  
Land Acquisitor, NP

**CARRY AND EARNING AGREEMENT**  
**NORTH PARACHUTE RANCH PROPERTY**

**EFFECTIVE DATE:** June 7, 2006

**PARTIES:** Berry Petroleum Company  
5201 Truxtun Avenue  
Suite 300  
Bakersfield, California 93309-0640  
Attn: Land Manager  
Fax: 661-616-3886  
Phone: 661-616-3900  
stb@bry.com  
("Berry")

and

**CONFIDENTIAL**

EnCana Oil & Gas (USA) Inc.  
370 Seventeenth Street  
Suite 1700  
Denver, Colorado 80202  
Attn: North Piceance Team Lead  
Fax: 720-876-6157  
Phone: 720-876-5157  
darrin.henke@encana.com

("EnCana" and, together with Berry, the "Parties")

**RECITALS:**

A. EnCana owns a leasehold interest in certain lands in Garfield County, Colorado depicted on the map attached hereto as Exhibit A (the "North Parachute Ranch Property") a portion of which, for purposes of this Carry and Earning Agreement (this "Agreement"), has been shaded in yellow on Exhibit A and is referred to herein as the "Berry Block."

B. Berry desires to explore and develop, and acquire a working interest in, the Berry Block on the terms and conditions set forth herein.

C. The Parties desire to enter into this Agreement to govern certain of their respective rights and obligations with respect to exploration and development of the North Parachute Ranch Property, including the Berry Block.



unexcused failure by Berry to spud at least 120 Berry Wells by the Drilling Deadline will be difficult to ascertain and, accordingly, as EnCana's sole and exclusive remedy for such default and notwithstanding anything to the contrary in Section 8 or otherwise herein, Berry agrees to pay EnCana the sum of \$200,000, as liquidated damages and not as a penalty, for each unexcused well less than 120 spudded by Berry on the Berry Block on or prior to the Drilling Deadline.

4.5 Road, Pipeline Rights of Way and Surface Access License Across North Parachute Ranch Property. EnCana hereby grants to Berry a nonexclusive license to go upon the Berry Block to conduct all operations relating to the drilling, completion, plugging and abandonment, and producing of the Berry Wells, and for saving, taking, transporting, storing, handling and treating of oil, gas and other substances produced therefrom. In addition, EnCana hereby grants Berry the right to construct, use, maintain and repair roads, pipelines and surface access across the balance of the North Parachute Ranch Property for the purpose of accessing, drilling, completing, plugging and abandoning and producing the Berry Wells at locations and under conditions to be determined in consultation with EnCana and subject to EnCana's approval which shall not be unreasonably withheld or delayed. Berry shall not utilize any portion of the Berry Block for storage or staging of equipment or for a field office. Within ten days after the assignment of the Lease to Berry, EnCana shall execute and deliver a license to Berry evidencing such grant.

## **Section 5. OPERATIONS; OPERATING AGREEMENT**

5.1 Operator. EnCana shall operate each Carry Well, and Berry shall operate each Berry Block Well.

5.2 Operating Agreement. An operating agreement between the Parties, designating EnCana as Operator of each Carry Well, Berry as the Operator of each Berry Well, and the wellbore of each of the Carry Wells and the Berry Block as the Contract Area, shall be executed by the Parties prior to the spudding of the first Carry Well or Berry Well in the form attached hereto as Exhibit D (the "Operating Agreement"). The Operating Agreement shall govern all operations on the Carry Wells or Berry Wells, respectively, after completion of each such Well, except as expressly provided herein. The Operating Agreement shall become effective as to each Well covered thereby after such Well has been drilled and completed. The Operating Agreement shall be deemed amended after each Carry Well is completed to include the Well under the Operating Agreement. In the event of any conflict or inconsistency between the terms of this Agreement and the Operating Agreement, this Agreement shall prevail to the extent of such conflict, as between Berry and EnCana or their permitted successors or permitted assigns.

## **Section 6. GEOLOGIC REQUIREMENTS; INFORMATION; TECHNICAL MEETINGS**

6.1 Operator to Provide Information. With respect to all Wells drilled hereunder or under an Operating Agreement, the Operator thereof shall furnish to the non-operating Party access to the cores, samples, logs and other information and data

In Witness Whereof, this Agreement is executed and effective as of the Effective Date first above written.

EnCana:

EnCana Oil & Gas (USA) Inc.

By:

Its:

VP Vice President

Berry:

Berry Petroleum Company

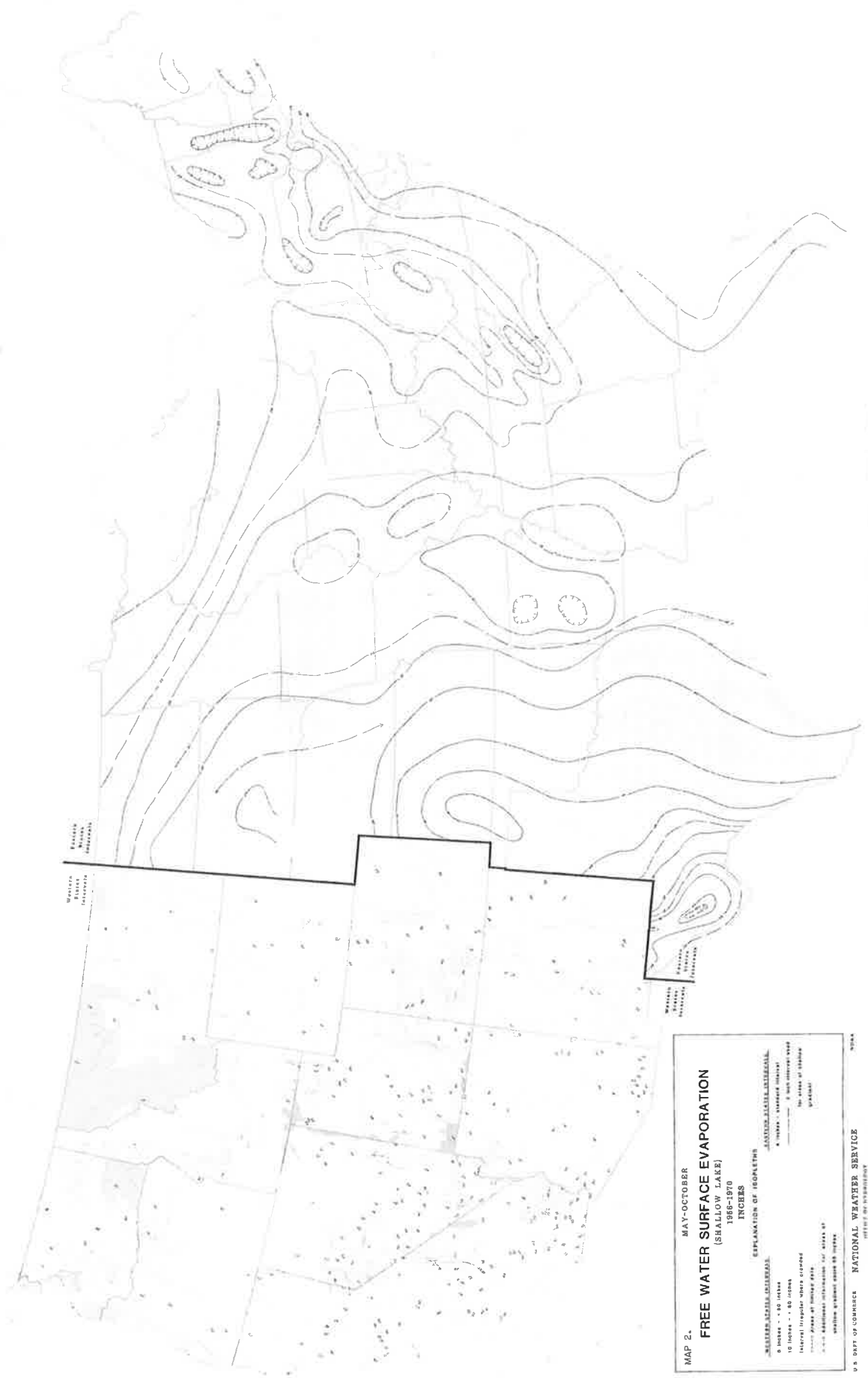
By:

Its:

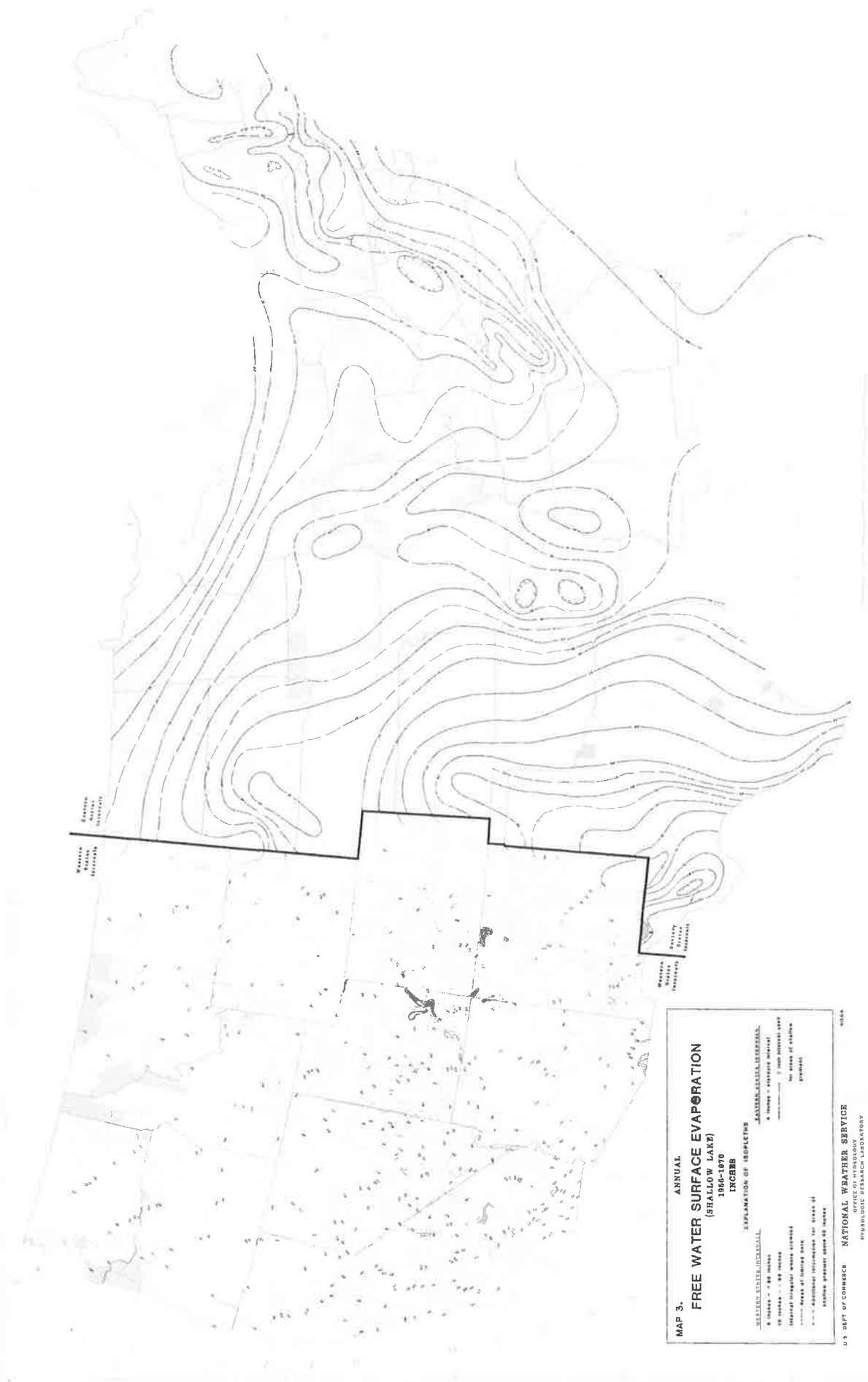
M. Dugill Vice President

## **ATTACHMENT C**







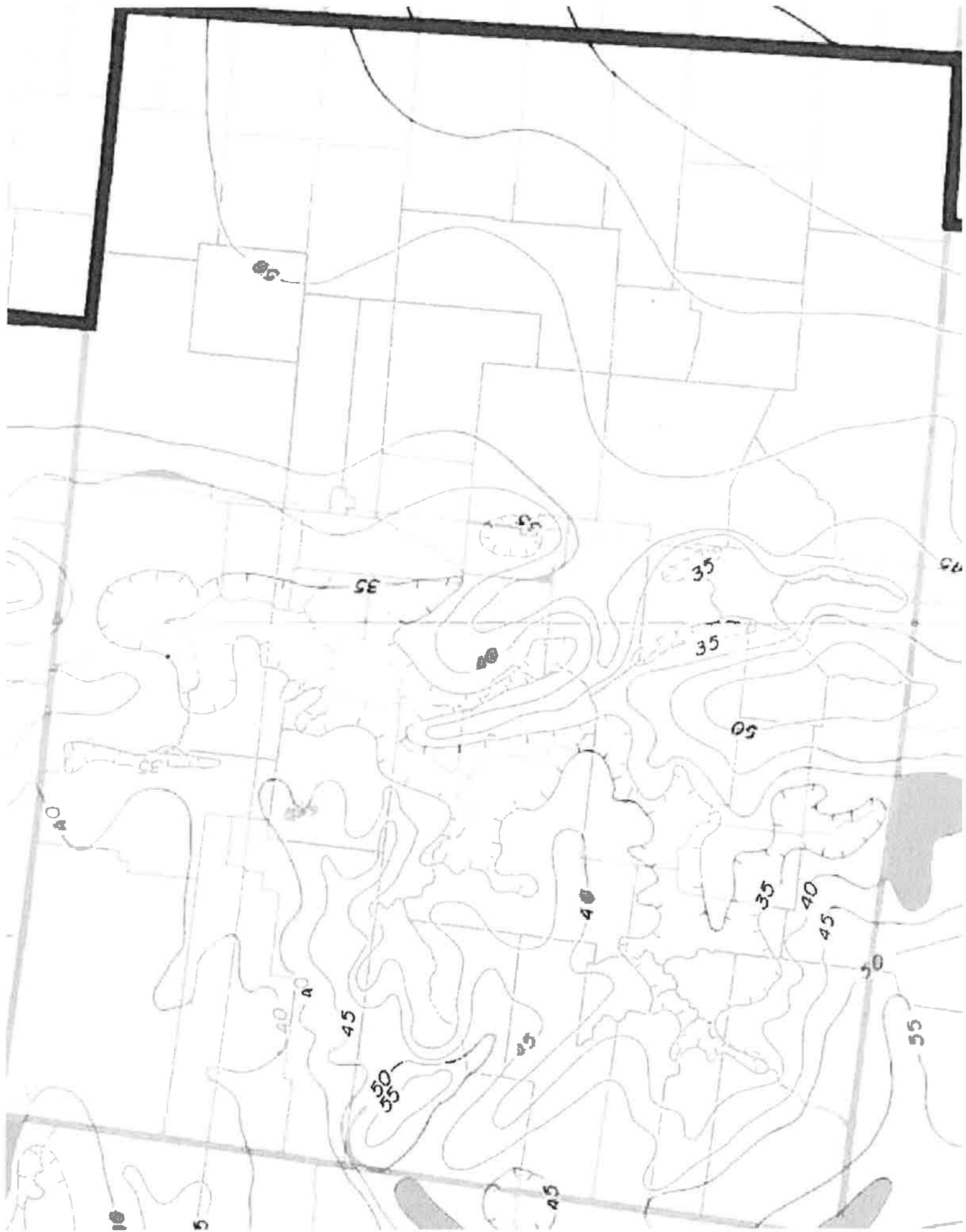


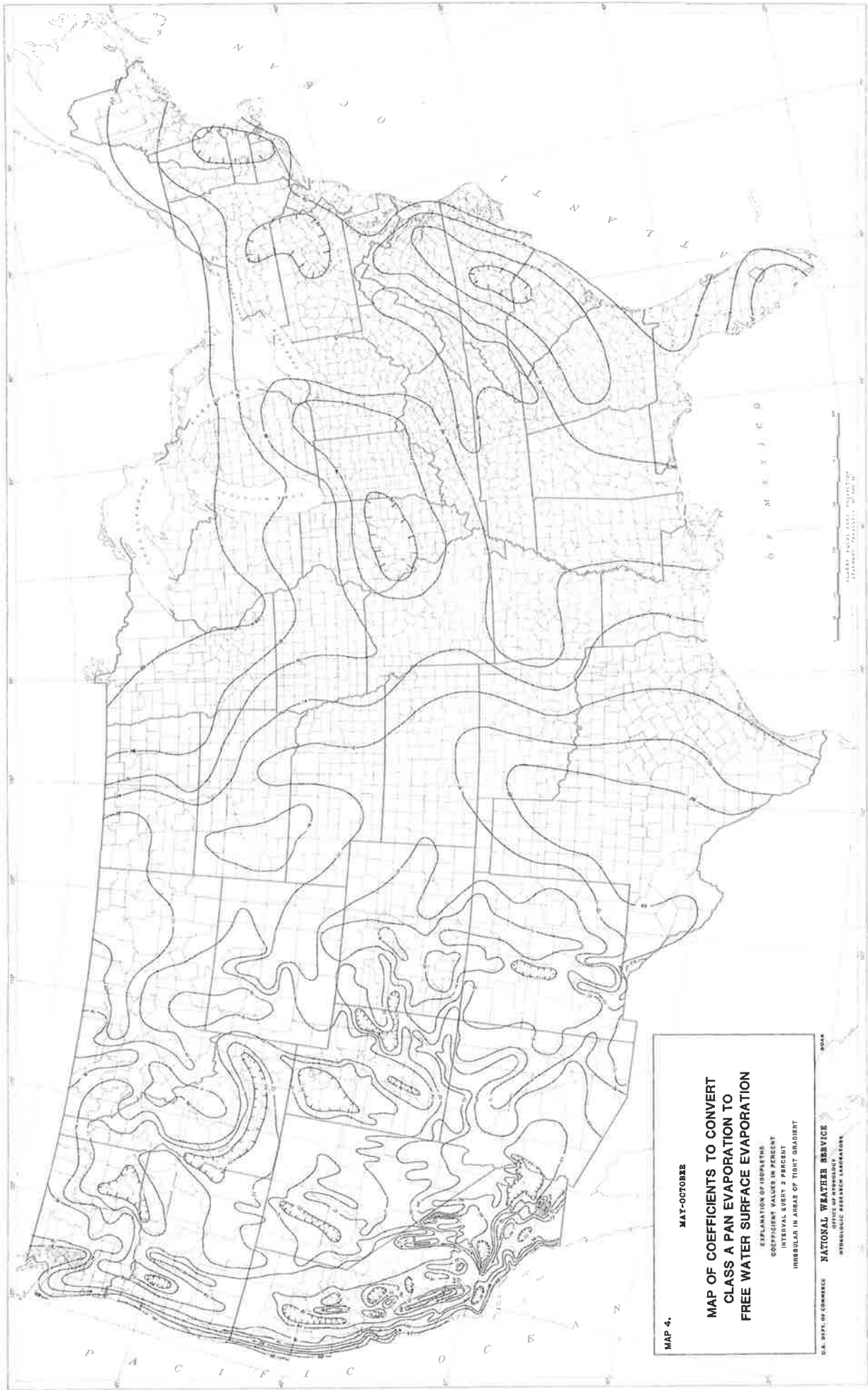
MAP 3. ANNUAL  
FREE WATER SURFACE EVAPORATION  
(SHALLOW LAKE)  
1966-1970  
INCHES

EXPLANATION OF SYMBOLS

WATER SURFACE EVAPORATION  
10 inches - 100 inches  
100 inches - 200 inches  
200 inches - 300 inches  
300 inches - 400 inches  
400 inches - 500 inches  
500 inches - 600 inches  
600 inches - 700 inches  
700 inches - 800 inches  
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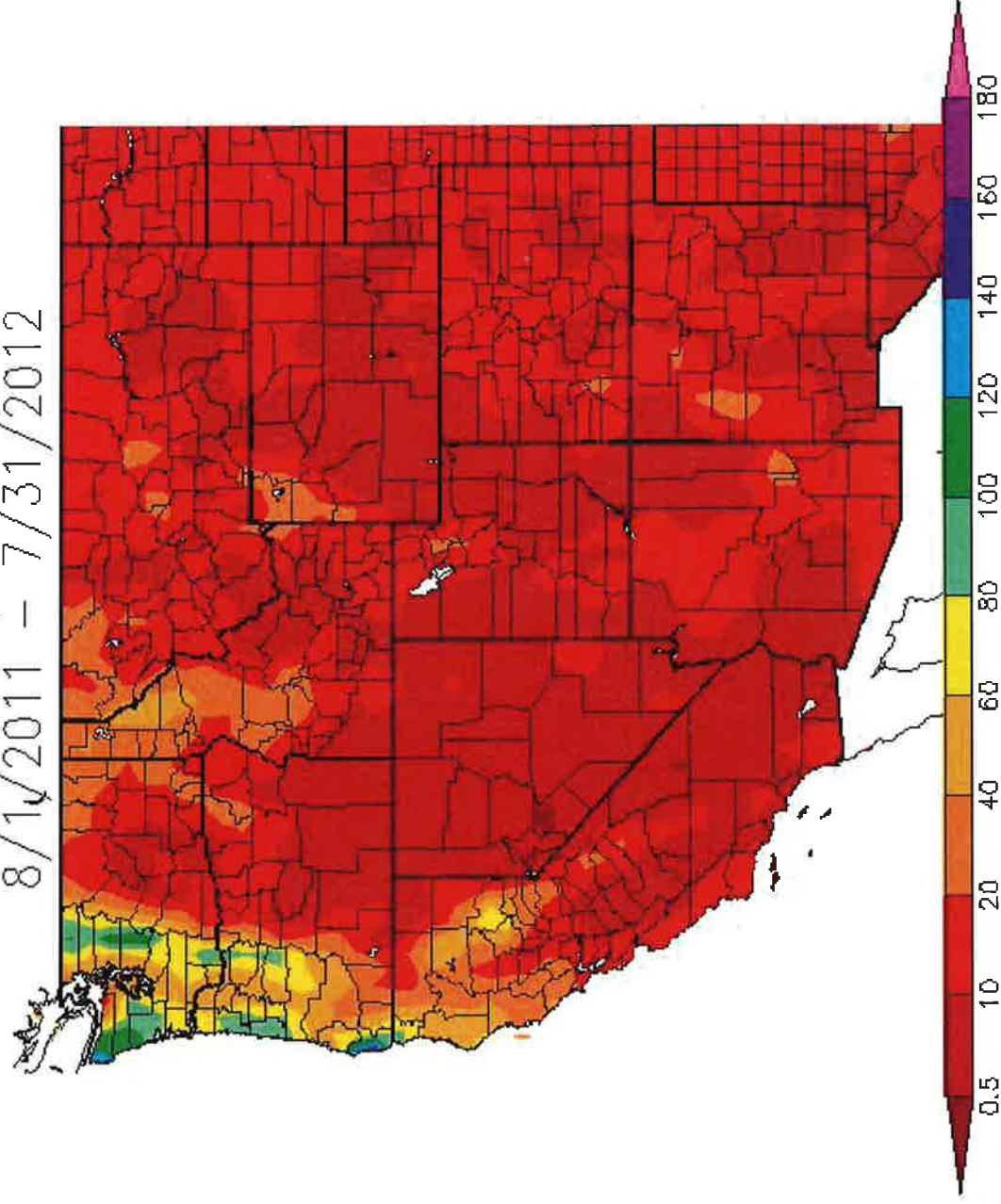
U.S. DEPT. OF COMMERCE NATIONAL WEATHER SERVICE  
HYDROLOGIC RESEARCH LABORATORY







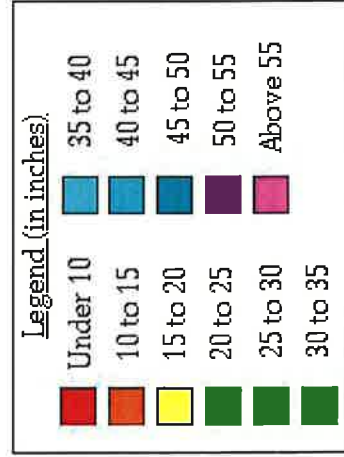
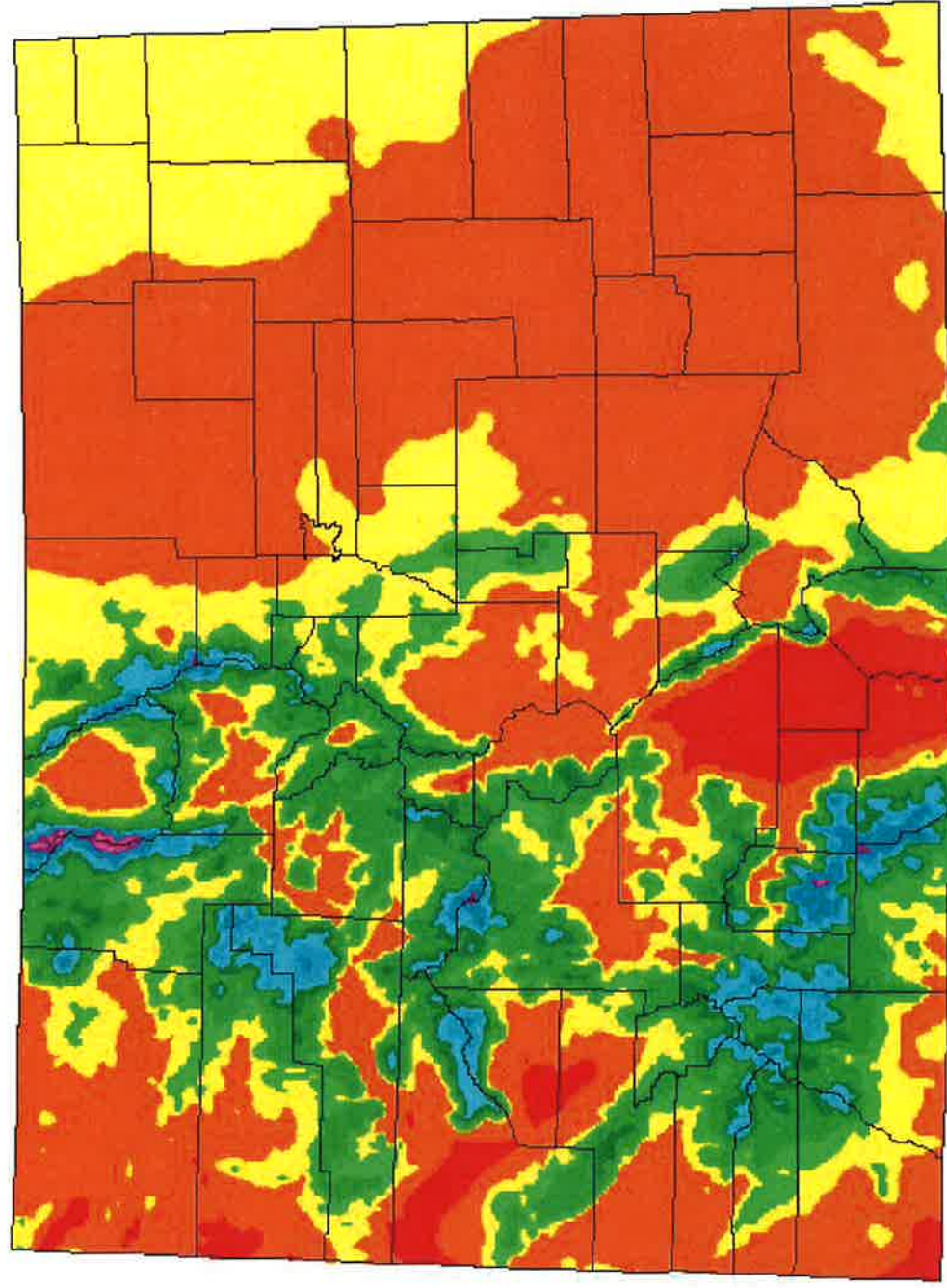
# Total Precipitation (in.) 8/1/2011 - 7/31/2012



Generated 8/01/2012 at WRCC using provisional data.  
NOAA Regional Climate Centers

# Average Annual Precipitation

## Colorado



Period: 1961-1990

This map is a plot of 1961-1990 annual average precipitation contours from NOAA Cooperative stations and (where appropriate) USDA-NRCS SNOTEL stations. Christopher Daly used the PRISM model to generate the gridded estimates from which this map was derived; the modeled grid was approximately 4x4 km latitude/longitude, and was resampled to 2x2 km using a Gaussian filter. Mapping was performed by Jenny Weisburg. Funding was provided by USDA-NRCS National Water and Climate Center.

12/8/97

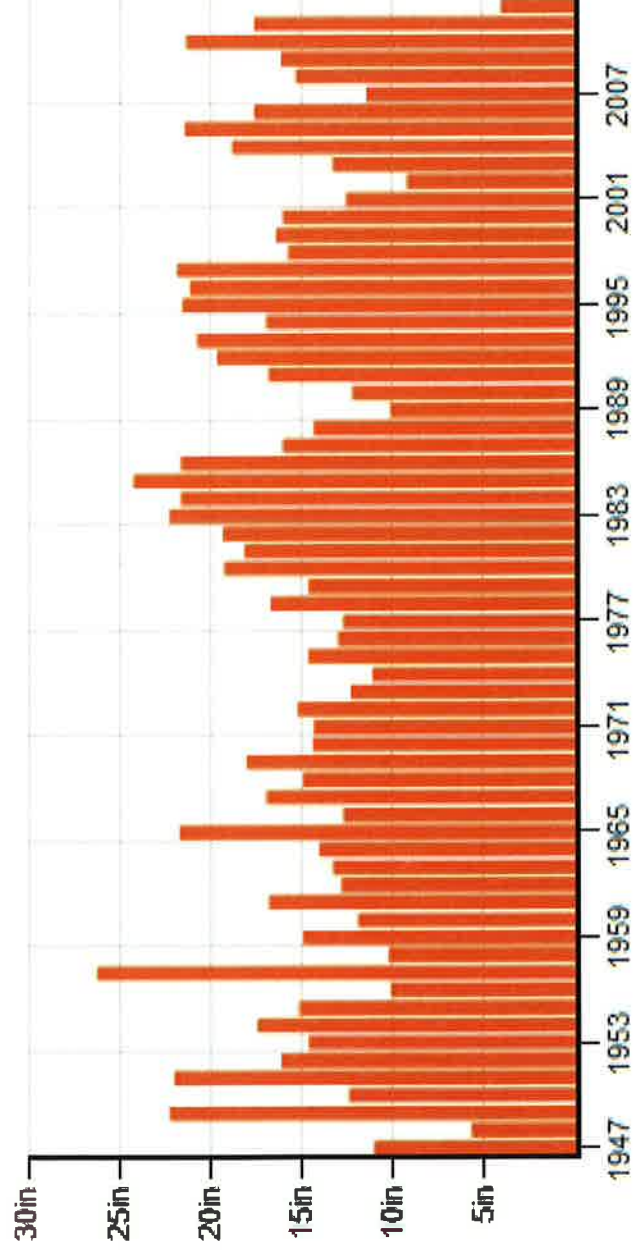
Monthly Climatic Data for ALTENBERN for years 1947 - 2012  
 Station - 50214 Latitude - 3930 Longitude - 10823 Elevation - 5690

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total monthly precipitation..													
1947	M	M	M	M	M	M	99	255	125	235	177	211	
1948	M	M	M	M	M	M	M	89	21	168	92	200	
1949	270	67	177	117	304	203	167	50	237	274	74	282	22.22
1950	282	102	24	131	71	1	143	9	219	28	106	128	12.44
1951	102	119	78	280	189	86	100	376	19	245	128	480	22.02
1952	282	90	303	63	78	122	106	393	26	0	55	89	16.07
1953	152	26	215	115	165	57	129	206	6	169	177	43	14.60
1954	216	119	211	104	62	59	128	182	265	165	137	89	17.37
1955	186	192	7	66	160	62	116	259	58	45	224	137	15.12
1956	227	140	16	112	72	22	111	113	0	98	191	84	10.14
1957	354	168	189	264	215	212	155	400	32	305	236	93	26.23
1958	29	170	204	90	48	0	24	32	241	23	124	36	10.21
1959	99	206	53	105	41	168	53	275	190	113	52	139	14.94
1960	103	183	161	114	52	53	32	73	108	102	132	79	11.92
1961	0	37	190	117	175	13	122	216	474	133	124	77	16.78
1962	204	386	62	92	80	49	26	66	156	45	62	53	12.81
1963	152	96	119	162	10	99	72	330	123	55	96	20	13.34
1964	110	16	142	165	93	96	138	162	80	0	147	251	14.00
1965	109	46	126	271	214	177	273	263	276	40	188	191	21.74
1966	39	129	74	60	119	26	94	115	29	133	76	377	12.71
1967	116	20	77	94	200	258	254	232	110	85	63	182	16.91
1968	51	141	86	163	136	47	150	369	23	148	75	100	14.89
1969	401	113	25	62	57	345	56	165	145	276	92	63	18.00
1970	61	53	204	156	13	128	139	101	157	125	215	89	14.41
1971	50	33	32	105	158	4	77	224	182	309	36	221	14.31
1972	0	0	9	70	142	311	48	64	166	401	111	199	15.21
1973	70	74	167	94	124	179	153	28	72	31	114	119	12.25
1974	206	19	133	89	0	84	87	54	136	122	94	81	11.05
1975	84	110	284	193	218	65	129	58	89	78	88	67	14.63
1976	39	315	138	105	142	97	183	89	81	95	3	14	13.01
1977	82	27	130	47	133	4	104	287	102	133	107	118	12.74
1978	216	203	355	208	63	10	27	18	57	12	312	185	16.66
1979	122	169	314	53	362	23	32	151	6	79	132	17	14.60
1980	404	340	231	86	318	1	98	99	48	194	74	22	19.15
1981	70	48	163	20	331	92	203	169	88	418	100	112	18.14
1982	171	37	174	63	111	34	95	119	436	190	384	112	19.26
1983	56	132	156	221	326	275	175	56	150	204	229	238	22.18
1984	68	20	176	194	129	360	154	142	111	429	74	304	21.61
1985	101	62	294	281	191	85	294	19	273	271	459	87	24.17
1986	49	162	196	188	157	13	320	317	382	197	142	34	21.57
1987	119	55	153	64	182	124	167	236	36	143	171	151	16.01
1988	132	34	115	186	118	100	106	145	144	19	189	137	14.25
1989	74	190	106	54	43	33	44	152	118	81	85	25	10.05
1990	46	137	106	186	33	18	157	140	129	106	92	65	12.15
1991	70	76	280	123	56	84	229	149	232	198	124	63	16.84
1992	48	145	168	120	422	37	301	80	69	260	144	167	19.61
1993	276	268	318	202	393	43	15	95	62	268	86	47	20.73
1994	24	162	60	300	101	43	28	203	260	187	196	126	16.90
1995	117	150	193	142	414	178	221	265	257	62	64	84	21.47
1996	155	345	86	184	102	164	177	46	215	276	232	129	21.11
1997	260	49	21	280	228	56	72	238	509	294	119	56	21.82
1998	117	219	182	161	45	189	134	36	136	202	93	59	15.73
1999	73	81	27	416	245	80	174	215	206	30	45	47	16.39
2000	103	193	186	78	125	116	53	195	172	159	121	97	15.98
2001	37	82	116	185	233	116	69	256	48	157	M	70	
2002	33	26	58	83	22	T	29	70	225	206	108	55	9.15
2003	37	89	120	92	247	91	58	86	172	6	244	90	13.32

2004	69	161	12	298	71	36	195	78	357	332	167	106	18.82
2005	346	208	190	129	M	310	33	270	245	230	82	94	
2006	103	16	299	149	21	29	M	242	238	496	123	43	
2007	47	131	80	142	88	35	120	234	261	M	M	M	
2008	234	148	59	106	188	43	117	123	94	121	144	153	15.30
2009	157	122	721	156	214	204	193	14	1151	84	53	221	16.05
2010	147	131	112	211	188	81	84	206	116	192	179	481	21.28
2011	23	117	181	182	251	65	177	164	219	176	176	29	17.60
2012	87	139	65	99	10	1	M	M	M	M	M	M	



**Total Annual Precipitation • 1947-2012**  
**Altenbern Ranch • Station 50214**



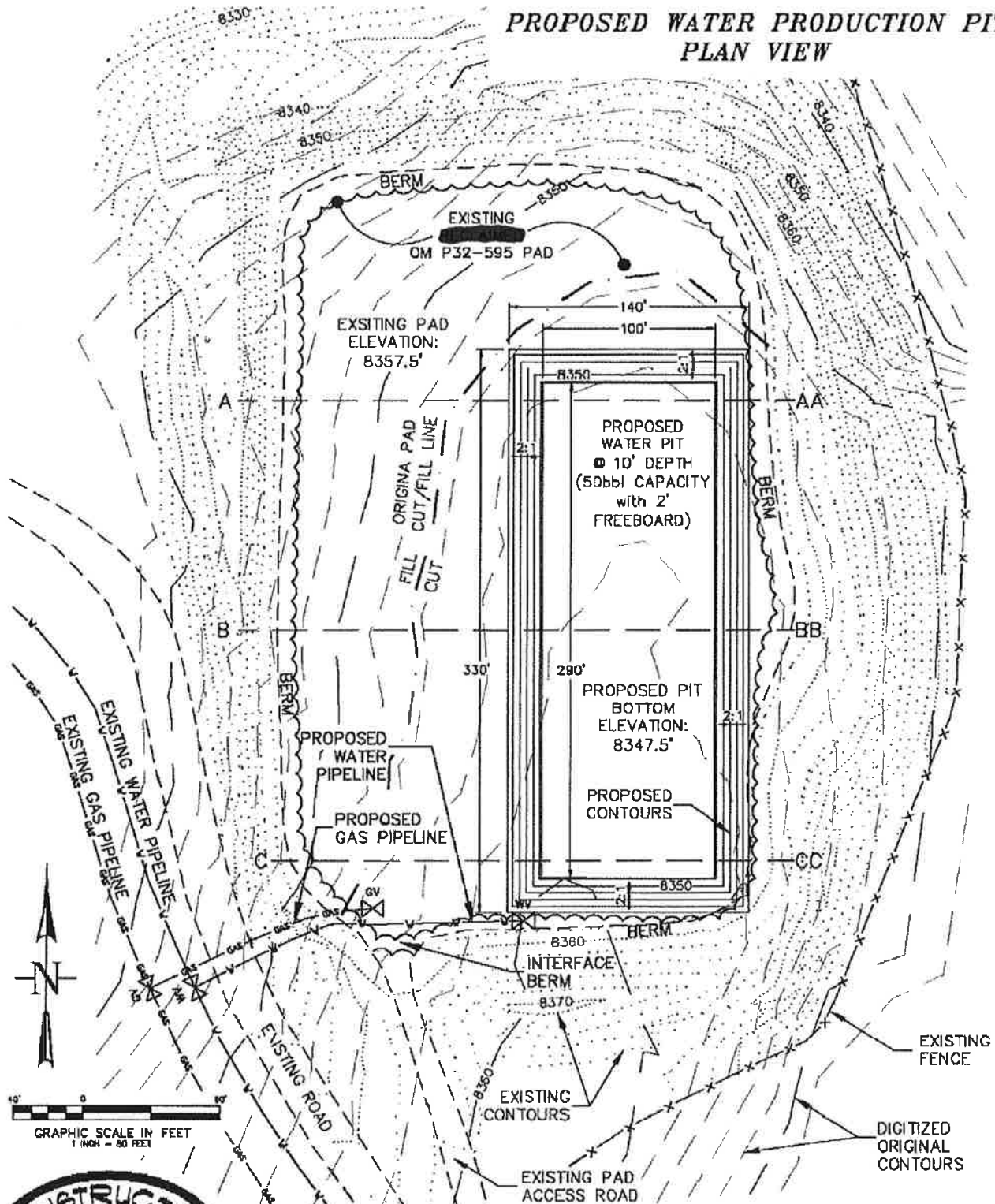
Source: Colorado Climate Center, Fort Collins, Colorado

Monthly Climatic Data for ALTENBERN for years 1947 - 2012  
 Station - 50214 Latitude - 3930 Longitude - 10823 Elevation - 5690

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total monthly precipitation.													
Ave	1.29	1.23	1.42	1.45	1.51	0.95	1.24	1.63	1.56	1.63	1.33	1.25	16.44
Max	4.04	3.86	3.55	4.16	4.22	3.60	3.20	4.00	5.09	4.96	4.59	4.81	26.23
Year	1980	1962	1978	1999	1992	1984	1986	1957	1997	2006	1985	2010	1957
Min	0.00	0.00	0.07	0.20	0.00	0.00	0.15	0.09	0.00	0.00	0.03	0.14	9.15
Year	1972+	1972	1955	1981	1974	2002+	1993	1950	1956	1964+	1976	1976	2002
Count	64	64	64	64	63	64	63	65	65	64	63	64	59

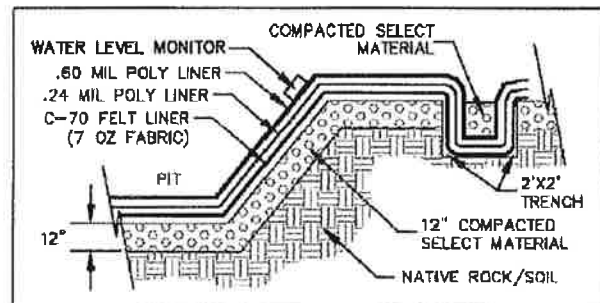
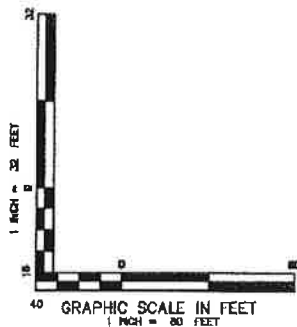
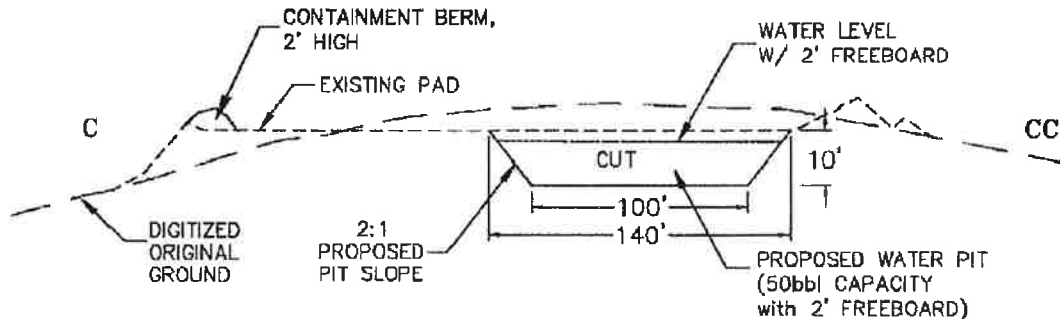
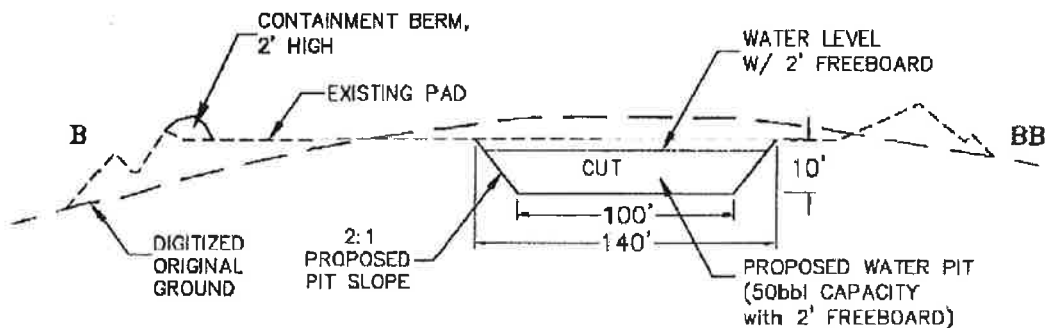
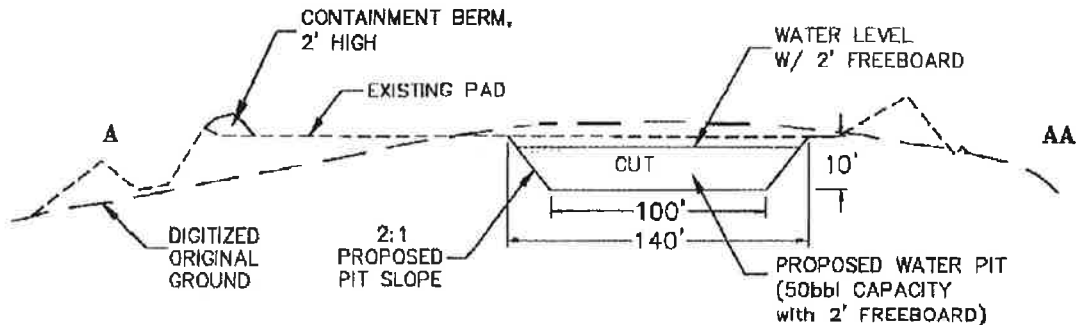
## **ATTACHMENT D**

# PROPOSED WATER PRODUCTION PIT PLAN VIEW





## PROPOSED WATER PRODUCTION PIT X-SECTIONS



N.T.S.

CLOSE UP X-SECTION VIEW OF BERRY TYPICAL DESIGN



CONSTRUCTION SURVEYS, INC. Old Mountain P32-595  
 0012 SUNRISE BLVD.  
 SILT, CO 81652  
 (970) 876-5753

081/4 081/4, SECTION 32, T. 5 S., R. 95 W.  
 BERRY PETROLEUM COMPANY

DATE: 05/03/12

SHEET: 2 OF 2

WELL PAD P32 595  
SECTION 32, T5S, R95W, 6th P.M.  
SE 1/4 SE 1/4

Sheet 1k of 12



UINTAH ENGINEERING & LAND SURVEYING  
85 So. 200 East • Vernal, Utah 84078 • (435) 789-1017

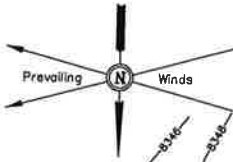
# BERRY PETROLEUM COMPANY

## CONSTRUCTION LAYOUT FOR

WELL PAD P32 595  
SECTION 32, T5S, R95W, 6th P.M.  
SE 1/4 SE 1/4



SCALE  
Sheet 2 of 12



SCALE: 1" = 50'  
DATE: 09-12-06  
Drawn By: D.R.B.  
Revised: 09-20-06 D.R.B.  
Revised: 02-10-09 D.R.B.  
Revised: 03-20-09 D.R.B.  
Revised: 04-05-10 D.R.B.



NOTE:  
Flare Pit is to be located a min. of 100' from the Well Head.

**SWAMP LEGEND:**  
LS - LEVEL SPREADER  
ECB - EROSION CONTROL BLANKET  
SCE - STABILIZED CONSTRUCTION ENTRANCE  
SedR - SEDIMENT RESERVOIR  
SL - SLASH  
ST - SEDIMENT TRAP  
TB - TOE BERM  
VB - VEGETATED BUFFER  
W - WATTLE

NOTE:  
Re-Route Existing Fenceline Around Location to the East

**RESERVE PIT**  
Total Pit Capacity W/2' of Freeboard = 18,580 Bbls. ±  
Total Pit Volume = 4,890 Cu. Yds.

0.19 Ac. to Sed. Res. #1  
3,600 cu.ft./Ac. Drainage  
Vol. = 684 cu.ft.  
L = 43', W=10', D=4'

### NOTES:

Elev. Ungraded Ground At OM16D Loc. Stake = 8357.7'  
FINISHED GRADE ELEV. AT OM16D LOC. STAKE = 8353.4'

### APPROXIMATE ACREAGES

APPROX. WELL DISTURBANCE = ±4.767 ACRES  
ACCESS ROAD DISTURBANCE = ±0.207 ACRES  
TOTAL = ±4.974 ACRES

UINTAH ENGINEERING & LAND SURVEYING  
85 So. 200 East • Vernal, Utah 84078 • (435) 789-1017



# BERRY PETROLEUM COMPANY

## LOCATION DRAWING FOR

WELL PAD P32 595  
SECTION 32, T5S, R95W, 6th P.M.  
SE 1/4 SE 1/4



SCALE

1916 Brass Cap  
1.0' High  
Lat: 39.570320  
Long: 108.068627

1/4 Section Line

Sheet 2a of 12



SCALE: 1" = 200'  
DATE: 04-05-10  
Drawn By: D.R.B.

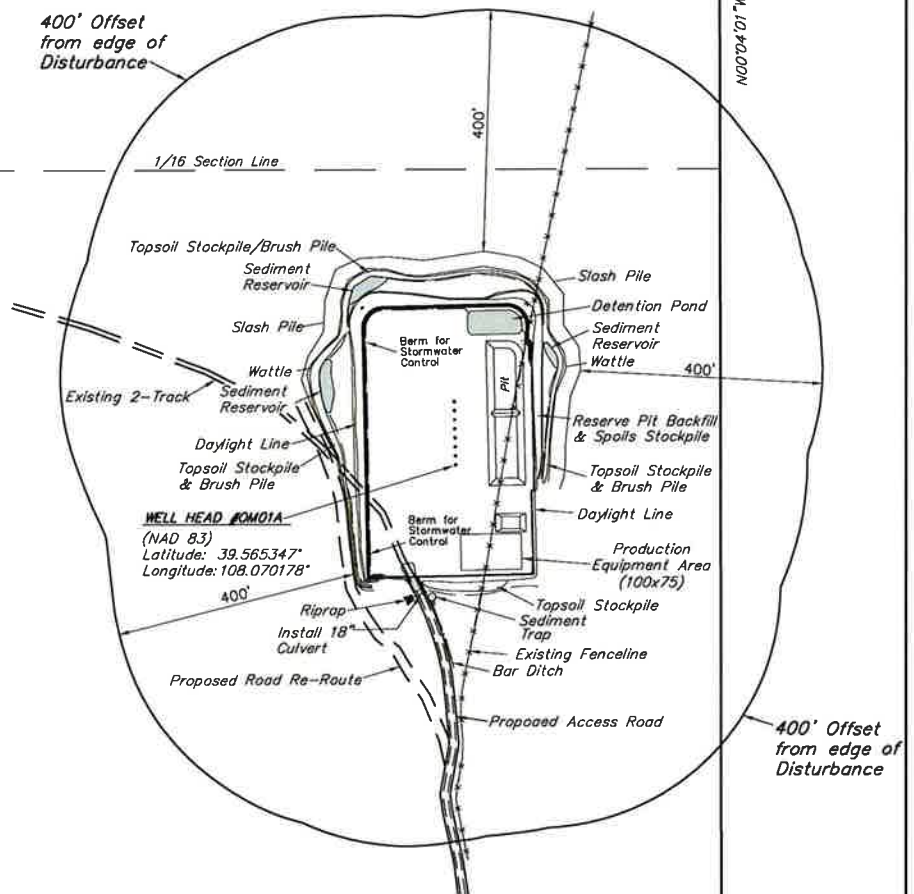
Section Line

N00°04'01"W - 2642.92' (Meas.)

SE 1/4

1/16 Section Line

400' Offset  
from edge of  
Disturbance



400' Offset  
from edge of  
Disturbance

Section Line

S89°55'34"W - 2637.84' (Meas.)

S 1/4 Sec 32  
1916 Brass Cap  
1.0' High  
Lat: 39.563060  
Long: 108.077974

1912 Brass Cap  
1.0' High  
Lat: 39.563066  
Long: 108.068620

### DISTURBANCE ACREAGE:

2.857 ± DRILLING OPERATIONS  
2.541 ± INTERIM RECLAIM

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85 So. 200 East • Vernal, Utah 84078 • (435) 789-1017



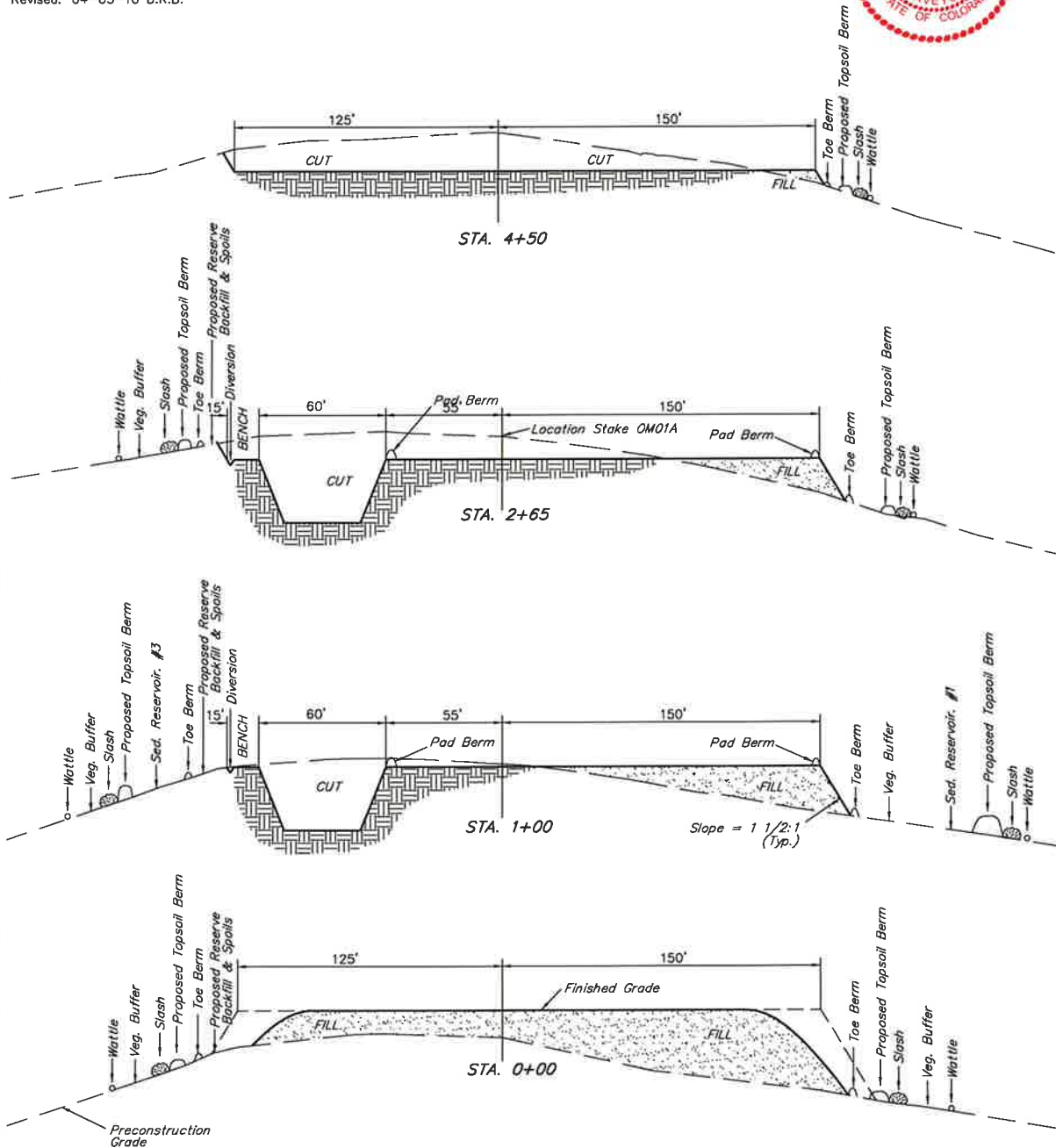
**BERRY PETROLEUM COMPANY**  
**CONSTRUCTION LAYOUT CROSS SECTIONS FOR**

WELL PAD P32 595  
 SECTION 32, T5S, R95W, 6th P.M.  
 SE 1/4 SE 1/4

Sheet 3 of 12

1" = 20'  
 X-Section  
 Scale  
 1" = 50'

DATE: 09-12-06  
 Drawn By: D.R.B.  
 Revised: 09-20-06 D.R.B.  
 Revised: 02-10-09 D.R.B.  
 Revised: 03-20-09 D.R.B.  
 Revised: 04-05-10 D.R.B.



NOTE:  
 Topsoil should not be  
 Stripped Below Finished  
 Grade on Substructure Area.

\* NOTE:  
 FILL QUANTITY INCLUDES  
 5% FOR COMPACTION

**APPROXIMATE YARDAGES**

CUT  
 (6") Topsoil Stripping = 2,660 Cu. Yds.  
 Remaining Location = 13,330 Cu. Yds.  
 TOTAL CUT = 15,990 CU.YDS.  
 FILL = 10,880 CU.YDS.

EXCESS MATERIAL = 5,110 Cu. Yds.  
 Topsoil & Pit Backfill = 5,110 Cu. Yds.  
 (1/2 Pit Vol.)  
 EXCESS UNBALANCE = 0 Cu. Yds.  
 (After Interim Rehabilitation)



**GSE STANDARD PRODUCTS**

## Product Data Sheet

**GSE HD**

GSE HD is a smooth, high quality, high density polyethylene (HDPE) geomembrane produced from specially formulated, virgin polyethylene resin. This polyethylene resin is designed specifically for flexible geomembrane applications. It contains approximately 97.5% polyethylene, 2.5% carbon black and trace amounts of antioxidants and heat stabilizers; no other additives, fillers or extenders are used. GSE HD has outstanding chemical resistance, mechanical properties, environmental stress crack resistance, dimensional stability and thermal aging characteristics. GSE HD has excellent resistance to UV radiation and is suitable for exposed conditions. *These product specifications meet or exceed GRI GM13.*

### Product Specifications

TESTED PROPERTY	TEST METHOD	FREQUENCY	MINIMUM VALUE				
Product Code			HDE 030A000	HDE 040A000	HDE 060A000	HDE 080A000	HDE 100A000
Thickness, mils (mm) or per project specs	ASTM D 5199	every roll	27 (0.69)	36 (0.91)	54 (1.4)	72 (1.8)	90 (2.3)
Density, g/cm <sup>3</sup>	ASTM D 1505	200,000 lb	0.94	0.94	0.94	0.94	0.94
Tensile Properties (each direction)	ASTM D 6693, Type IV	20,000 lb					
Strength at Break, lb/in-width (N/mm)	Dumbell, 2 ipm		122 (21)	162 (28)	243 (43)	324 (57)	405 (71)
Strength at Yield, lb/in-width (N/mm)			63 (11)	84 (15)	130 (23)	173 (30)	216 (38)
Elongation at Break, %	G.L. 2.0 in (51 mm)		700	700	700	700	700
Elongation at Yield, %	G.L. 1.3 in (33 mm)		13	13	13	13	13
Tear Resistance, lb (N)	ASTM D 1004	45,000 lb	21 (93)	28 (125)	42 (187)	56 (249)	70 (311)
Puncture Resistance, lb (N)	ASTM D 4833	45,000 lb	59 (263)	79 (352)	119 (530)	158 (703)	198 (881)
Carbon Black Content, %	ASTM D 1603	20,000 lb	2.0	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 5596	45,000 lb	+Note 1	+Note 1	+Note 1	+Note 1	+Note 1
Notched Constant Tensile Load, hrs	ASTM D 5397, Appendix	200,000 lb	400	400	400	400	400
REFERENCE PROPERTY	TEST METHOD	FREQUENCY	NOMINAL VALUE				
Oxidative Induction Time, minutes	ASTM D 3895, 200° C; O <sub>2</sub> , 1 atm	200,000 lb	>100	>100	>100	>100	>100
Roll Length (approximate), ft (m)			1,120 (341)	870 (265)	560 (171)	430 (131)	340 (104)
Roll Width, ft (m)			22.5 (6.9)	22.5 (6.9)	22.5 (6.9)	22.5 (6.9)	22.5 (6.9)
Roll Area, ft <sup>2</sup> (m <sup>2</sup> )			25,200 (2,341)	19,575 (1,819)	12,600 (1,171)	9,675 (899)	7,650 (711)

#### NOTES:

- +Note 1: Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.
- GSE HD is available in rolls weighing about 3,900 lb (1,769 kg)
- All GSE geomembranes have dimensional stability of  $\pm 2\%$  when tested with ASTM D 1204 and LTB of  $< 77^\circ \text{C}$  when tested with ASTM D 746.

DS005 R03/8/04

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**Americas**  
**Europe/Middle East/Africa**  
**Asia/Pacific**

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GSE Lining Technology Company Ltd.

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800-435-2008

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49-40-767420  
66-2-937-0091

Fax: 281-230-8650  
Fax: 49-40-7674233  
Fax: 66-2-937-0097

This product data sheet is also available on our website at:

**www.gseworld.com**

## **ATTACHMENT E**

# BERRY PETROLEUM COMPANY

## WELL PAD P32 595

LOCATED IN GARFIELD COUNTY, COLORADO  
SECTION 32, T5S, R95W, 6th P.M.



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: NORTHERLY



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: SOUTHERLY



Since 1964

UELS

Uintah Engineering & Land Surveying  
85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

LOCATION PHOTOS

02 23 09  
MONTH DAY YEAR

PHOTO

TAKEN BY: B.B.

DRAWN BY: Z.L.

REVISED: 00-00-00



# BERRY PETROLEUM COMPANY

## WELL PAD P32 595

LOCATED IN GARFIELD COUNTY, COLORADO

SECTION 32, T5S, R95W, 6th P.M.



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: EASTERLY



PHOTO: VIEW OF LOCATION STAKE

CAMERA ANGLE: WESTERLY



Uintah Engineering & Land Surveying  
85 South 200 East Vernal, Utah 84078  
(435) 789-1017 \* FAX (435) 789-1813

LOCATION PHOTOS

02 23 09  
MONTH DAY YEAR

PHOTO

TAKEN BY: B.B.

DRAWN BY: Z.L.

REVISED: 00-00-00

# T55, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

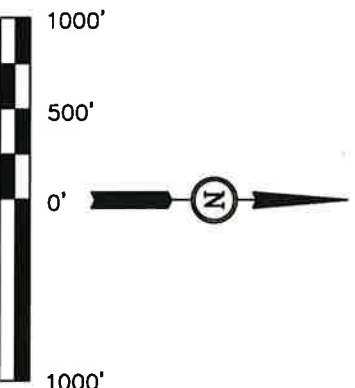
Well location, MILK CABIN OM01A P32 595 (SURFACE LOCATION), located as shown in the SE 1/4 SE 1/4 of Section 32, T55, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T55, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A C.P.S. OBSERVATION.



### SCALE

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Revised: 02-20-09 D.R.B.  
Revised: 02-10-09 D.R.B.

REGISTERED AND SURVEYOR  
REGISTRATION NO. 17492  
STATE OF COLORADO

**UNTAR ENGINEERING & LAND SURVEYING**  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(436) 789-1017

SCALE 1" = 1000'

DATE SURVEYED: 08-31-06 DATE DRAWN: 09-12-06

PARTY

G.O. B.S. D.R.B.

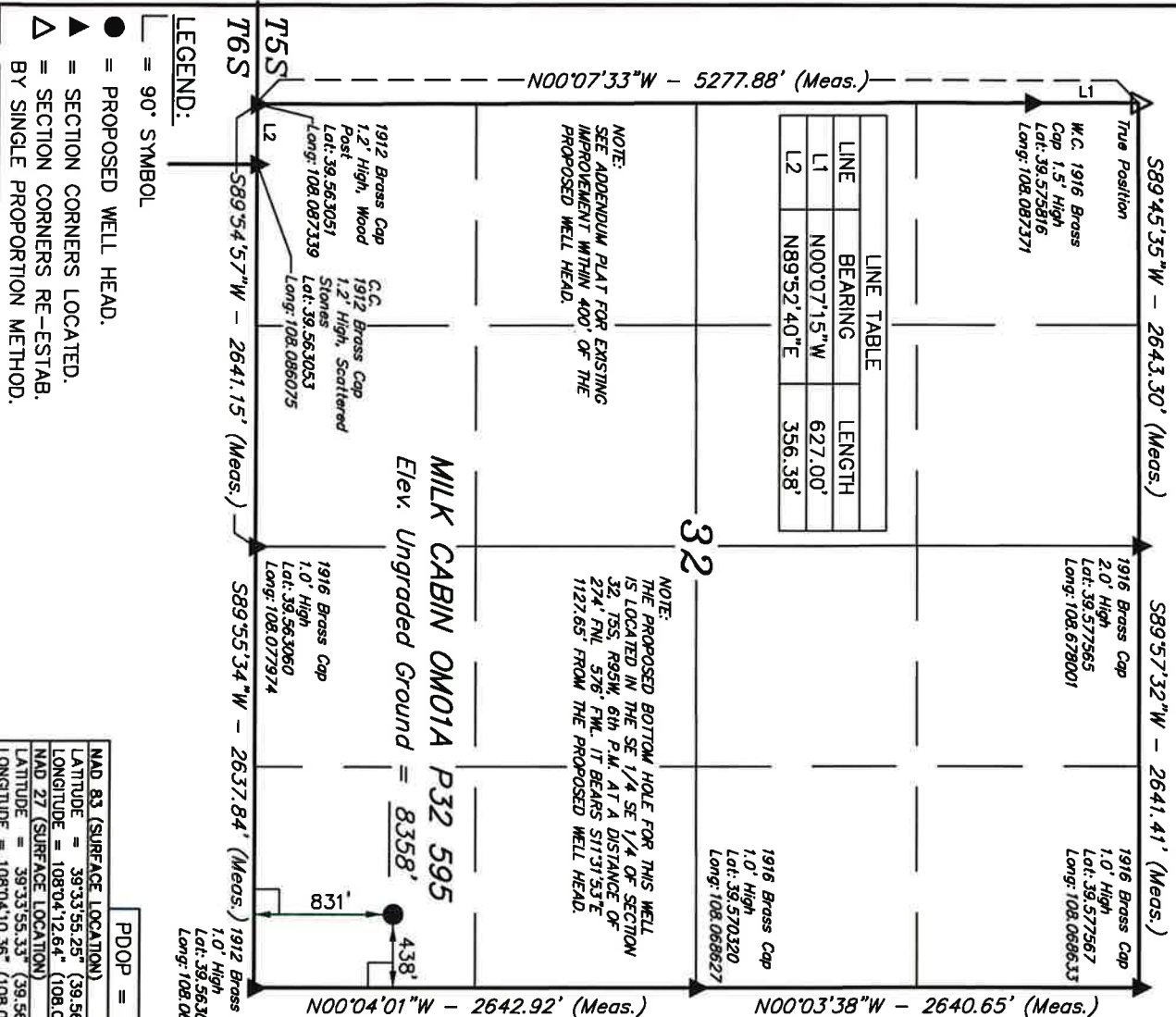
REFERENCES  
G.L.O. PLAT

WEATHER

WARM

FILE

BERRY PETROLEUM COMPANY



1912 Brass Cap 1.0' High  
Lat: 38.563066 Long: 108.086620

PDOP = 2.7

NAD 83 (SURFACE LOCATION)	
LATITUDE = 39.3355.25" (39.565347)	
LONGITUDE = 108.0412.64" (108.070178)	
NAD 27 (SURFACE LOCATION)	
LATITUDE = 39.3355.33" (39.565369)	
LONGITUDE = 108.0410.36" (108.069544)	

1912 Brass Cap  
1.2' High, Wooden  
Post  
Lat: 39.563053  
Long: 108.087339

1916 Brass Cap  
1.0' High  
Lat: 39.563061  
Long: 108.077975

1912 Brass Cap  
1.0' High  
Lat: 39.563066  
Long: 108.068620

1912 Brass Cap  
1.2' High  
Lat: 39.563075  
Long: 108.059275

755  
S89°54'57"W - 2641.15' (Meas.)

76S  
S89°54'15"W - 2635.47' (Meas.)

C.C.  
1912 Brass Cap  
1.2' High, Scattered  
Stones  
Lat: 39.563053  
Long: 108.086075

MILK CABIN  
OM01A P32 595  
TARGET BOTTOM HOLE

C.C.  
1912 Brass Cap  
1.0' High  
Lat: 39.563067  
Long: 108.067336

N00°07'03"W - 4044.09' (Meas.)

N00°02'02"E - 4052.63' (Meas.)

N00°04'56"W - 2637.75' (Meas.)

N00°07'27"W - 2641.79' (Meas.)

N89°56'24"W - 5276.15' (Meas.)

1912 Brass Cap  
1.0' High  
Lat: 39.551953  
Long: 108.086050

1912 Brass Cap  
0.2' High, N-S  
Fence  
Lat: 39.551944  
Long: 108.067350

LINE	BEARING	LENGTH
L2	N89°52'40"E	356.38'
L3	S89°54'51"W	362.28'

NAD 83 (TARGET BOTTOM HOLE)	
LATITUDE =	39°33'44.33" (39.562314)
LONGITUDE =	108°04'09.77" (108.069381)
NAD 27 (TARGET BOTTOM HOLE)	
LATITUDE =	39°33'44.41" (39.562336)
LONGITUDE =	108°04'07.49" (108.068747)

NOTE:  
THE PROPOSED BOTTOM HOLE FOR THIS WELL  
BEARS S71°31'53"E 1127.65' FROM THE  
PROPOSED WELL HEAD.

# BERRY PETROLEUM COMPANY

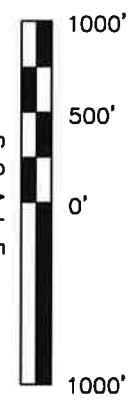
Well location, MILK CABIN OM01A P32 595  
(TARGET BOTTOM HOLE), located as shown in  
the NE 1/4 NE 1/4 of Section 2, T6S, R96W,  
6th P.M., Garfield County, Colorado.

## BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION  
30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH  
QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE  
SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED  
STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY.  
SAID ELEVATION IS MARKED AS BEING 5966 FEET.

## BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.



## SCALE

### CERTIFICATE

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM  
FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY  
SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE  
BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED AND SURVEYOR  
REGISTRATION NO. 17492  
STATE OF COLORADO

UNTAH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(435) 789-1017

SCALE 1" = 1000'	DATE SURVEYED: 08-31-06	DATE DRAWN: 09-12-06
PARTY C.O. B.S. D.R.B.	REFERENCES G.L.O. PLAT	
WEATHER WARM	FILE	BERRY PETROLEUM COMPANY



# T5S, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

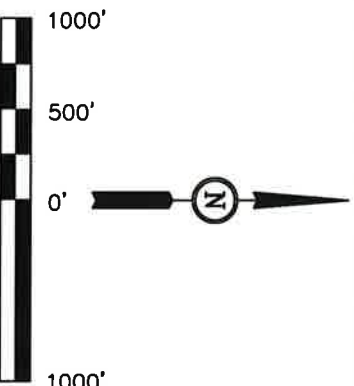
Well location, MILK CABIN OM09B P32 595, located as shown in the SE 1/4 SE 1/4 of Section 32, T5S, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.



### CERTIFICATE

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Revised: 02-20-09 D.R.B.  
Revised: 02-10-09 D.R.B.

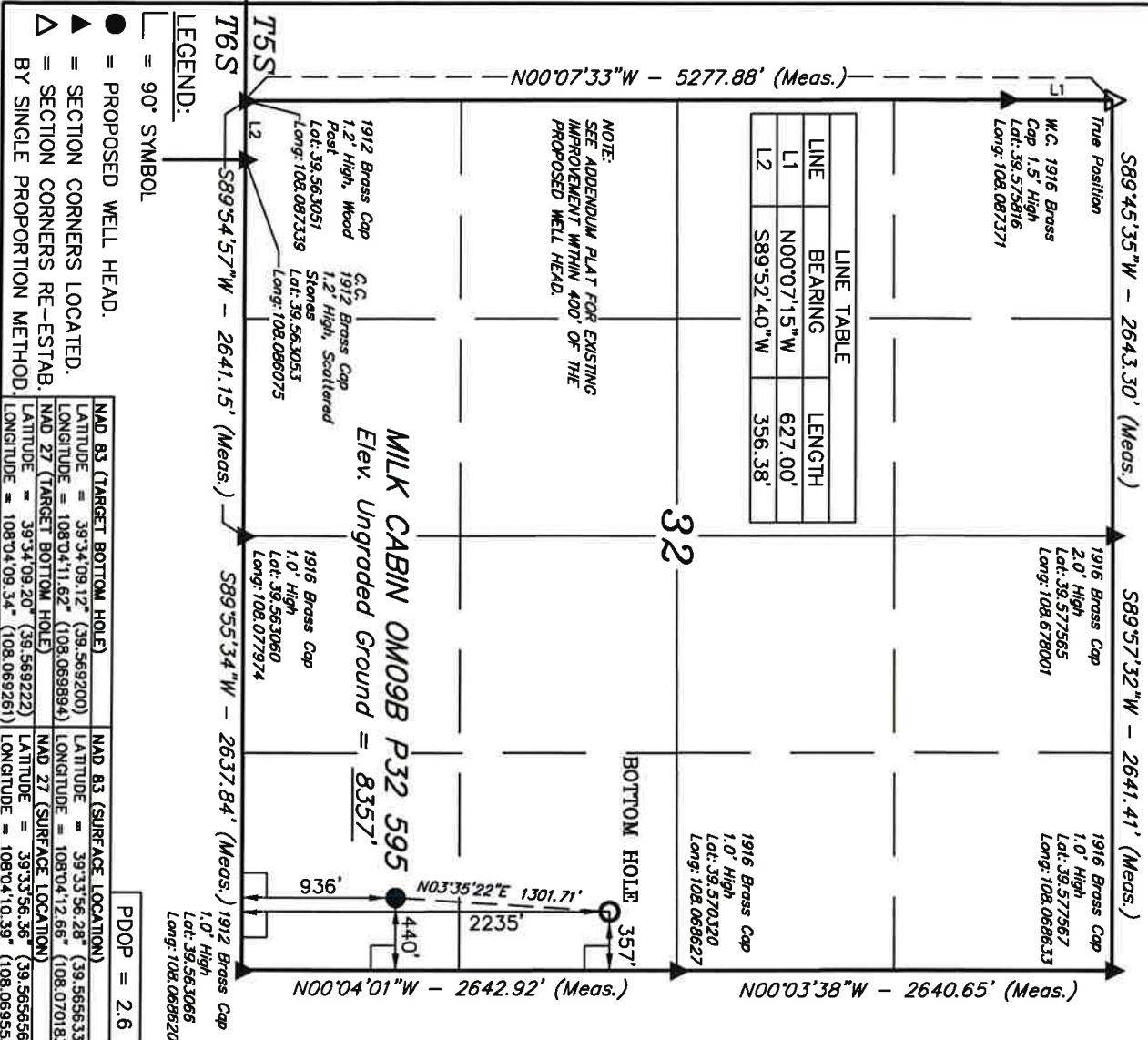
REGISTERED LAND SURVEYOR  
REGISTRATION NO. 1742  
STATE OF COLORADO

UINTAH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(436) 789-1017

SCALE 1" = 1000' DATE SURVEYED: 08-31-06 DATE DRAWN: 09-12-06

PARTY G.O. B.S. D.R.B. REFERENCES G.L.O. PLAT

WEATHER WARM FILE BERRY PETROLEUM COMPANY





# T5S, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

Well location, MILK CABIN OM09C P32 595, located as shown in the SE 1/4 SE 1/4 of Section 32, T5S, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

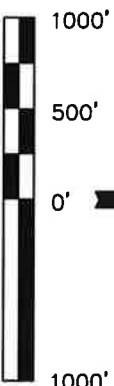
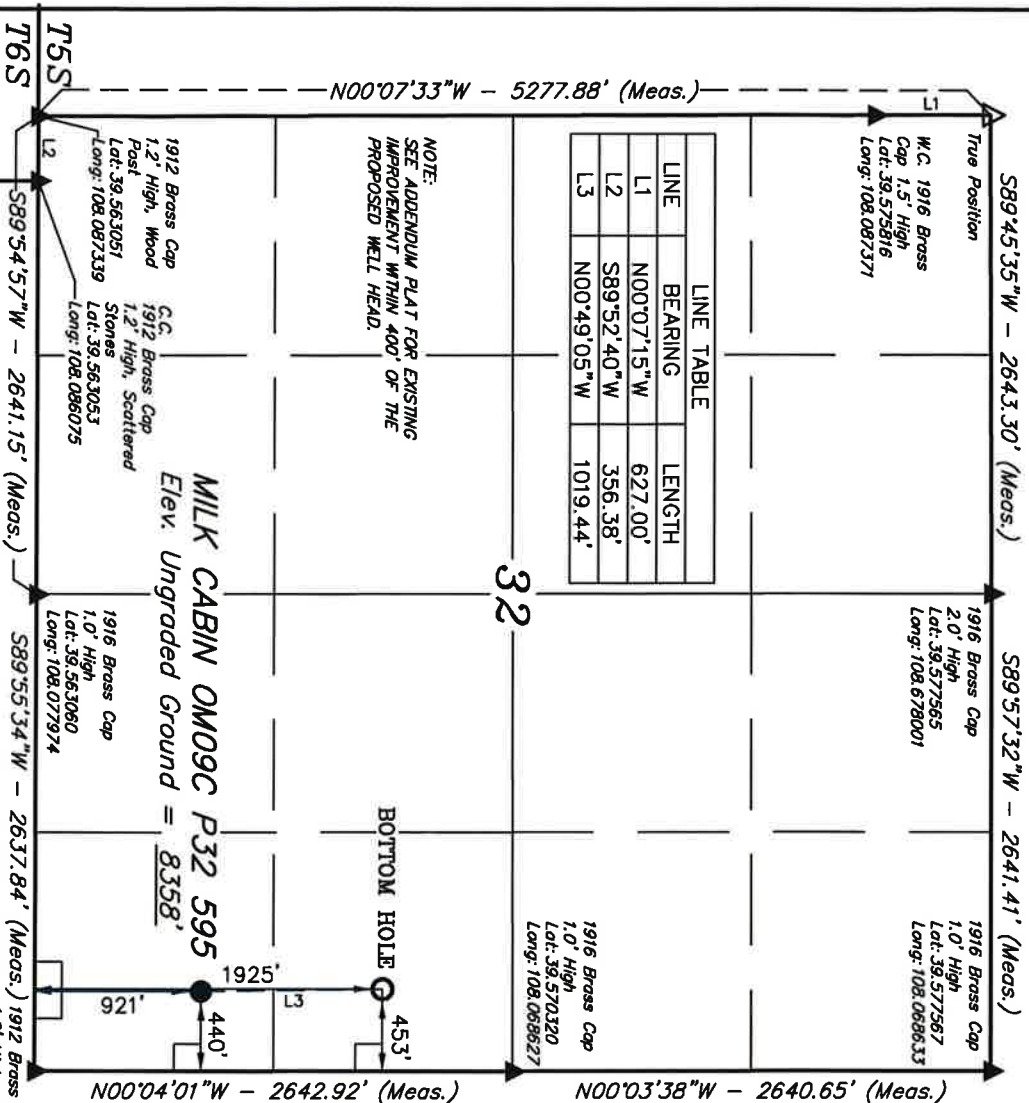
SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.

LINE	BEARING	LENGTH
L1	N00°07'15"W	627.00'
L2	S89°52'40"W	356.38'
L3	N00°49'05"W	1019.44'

NOTE:  
SEE ADDENDUM PLAT FOR EXISTING  
IMPROVEMENT WITHIN 400' OF THE  
PROPOSED WELL HEAD.



### SCALE

### CERTIFICATE

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME, OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Revised: 02-20-09 D.R.B.  
Revised: 02-10-09 D.R.B.

REGISTERED LAND SURVEYOR  
REGISTRATION NO. 1292  
STATE OF COLORADO

UTAH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(435) 789-1017

SCALE 1" = 1000'

DATE SURVEYED: 08-31-06 DATE DRAWN: 09-12-06

PARTY G.O. B.S. D.R.B. REFERENCES G.L.O. PLAT

WEATHER WARM FILE BERRY PETROLEUM COMPANY

PDOP = 2.6

LEGEND:	
●	= 90° SYMBOL
●	= PROPOSED WELL HEAD.
▲	= SECTION CORNERS LOCATED.
△	= SECTION CORNERS RE-ESTAB.
BY SINGLE PROPORTION METHOD.	

NAD 83 (TARGET BOTTOM HOLE)	NAD 83 (SURFACE LOCATION)
LATITUDE = 39°34'06.06" (39.568350)	LATITUDE = 39°33'56.13" (39.565592)
LONGITUDE = 108°04'14.84" (108.070789)	LONGITUDE = 108°04'12.66" (108.070183)
NAD 27 (TARGET BOTTOM HOLE)	NAD 27 (SURFACE LOCATION)
LATITUDE = 39°34'06.14" (39.568372)	LATITUDE = 39°33'56.22" (39.565617)
LONGITUDE = 108°04'10.56" (108.069600)	LONGITUDE = 108°04'10.38" (108.069550)

# T5S, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

Well location, MILK CABIN OM09D P32 595, located as shown in the SE 1/4 SE 1/4 of Section 32, T5S, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

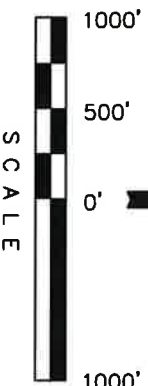
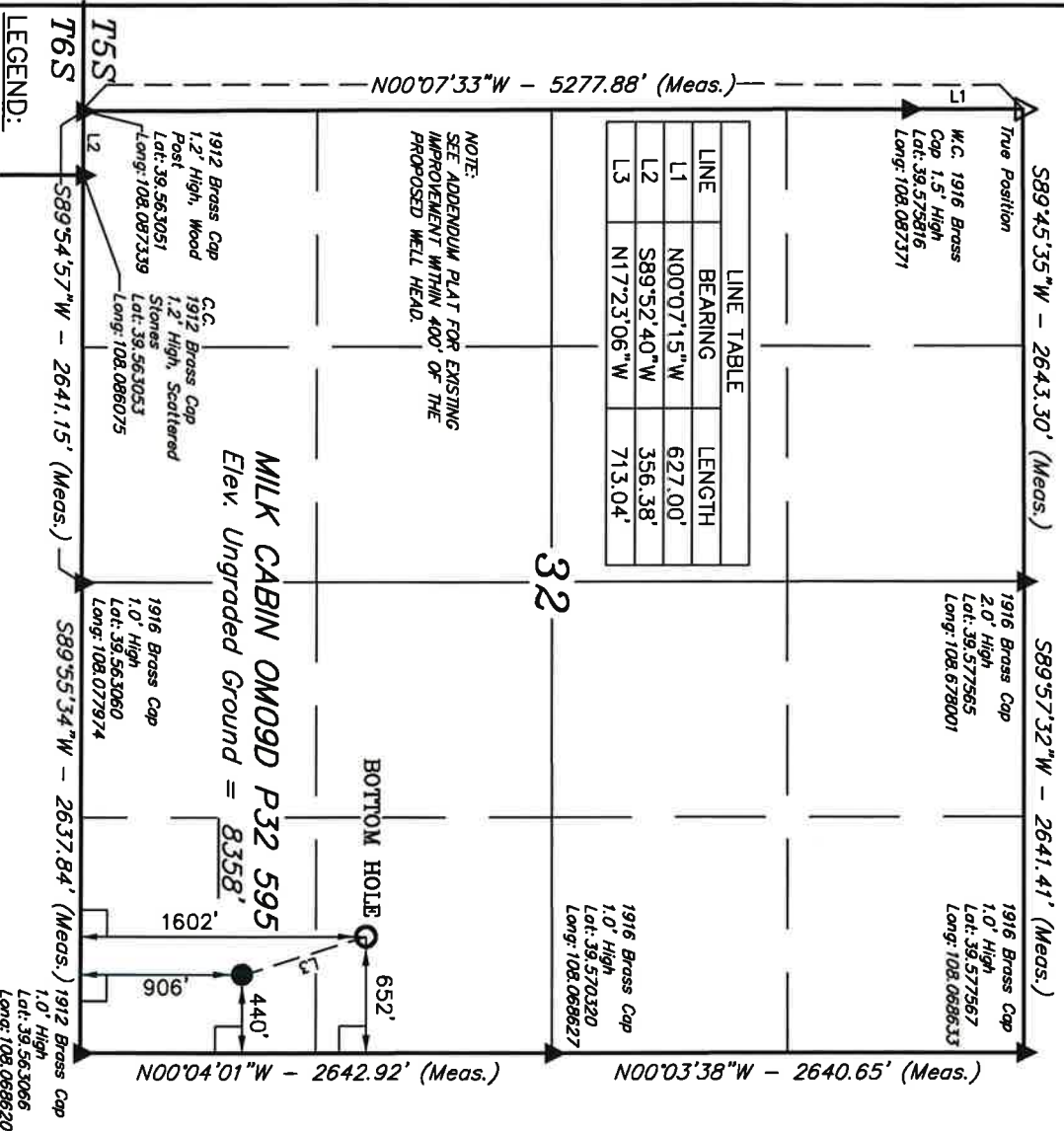
SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.

LINE TABLE	
LINE	BEARING
L1	N00°07'15"W
L2	S89°52'40"W
L3	N17°23'06"W

NOTE:  
SEE ADDENDUM PLAT FOR EXISTING  
IMPROVEMENT WITHIN 400' OF THE  
PROPOSED WELL HEAD.



### CERTIFICATE

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Revised: 02-20-09 D.R.B.  
Revised: 02-13-09 D.R.B.  
Revised: 02-10-09 D.R.B.

REGISTERED LAND SURVEYOR  
REGISTRATION NO. 17392  
STATE OF COLORADO

UTAH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(435) 789-1017

SCALE  
1" = 1000'

DATE SURVEYED: 08-31-06  
DATE DRAWN: 09-12-06

PARTY

G.O. B.S. D.R.B.

REFERENCES  
G.L.O. PLAT

WEATHER

WARM

FILE

BERRY PETROLEUM COMPANY

- = 90° SYMBOL
- = PROPOSED WELL HEAD.
- ▲ = SECTION CORNERS LOCATED.
- △ = SECTION CORNERS RE-ESTAB.

BY SINGLE PROPORTION METHOD.

1912 Brass Cap  
1.0' High  
Lat: 39.563066  
Long: 108.068620

PDOP = 2.6

NAD 83 (TARGET BOTTOM HOLE)

LATITUDE = 39°34'02.86" (39.567461)

LONGITUDE = 108°04'15.38" (108.070933)

NAD 27 (TARGET BOTTOM HOLE)

LATITUDE = 39°34'02.94" (39.567483)

LONGITUDE = 108°04'13.10" (108.070306)

NAD 83 (SURFACE LOCATION)

LATITUDE = 39°33'55.99" (39.565553)

LONGITUDE = 108°04'12.66" (108.070183)

NAD 27 (SURFACE LOCATION)

LATITUDE = 39°33'56.07" (39.565575)

LONGITUDE = 108°04'10.38" (108.069550)





BERRY PETROLEUM COMPANY

T5S, R95W, 6th P.M.

Well location, MILK CABIN OM13B P32 595 (TARGET BOTTOM HOLE), located as shown in the SW 1/4 SW 1/4 of Section 33, T5S, R95W, 6th P.M., Garfield County, Colorado.

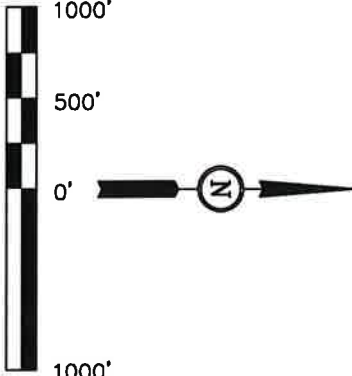
BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GUICH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.

LINE TABLE		
LINE	BEARING	LENGTH
1.3	N00°10'14"W	326.70'



CERTIFICATE

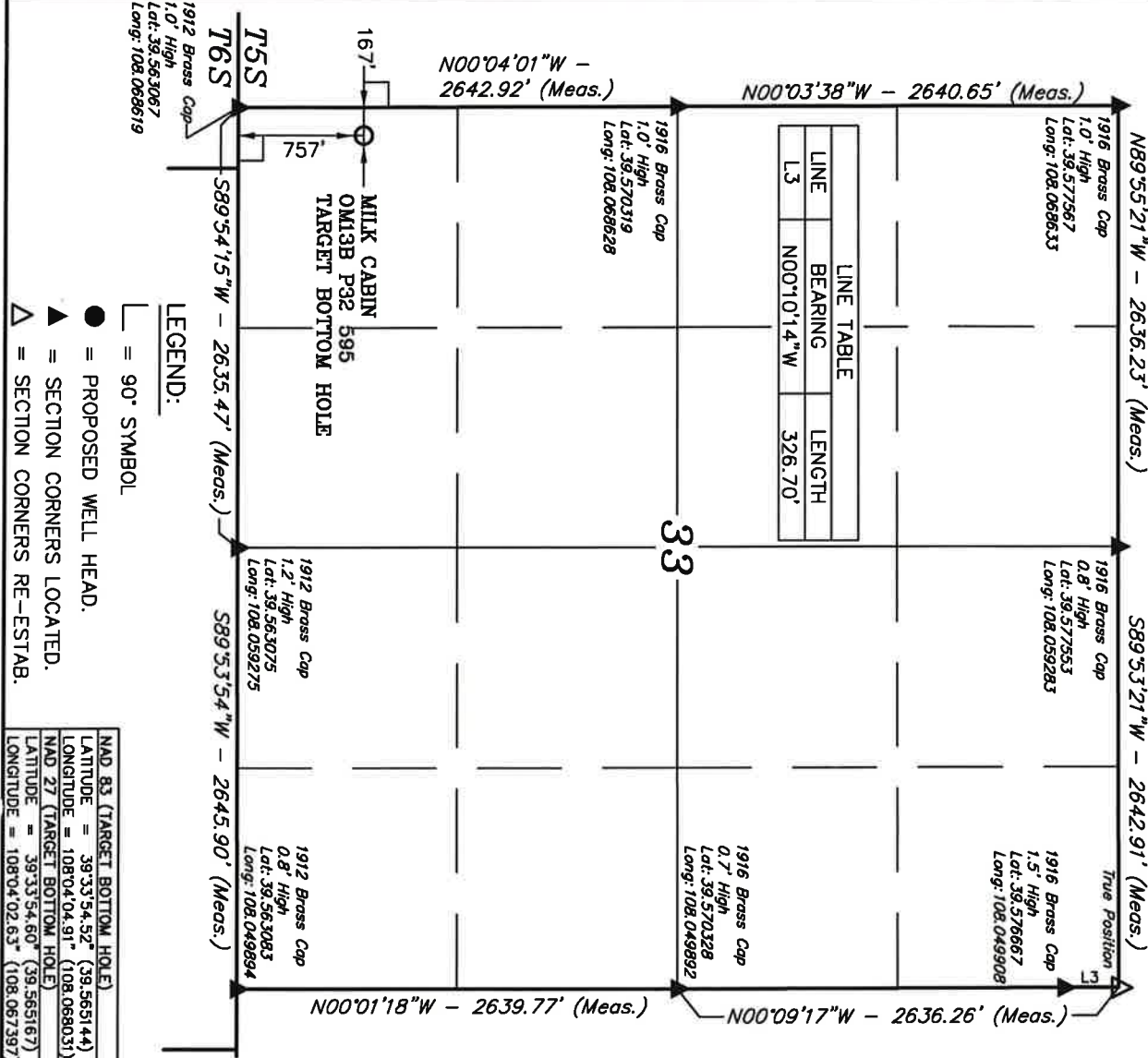
THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME, 08 UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE, AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED LAND SURVEYOR  
REGISTRATION NO. 174492  
STATE OF COLORADO

UTAH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(435) 789-1017

SCALE	DATE SURVEYED:	DATE DRAWN:
1" = 1000'	08-31-06	02-10-09

PARTY	REFERENCES	FILE
G.O. B.S. D.R.B.	G.L.O. PLAT	
WEATHER		BERRY PETROLEUM COMPANY
WARM		





# T5S, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

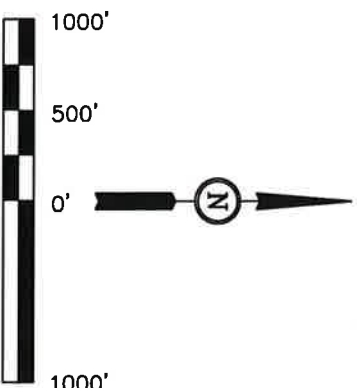
Well location, MILK CABIN OM16A P32 595, located as shown in the SE 1/4 SE 1/4 of Section 32, T5S, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.



### CERTIFICATE

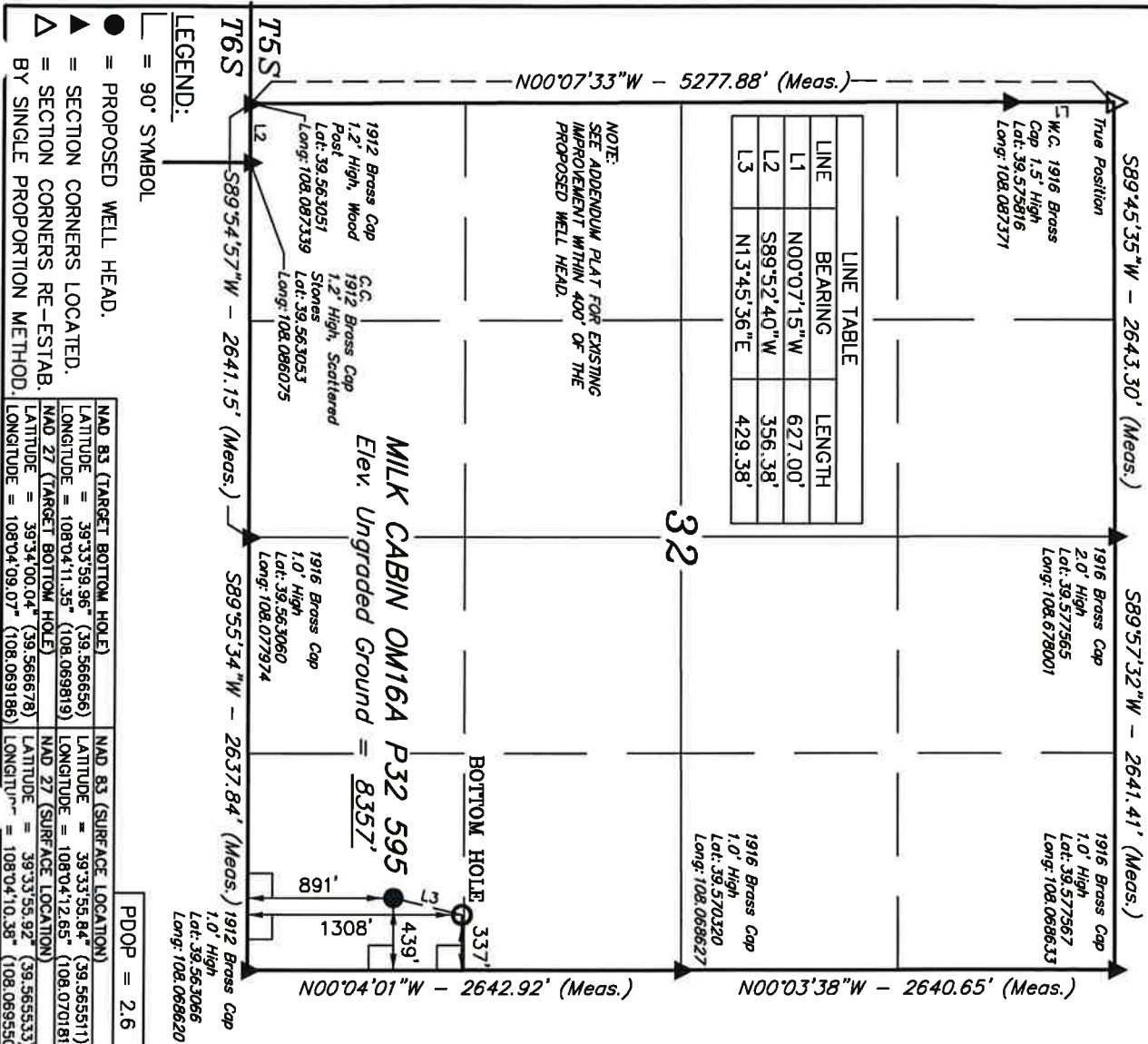
THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Revised: 02-20-09 D.R.B.  
Revised: 02-10-09 D.R.B.

REGISTERED LAND SURVEYOR  
REGISTRATION NO. 17482  
STATE OF COLORADO

UTAH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(435) 789-1017

SCALE 1" = 1000'  
PARTY G.O. B.S. D.R.B.  
WEATHER WARM  
DATE SURVEYED: 08-31-06  
DATE DRAWN: 09-12-06  
REFERENCES C.L.O. PLAT  
FILE BERRY PETROLIUM COMPANY



# T5S, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

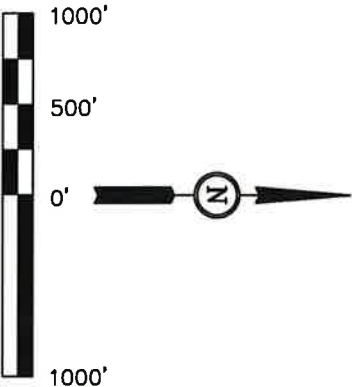
Well location, MILK CABIN OM16B P32 595, located as shown in the SE 1/4 SE 1/4 of Section 32, T5S, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.



### CERTIFICATE

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Revised: 02-20-09 D.R.B.  
Revised: 02-10-09 D.R.B.

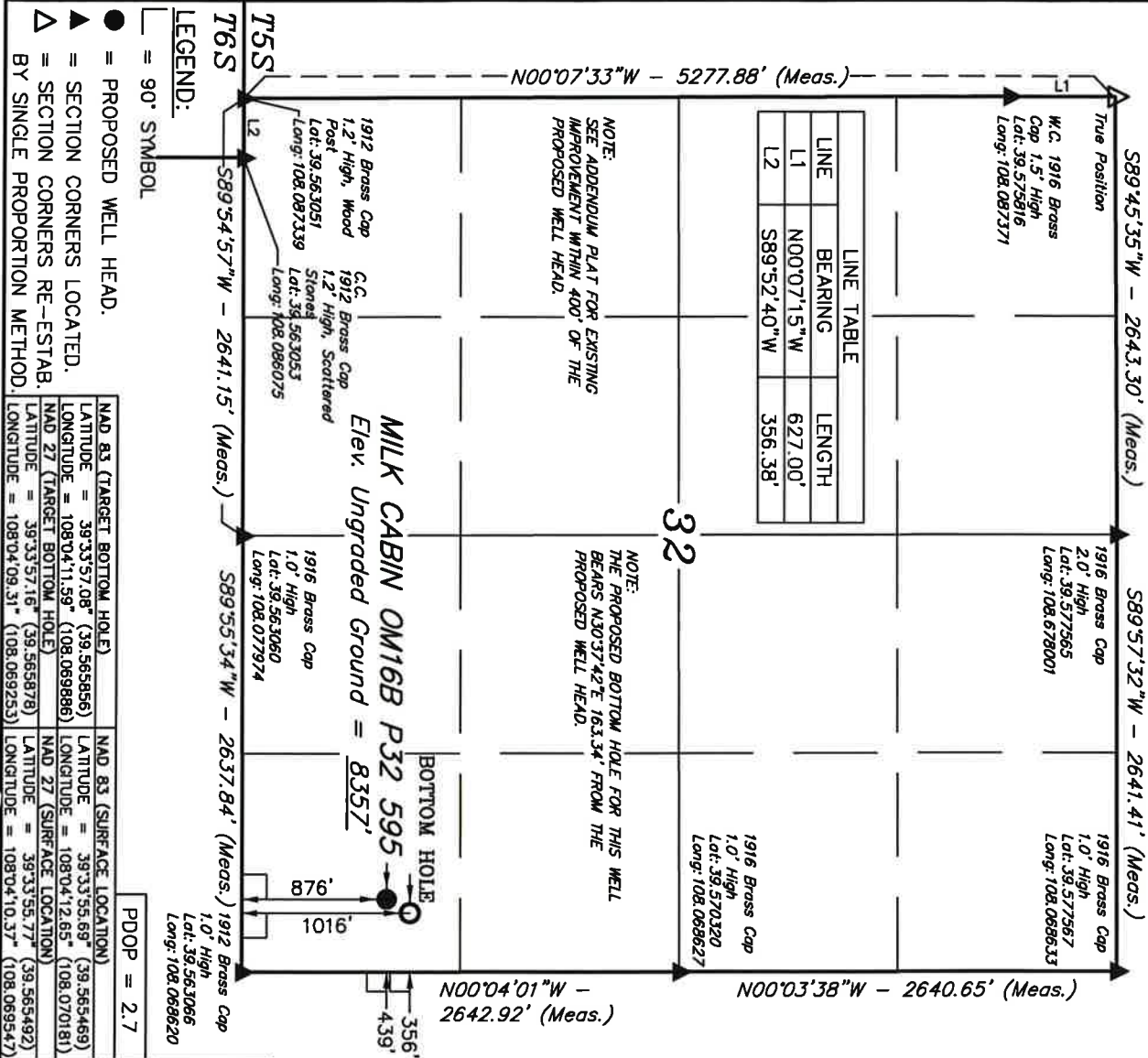
REGISTERED LAND SURVEYOR  
RENEWAL NOT 12/19/20  
STATE OF COLORADO

**UINTAH ENGINEERING & LAND SURVEYING**  
**85 SOUTH 200 EAST - VERNAL, UTAH 84078**  
(435) 789-1017

SCALE 1" = 1000'  
PARTY G.O. B.S. D.R.B.  
WEATHER WARM

DATE SURVEYED: 08-31-06  
DATE DRAWN: 09-12-06  
REFERENCES G.L.O. PLAT

FILE BERRY PETROLEUM COMPANY



# T5S, R95W, 6th P.M.

## BERRY PETROLEUM COMPANY

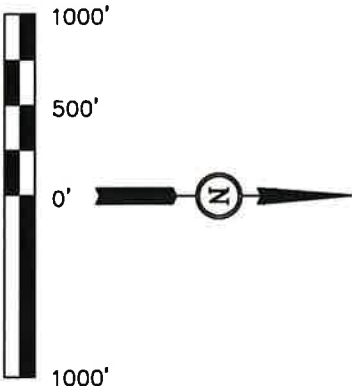
Well location, MILK CABIN OM16D P32 59S, located as shown in the SE 1/4 SE 1/4 of Section 32, T5S, R95W, 6th P.M., Garfield County, Colorado.

### BASIS OF ELEVATION

SPOT ELEVATION AT THE NORTHWEST CORNER OF SECTION 30, T5S, R95W, 6th P.M. TAKEN FROM THE FORKED GULCH QUADRANGLE, COLORADO, GARFIELD COUNTY, 7.5 MINUTE SERIES (TOPOGRAPHICAL MAP) PUBLISHED BY THE UNITED STATES DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY. SAID ELEVATION IS MARKED AS BEING 5966 FEET.

### BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.



### SCALE

THIS IS TO CERTIFY THAT THE ABOVE PLAT WAS PREPARED FROM FIELD NOTES OF ACTUAL SURVEYS MADE BY ME OR UNDER MY SUPERVISION AND THAT THE SAME ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Revised: 02-20-09 D.R.B.  
Revised: 02-10-09 D.R.B.

REGISTERED AND SHAWNEE  
REGISTRATION NO. 17492  
STATE OF COLORADO

**UTAH ENGINEERING & LAND SURVEYING**  
**85 SOUTH 200 EAST - VERNAL, UTAH 84078**  
(435) 789-1017

SCALE 1" = 1000'  
DATE SURVEYED: 08-31-06  
DATE DRAWN: 09-12-06

PARTY G.O. B.S. D.R.B.  
REFERENCES G.L.O. PLAT

WEATHER WARM  
BERRY PETROLEUM COMPANY

LINE	BEARING	LENGTH
L1	N00°07'15"W	627.00'
L2	S89°52'40"W	356.38'
L3	S30°11'19"E	470.07'

NOTE:  
SEE ADDENDUM PLAT FOR EXISTING  
IMPROVEMENT WITHIN 400' OF THE  
PROPOSED WELL HEAD.

MILK CABIN OM16D P32 59S  
Elev. Ungraded Ground = 8357'

1912 Brass Cap  
1.2' High, Wood  
Post  
Lat: 39.563051  
Long: 108.087339

C.C.  
1912 Brass Cap  
1.2' High, Scattered  
Stones  
Lat: 39.563053  
Long: 108.086075

1916 Brass Cap  
1.0' High  
Lat: 39.563060  
Long: 108.077874

BOTTOM HOLE  
4.39'  
4.30'  
203'

T5S  
S89°54'57"W - 2641.15' (Meas.)  
S89°55'34"W - 2637.84' (Meas.)  
1912 Brass Cap  
1.0' High  
Lat: 39.563066  
Long: 108.068620

T6S

LEGEND:  
= 90° SYMBOL  
= PROPOSED WELL HEAD.

▲ = SECTION CORNERS LOCATED.  
△ = SECTION CORNERS RE-ESTAB.  
BY SINGLE PROPORTION METHOD.

NAD 83 (TARGET BOTTOM HOLE)		NAD 83 (SURFACE LOCATION)	
LATITUDE = 39°33'51.38" (39.564272)	LATITUDE = 39°33'55.38" (39.565386)		
LONGITUDE = 108°04'09.63" (108.089342)	LONGITUDE = 108°04'12.64" (108.070178)		
NAD 27 (TARGET BOTTOM HOLE)		NAD 27 (SURFACE LOCATION)	
LATITUDE = 39°33'51.46" (39.564294)	LATITUDE = 39°33'55.48" (39.565411)		
LONGITUDE = 108°04'07.35" (108.088708)	LONGITUDE = 108°04'10.37" (108.089547)		

PDOP = 2.7

## **ATTACHMENT F**



**FORM  
2A**Rev  
04/01**State of Colorado  
Oil and Gas Conservation Commission**

1120 Lincoln Street, Suite 801, Denver, Colorado 80205 Phone: (303) 894-2100 Fax: (303) 894-2109



DE ET OE ES

Document Number:

400058965

**Oil and Gas Location Assessment**☐ New Location ☒ Amend Existing Location Location#: 413574

Submit original plus one copy. This form is to be submitted to the COGCC prior to any ground disturbance activity associated with oil and gas development operations. This Assessment may be approved as a stand alone application or submitted as an informational report accompanying an Application for Permit-To-Drill, Form 2. Approval of this Assessment will allow for the construction of the below specified location; however, it does not supersede any land use rules applied by the local land use authority. This form may serve as notice to land owners and other interested parties, please see the COGCC web site at <http://colorado.gov/cogcc/> for all accompanying information pertinent to this Oil and Gas Location Assessment.

Location ID:

**413574**

Expiration Date:

**07/20/2013**☒ This location assessment is included as part of a permit application.**1. CONSULTATION**

- ☐ This location is included in a Comprehensive Drilling Plan. CDP # \_\_\_\_\_
- ☒ This location is in a sensitive wildlife habitat area.
- ☐ This location is in a wildlife restricted surface occupancy area.
- ☐ This location includes a Rule 306.d.(1)A.ii. variance request.

**2. Operator**

Operator Number: 10091

Name: BERRY PETROLEUM COMPANY

Address: 1999 BROADWAY STE 3700

City: DENVER State: CO Zip: 80202

**3. Contact Information**

Name: JANNI KEIDEL

Phone: (303) 999-4225

Fax: (303) 999-4325

email: jek@bry.com

**4. Location Identification:**

Name: MILK CABIN "P32 595" PAD Number: OM01A P32 595

County: GARFIELD

Quarter: SESE Section: 32 Township: 5S Range: 95W Meridian: 6 Ground Elevation: 8358

Define a single point as a location reference for the facility location. This point should be used as the point of measurement in the drawings to be submitted with this application. When the location is to be used as a well site then the point shall be a well location.

Footage at surface: 831 feet, from North or South section line: FSL and 438 feet, from East or West section line: FEL

Latitude: 39.565347 Longitude: -108.070178 PDOP Reading: 2.7 Date of Measurement: 08/31/2006

Instrument Operator's Name: ROBERT KAY

**5. Facilities (Indicate the number of each type of oil and gas facility planned on location):**

Special Purpose Pits: <input type="text" value="1"/>	Drilling Pits: <input type="text" value="1"/>	Wells: <input type="text" value="8"/>	Production Pits: <input type="text" value="1"/>	Dehydrator Units: <input type="text"/>
Condensate Tanks: <input type="text" value="2"/>	Water Tanks: <input type="text" value="2"/>	Separators: <input type="text" value="3"/>	Electric Motors: <input type="text" value="3"/>	Multi-Well Pits: <input type="text"/>
Gas or Diesel Motors: <input type="text" value="6"/>	Cavity Pumps: <input type="text"/>	LACT Unit: <input type="text"/>	Pump Jacks: <input type="text"/>	Pigging Station: <input type="text"/>
Electric Generators: <input type="text" value="3"/>	Gas Pipeline: <input type="text" value="1"/>	Oil Pipeline: <input type="text"/>	Water Pipeline: <input type="text" value="1"/>	Flare: <input type="text"/>
Gas Compressors: <input type="text"/>	VOC Combustor: <input type="text"/>	Oil Tanks: <input type="text" value="1"/>	Fuel Tanks: <input type="text" value="2"/>	

Other: DRILLING RIG TEMPORARY ON LOCATION FOR 10 DAYS PER WELL. SEPARTORS USED WILL BE: 2 QUADS, 1 DBL. TEMPORARY OFFICE AND HOUSING.

**6. Construction:**

Date planned to commence construction: 08/01/2010 Size of disturbed area during construction in acres: 4.94  
Estimated date that interim reclamation will begin: 05/01/2011 Size of location after interim reclamation in acres: 4.78  
Estimated post-construction ground elevation: 8353 Will a closed loop system be used for drilling fluids: Yes ☐  
Will salt sections be encountered during drilling: Yes ☐ No ☒ Is H2S anticipated? Yes ☐ No ☒  
Will salt (>15,000 ppm TDS Cl) or oil based muds be used: Yes ☐ No ☒  
Mud disposal: Offsite ☐ Onsite ☒ Method: Land Farming ☐ Land Spreading ☒ Disposal Facility ☐  
Other: \_\_\_\_\_

**7. Surface Owner:**

Name: \_\_\_\_\_ Phone: \_\_\_\_\_  
Address: \_\_\_\_\_ Fax: \_\_\_\_\_  
Address: \_\_\_\_\_ Email: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_ Date of Rule 306 surface owner consultation: 06/10/2010  
Surface Owner: ☒ Fee ☐ State ☐ Federal ☐ Indian  
Mineral Owner: ☒ Fee ☐ State ☐ Federal ☐ Indian  
The surface owner is: ☒ the mineral owner ☒ committed to an oil and gas lease  
☐ is the executor of the oil and gas lease ☐ the applicant  
The right to construct the location is granted by: ☒ oil and gas lease ☐ Surface Use Agreement ☐ Right of Way  
☐ applicant is owner  
Surface damage assurance if no agreement is in place: ☐ \$2000 ☐ \$5000 ☐ Blanket Surety ID \_\_\_\_\_

**8. Reclamation Financial Assurance:**

☒ Well Surety ID: 20040105 ☒ Gas Facility Surety ID: 20040107 ☐ Waste Mgmt. Surety ID: \_\_\_\_\_

**9. Cultural:**

Is the location in a high density area (Rule 603.b.): Yes ☐ No ☒  
Distance, in feet, to nearest building: 31751, public road: 11354, above ground utilit: 12184  
\_\_\_\_\_, railroad: 33934, property line: 6125

**10. Current Land Use (Check all that apply):**

Crop Land: ☐ Irrigated ☐ Dry land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP  
Non-Crop Land: ☒ Rangeland ☐ Timber ☐ Recreational ☐ Other (describe): \_\_\_\_\_  
Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

**11. Future Land Use (Check all that apply):**

Crop Land: ☐ Irrigated ☐ Dry land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP  
Non-Crop Land: ☒ Rangeland ☐ Timber ☐ Recreational ☐ Other (describe): \_\_\_\_\_  
Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

**12. Soils:**

List all soil map units that occur within the proposed location. Attach the National Resource Conservation Service (NRCS) report showing the "Map Unit Description" report listing the soil typical vertical profile. This data is to be used when segregating topsoil.

The required information can be obtained from the NRCS web site at <http://soildatamart.nrcs.usda.gov/> or from the COGCC web site GIS Online map page found at <http://colorado.gov/cogcc>. Instructions are provided within the COGCC web site help section.

NRCS Map Unit Name: # 53 PARACHUTE-RHONE LOAMS. 5 TO 30 PERCENT SLOPES

NRCS Map Unit Name: \_\_\_\_\_

NRCS Map Unit Name: \_\_\_\_\_

### 13. Plant Community:

Complete this section only if any portion of the disturbed area of the location's current land use is on non-crop land.

Are noxious weeds present: Yes ☐ No ☒

Plant species from: ☐ NRCS or, ☒ field observation Date of observation: 08/31/2006

List individual species: OAK BRUSH, SAGE BRUSH AND NATIVE GRASSES

Check all plant communities that exist in the disturbed area.

☐ Disturbed Grassland (Cactus, Yucca, Cheatgrass, Rye)

☒ Native Grassland (Bluestern, Grama, Wheatgrass, Buffalograss, Fescue, Oatgrass, Brome)

☒ Shrub Land (Mahogany, Oak, Sage, Serviceberry, Chokecherry)

☐ Plains Riparian (Cottonwood, Willow, Aspen, Maple, Poplar, Russian Olive, Tamarisk)

☐ Mountain Riparian (Cottonwood, Willow, Blue Spruce)

☐ Forest Land (Spruce, Fir, Ponderosa Pine, Lodgepole Pine, Juniper, Pinyon, Aspen)

☐ Wetlands Aquatic (Bullrush, Sedge, Cattail, Arrowhead)

☐ Alpine (above timberline)

☐ Other (describe): \_\_\_\_\_

### 14. Water Resources:

Rule 901.e. may require a sensitive area determination be performed. If this determination is performed the data is to be submitted with the Form 2A.

Is this a sensitive area: ☐ No ☒ Yes Was a Rule 901.e. Sensitive Areas Determination performed: ☒ No ☐ Yes

Distance (in feet) to nearest surface water: 953, water well: 7654, depth to ground water: 150

Is the location in a riparian area: ☒ No ☐ Yes Was an Army Corps of Engineers Section 404 permit filed ☒ No ☐ Yes

Is the location within a Rule 317B Surface Water Suppl Area buffer zone:

☒ No ☐ 0-300 ft. zone ☐ 301-500 ft. zone ☐ 501-2640 ft. zone

If the location is within a Rule 317B Surface Water Supply Area buffer have all public water supply systems within 15 miles been notified: ☒ No ☐ Yes

### 15. Comments:

I certify that there have been no changes on land use, lease description. Pad has been built. Pit has been constructed. Wells have not been drilled. Conductors have not been set. No rig on site. The refile will not require any expansion / additional surface disturbance of pad. The location does not require a variance from any of the rules listed in Rule 306.d. (1). (A). (ii). The location is not in a restricted surface occupancy area. The location is in a sensitive wildlife habitat area for Elk Production. The production casing Top of Cement will be 200' above the Top of Gas. BMP's for this location has been attached as a separate document.

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct and complete.

Signed: \_\_\_\_\_ Date: 06/14/2010 Email: jek@bry.com

Print Name: JANNI KEIDEL Title: PERMITTING AGENT

Based on the information provided herein, this Application for Permit-to-Drill complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: \_\_\_\_\_

*David S. Neskin*

Director of COGCC

Date: 7/21/2010

**CONDITIONS OF APPROVAL, IF ANY:**

**All representations, stipulations and conditions of approval stated in this Form 2A for this location shall constitute representations, stipulations and conditions of approval for any and all subsequent operations on the location unless this Form 2A is modified by Sundry Notice, Form 4 or an Amended Form 2A.**

No portion of any pit that will be used to hold liquids shall be constructed on fill material, unless the pit and fill slope are designed and certified by a professional engineer, subject to review and approval by the director prior to construction of the pit. The construction and lining of the pit shall be supervised by a professional engineer or their agent. The entire base of the pit must be in cut.

The nearby hillside must be monitored for any day-lighting of drilling fluids throughout the drilling of the surface casing interval.

The moisture content of any drill cuttings in a cuttings pit, trench, or pile shall be as low as practicable to prevent accumulation of liquids greater than de minimis amounts. At the time of closure, the drill cuttings must also meet the applicable standards of table 910-1.

Reserve pit must be lined.

Notice to Operators (NTO) Drilling Wells on the Roan Plateau in Garfield County: Comply with all provisions of the June 12, 2008 Notice to Operators (NTO) Drilling Wells Within  $\frac{3}{4}$  Mile of the Rim of the Roan Plateau in Garfield County – Pit Design, Construction, and Monitoring Requirements. At a minimum, the following condition of approval (COA) will apply:

COA 6 - All pits must be lined.

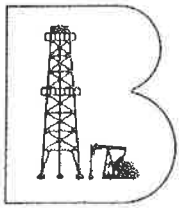
Operator must ensure 110 percent secondary containment for any volume of fluids contained at well site during drilling and completion operations. If fluids are conveyed via pipeline, operator must implement best management practices to contain any unintentional release of fluids.



### **Attachment Check List**

Att Doc Num	Name	Doc Description
2033219	CORRESPONDENCE	LF@2491826 2033219
400058965	FORM 2A SUBMITTED	LF@2490745 400058965
400068973	LOCATION PICTURES	LF@2490746 400068973
400068974	REFERENCE AREA PICTURES	LF@2490747 400068974
400068975	HYDROLOGY MAP	LF@2490748 400068975
400068976	EQUIPMENT LIST	LF@2490749 400068976
400068977	CONST. LAYOUT DRAWINGS	LF@2490750 400068977
400068978	LOCATION DRAWING	LF@2490751 400068978
400068979	ACCESS ROAD MAP	LF@2490752 400068979
400068980	NRCS MAP UNIT DESC	LF@2490753 400068980
400068981	LOCATION DRAWING	LF@2490754 400068981
400068982	CONST. LAYOUT DRAWINGS	LF@2490755 400068982
400068984	CONST. LAYOUT DRAWINGS	LF@2490756 400068984
400068985	MULTI-WELL PLAN	LF@2490757 400068985
400068986	MINERAL LEASE MAP	LF@2490758 400068986
400068987	PROPOSED BMPs	LF@2490759 400068987
400068988	REFERENCE AREA MAP	LF@2490760 400068988

Total Attach: 17 Files



## Berry Petroleum Company

1999 Broadway, Suite 3700

Denver, CO 80202

Main (303) 999-4400

Fax (303) 999-4401

[www.bry.com](http://www.bry.com)

June 4, 2009

EnCana Oil & Gas (USA) Inc.  
370 17<sup>th</sup> Street, Suite 1700  
Denver, Colorado 80202

Attn: Bob Weaver, Land Negotiator

**Re: Wildlife Conditions of Approval**  
**Berry's P32 595 Pad, SESE of Sec. 32-5S 95W**  
**Berry's IO2 696 Pad, SENE of Sec. 2-6S-96W**  
**North Parachute Ranch**  
**Garfield County, Colorado**

Dear Bob,

I have attached your letters dated July 29, 2009 regarding Wildlife COA's for the pads referenced above, four separate letters total. They are all fully executed Berry Petroleum Company.

Thanks for your help in this matter.

Sincerely,

Jerry L. Gonzalez  
Senior Landman

Enclosures as stated



**EnCana Oil & Gas (USA) Inc.**

370 17th Street  
Suite 1700  
Denver, CO 80202

tel: (303) 623-2300  
fax: (303) 623-2400  
www.encana.com

July 29, 2009

Mr. Jerry L. Gonzalez  
Berry Petroleum Company  
1999 Broadway, Suite 3700  
Denver, CO 80202

Re: Berry's P32 595 Pad, SESE of Sec. 32-5S 95W  
Wells - Milk Cabin OM 16D P32 595, 09B P32 595, 16A P32 595, 01A P32 595,  
13B P32 595, 16B P32 595, 09D P32 595, & 09C P32 595  
North Parachute Ranch  
Garfield County, Colorado

Dear Mr. Gonzalez,

This letter is in response to your letter dated June 4, 2009 requesting that EnCana Oil & Gas (USA) Inc. consent, as the surface owner, to conditions of approval that the Colorado Oil and Gas Conservation Commission ("COGCC") has proposed with regard to Applications for Permits to Drill on surface owned by EnCana. Subject to the conditions below, we consent to the implementation of the recommendations of the COGCC.

Our consent to the implementation of the recommendations proposed by the COGCC is conditioned upon Berry's compliance with the Surface Use License Agreement dated June 7, 2006, between EnCana and Berry and further conditioned upon Berry's agreement to, and compliance with, the conditions set forth in the confidential letter between Berry and EnCana dated as of today's date.

Please signify your acceptance of our conditional approval by returning one original executed counterpart of this letter to me.

Sincerely,  
EnCana Oil & Gas (USA) Inc.

Robert E. Weaver  
Land Negotiator

Berry Letter Agreement  
June 29, 2009  
Page 2 of 2

Agreed to and Accepted by Berry Petroleum Company

By   
Print Name: **James T. Albi**  
Title: **Piceance Asset Manager** 

cc: Nicole Byrnes  
Jill Cooper





**EnCana Oil & Gas (USA) Inc.**

370 17th Street  
Suite 1700  
Denver, CO 80202

tel: (303) 623-2300  
fax: (303) 623-2400  
www.encana.com

July 29, 2009

Mr. Jerry L. Gonzalez  
Berry Petroleum Company  
1999 Broadway, Suite 3700  
Denver, CO 80202

Re: Berry's P32 595 Pad, SESE of Sec. 32-5S 95W  
Wells - Milk Cabin OM 16D P32 595, 09B P32 595, 16A P32 595, 01A P32 595,  
13B P32 595, 16B P32 595, 09D P32 595, & 09C P32 595  
North Parachute Ranch  
Garfield County, Colorado

Dear Mr. Gonzalez:

This letter will confirm that Berry has agreed to comply with the following conditions in addition to complying with the terms of the Surface Use License Agreement dated June 7, 2006, between Berry and EnCana and conditions of approval required by the Colorado Oil and Gas Conservation Commission, when Berry conducts operations on any lands owned by EnCana. Berry will

- Perform biological site surveys (on-site) for each new development, using the most recent data sets for wildlife and aquatic resources (the report format is based upon Federal on-site surveys). The biological on-site report will be used to determine which mitigation and avoidance measures will be applicable to the project. All data collected on EnCana property and associated reports will belong to EnCana.
- Perform pre-construction surveys when the on-site inspection and commencement of disturbance occur in different field seasons (e.g., new raptor nests), using the most recent data sets for wildlife and aquatic resources. This follow-up survey will be used to adapt mitigation and avoidance measures as appropriate. All data collected on EnCana property and associated reports will belong to EnCana.
- Prohibit employees and contractors from carrying projectile weapons (including bows) on EnCana property, except during EnCana-organized events.
- Prohibit pets on EnCana property.
- Strategically apply fugitive dust control measures on the NPR to reduce coating of vegetation and deposition in water sources, including enforcing established speed limits on private lease roads.
- Follow the North Parachute Ranch Integrated Vegetation Management Guidance (2009) as guidance for interim and final reclamation practices, including identifying appropriate

seed mixes and invasive weed control measures. Selection of seed mixes will be based upon the type of ecosystem affected. Implementation of the North Parachute Ranch Integrated Vegetation Management Guidance will be documented on Form 4 (Sundry Notice for Reclamation).

- With regard to Black Bear:
  - Conduct regular contractor and employee training with respect to wildlife awareness.
  - Reinforce training at worksite tailgate meetings, monthly safety meetings, and through the use of signs where applicable.
  - Use enclosed, locking garbage receptacles or implement a strict daily trash removal regime on each temporary or permanent work location.
- With regard to Mule Deer and American Elk:
  - Avoid disturbance of big game production areas and winter range wherever possible, but this will be a secondary consideration to preserving sage grouse habitat.
  - Only essential traffic will be permitted to access sites throughout the NPR where no active operations (construction, drilling, and fracturing) are occurring.
  - Trench plugs sloped to allow wildlife (and livestock) to cross the trench or escape the trench should they enter will be used at known livestock and wildlife trails along long spans of open trench.
- With regard to Raptors:
  - Conduct annual surveys for occupied raptor nests within a minimum of 1/2 mile of major activities (construction, drilling, fracturing) to avoid impacting breeding and rearing activities of protected species. All data collected on EnCana property and associated reports will belong to EnCana.
  - Apply the disturbance buffers represented in EnCana's Wildlife Matrix prior to commencing new construction and drilling or completion operations near occupied nests:

Within 0.25 miles of a Coopers Hawk (COHA) nest	April 1 to August 15 (breeding/nesting season)
Within 0.33 miles of a Red-tailed Hawk (RTHA) nest	March 1 to July 15 (breeding/nesting season)
Within 0.25 miles of a Sharp-shinned Hawk (SSHA) nest	April 1 to August 15 (breeding/nesting season)
Within 0.5 mile of a Golden Eagle (GOEA) nest complex	December 15 to July 15 (breeding/nesting season)
Within 0.25 miles of a Northern Harrier (NOHA) nest	April 1 to August 15 (breeding/nesting season)

Within 0.5 miles of a Peregrine Falcon (PEFA) nest complex	March 15 to July 31 (breeding/nesting season)
Within 0.25 miles of a Great Horned Owl (GHOW) nest	March to August
Within 0.25 miles of a Long-eared Owl (LEOW) nest	March 1 to July 15 (breeding/nesting season)
Within 0.25 miles of a Northern Pygmy Owl (NOPO) nest	March 15 to July 15 (breeding/nesting season)

- Schedule the commencement of disturbance for the time of year outside of average breeding seasons for the species of concern, if the duration of operations on a location prevents seasonal avoidance (e.g., during drilling and completion operations that exceed 12 months per location).

If previously unidentified wildlife or habitat concerns are identified during the pre-construction survey, additional mitigation measures may be specified by EnCana.

Please contact me if you have any questions or require additional information to facilitate your compliance with the foregoing conditions.

Sincerely,

EnCana Oil & Gas (USA) Inc.



Robert E. Weaver  
Land Negotiator

Agreed to and Accepted by Berry Petroleum Company

By   
Print Name: **James T. Albi**  
Title: **Piceance Asset Manager** *sw cf*

cc: Nicole Byrnes  
Jill Cooper

## **ATTACHMENT G**



**BERRY PETROLEUM COMPANY**  
**OLD MOUNTAIN PAD P-32 WATER STORAGE FACILITY**  
**Impact Analysis: Section 4-502 E (8) Environmental Effects**  
**Garfield County Unified Land Use Resolution 2008**



*Cover Photo: View of current conditions at the proposed water storage area  
looking north from southern edge of the pad*

**Prepared for:**  
**Berry Petroleum Company**  
**Denver, Colorado**

**Prepared by:**  
**WestWater Engineering, Inc.**  
**2516 Foresight Circle #1**  
**Grand Junction, CO 81505**

**July 2012**

## **INTRODUCTION**

At the request of Berry Petroleum Company (Berry), WestWater Engineering (WWE) biologists conducted field surveys and assessments of wildlife, wildlife habitats, and sensitive plant species at the proposed produced water storage facility to be built on the existing Old Mountain P-32 pad (Figure 1). The survey was conducted on June 15, 2012. This document reports the results and analysis of the findings that are pertinent to Garfield County Land Use regulations (2008) that apply to this project.

The site is located on private lands northeast of Parachute, Colorado, in Section 32, Township 5 South, Range 95 West, 6<sup>th</sup> Principal Meridian. Access to the project area is available via Garfield County Road 215 (Parachute Creek Road), up Wheeler Gulch through the Williams' tunnel and then a private road system. The current primary land uses of the area include rangeland, wildlife habitat, and natural resource extraction including natural gas development.

### **Survey Methods**

A preliminary review of the project area using aerial photographs was conducted to familiarize biologists with the project area and as an aid to help determine the potential presence of wildlife and any threatened, endangered, or sensitive species including plants. Field data collected during the survey were documented and/or recorded with the aid of a handheld global positioning system (GPS) receiver utilizing NAD83 map datum, with all coordinate locations based on the Universal Transverse Mercator (UTM) coordinate system in Zone 12. Photographs were taken of the general project location, vegetation, and terrain.

WWE biologists conducted pedestrian surveys of the area to locate and identify wildlife species, wildlife sign, wildlife habitats, and vegetative communities. Vegetation types were determined through field identification of plants, aerial photography, and on-the-ground assessments of the plant community. Visual searches for raptors and other bird species nests focused on the riparian corridor and pinyon-juniper (P-J) woodlands within 0.25-miles of the project site. Nest searches and bird identification were aided with the use of binoculars. WestWater biologists searched for raptor nests by walking through suitable habitat and visually inspecting trees for nests. This technique was coupled with the use of electronic MP3 wildlife callers to broadcast the recorded call of a Great Horned Owl, which will often elicit a defensive response from nesting accipiters (Kennedy and Stahlecker 1993). Data from the Colorado Division of Parks and Wildlife's (CPW) Natural Diversity Information Source (NDIS) was used to determine important wildlife areas including big game winter range. Noxious weed surveys were conducted within 100 feet of the project site.

## **SECTION 4-502 E. - ENVIRONMENTAL EFFECTS**

### **EXISTING ENVIRONMENTAL CONDITIONS**

#### **Wetlands and Waters of the U.S.**

Waters of the U.S. (WoUS) include wetlands and drainages under the jurisdiction of the U.S. Army Corps of Engineers (COE). Perennial, intermittent, and ephemeral streams and drainages are considered WoUS if they exhibit evidence of flow (i.e., ordinary high water mark) and are

hydrologically connected to a perennial stream. In addition to hydrology, a jurisdictional wetland will also demonstrate the unique soil and vegetation characteristics that result from inundation or saturation.

The proposed project site is located on a relatively level ridge top (Figure 1). U.S. Geological Survey mapping does not show any drainage crossing the project area. WWE biologists determined that no jurisdictional wetlands or drainages would be affected by the project.

### **Vegetation**

The project would be located within the disturbance associated with Berry's existing OM P-32 pad. The affected vegetation near the project site is not diverse and is composed predominantly of weedy grass/forb species. Native vegetation in the surrounding area is composed of mountain shrub and oakbrush woodlands with some small aspen stands on north-facing slopes. Common plant species observed during the survey are listed in Table 1.

**Table 1. Common plant species observed within the general project area**

Aspen ( <i>Populus tremuloides</i> )	Oregon grape ( <i>Mahonia repens</i> )
Big sagebrush ( <i>Artemisia tridentata</i> )	Serviceberry ( <i>Amelanchier alnifolia</i> )
Cheatgrass ( <i>Bromus tectorum</i> )	Smooth brome ( <i>Bromus inermis</i> )
Gamble's oak ( <i>Quercus gambelii</i> )	Snowberry ( <i>Symphoricarpos rotundifolius</i> )
Green rabbitbrush ( <i>Chrysothamnus vicidifloris</i> )	Western wheatgrass ( <i>Pascopyrum smithii</i> )
Letterman's needlegrass ( <i>Achnatherum lettermanii</i> )	Yarrow ( <i>Achillea millefolium</i> )
Lupine ( <i>Lupinus sp.</i> )	Yellow Puccoon ( <i>Lithospermum ruderale</i> )
Meadowrue ( <i>Thalictrum fendleri</i> )	

### ***Threatened, Endangered, Sensitive Plant Species***

A review of the soils and terrain at project site, and previous WWE surveys indicated that no threatened, endangered, or special status plant species have the potential to occur within the project area.

### ***Noxious Weeds***

The weed survey included the project footprint plus 100 feet on all sides. Noxious weeds and nuisance plants such as Russian thistle, field alyssum and shepherd's-purse were scattered throughout the previously disturbed pad area. Cheatgrass is widely scattered in and around the project area and UTM locations were not recorded for this species. Houndstongue was the only noxious weed species listed by Garfield County found within the project boundaries. The locations of weeds observed during the survey are described in Table 2 and Figure 1.

**Table 2. Noxious Weed Locations found throughout Project Area**

<b>Common Name</b>	<b>Scientific Name</b>	<b>State List Designation</b>	<b>UTM Easting</b>	<b>UTM Northing</b>
Houndstongue	<i>Cynoglossum officinale</i>	C	751743	4383551
Houndstongue	<i>Cynoglossum officinale</i>	C	751747	4383562
Houndstongue	<i>Cynoglossum officinale</i>	C	751759	4383598
Houndstongue	<i>Cynoglossum officinale</i>	C	751630	4383606
Houndstongue	<i>Cynoglossum officinale</i>	C	751610	4383612
Houndstongue	<i>Cynoglossum officinale</i>	C	751755	4383642
Houndstongue	<i>Cynoglossum officinale</i>	C	751748	4383655
Houndstongue	<i>Cynoglossum officinale</i>	C	751749	4383664
Houndstongue	<i>Cynoglossum officinale</i>	C	751778	4383709
Houndstongue	<i>Cynoglossum officinale</i>	C	751728	4383718
Houndstongue	<i>Cynoglossum officinale</i>	C	751689	4383765

\* Noxious weed species listed by Garfield County

## **Wildlife**

### ***Federally and State Listed Candidate, Threatened, Endangered, and Species of Concern***

Federally and state listed species with potential to occur within the project area vicinity are described in Table 3.

**Table 3. Federally and State Listed Candidate, Threatened, Endangered, and Species of Concern with potential to occur in the vicinity of the proposed water storage facility**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Status*</b>	<b>Occurrence</b>
<b>MAMMALS</b>			
Townsend's big-eared bat	<i>Corynorhinus townsendii pallescens</i>	SC	Breeds in mine shafts, caves, rock outcrops, and cliffs. This species roosts and forages within pinyon/juniper woodlands and open montane forests.
<b>FISH</b>			
Bonytail	<i>Gila elegans</i>	FE, SE	Occurs downstream in the Colorado River.
Colorado pikeminnow	<i>Ptychocheilus Lucius</i>	FE, ST	Occurs downstream in the Colorado River.
Humpback chub	<i>Gila cypha</i>	FE, ST	Occurs downstream in the Colorado River.
Razorback sucker	<i>Xyrauchen texanus</i>	FE, SE	Occurs downstream in the Colorado River.
<b>AMPHIBIANS</b>			
Northern leopard frog	<i>Rana pipiens</i>	SC	No temporary or permanent water sources present at the water storage facility location. May occur in wet areas and drainages near the project site.
<b>REPTILES</b>			
Midget faded rattlesnake	<i>Crotalus viridis concolor</i>	SC	Habitat varies from riparian to semi-desert shrublands and foothills. Known to occur in Garfield County.

\*= FE-Federally Endangered, FT-Federally Threatened, SE-State Endangered, ST-State Threatened, SC-State Special Concern



No federally and state listed species are known to occur at the proposed water storage facility location. However, runoff from the proposed site would eventually drain into the Colorado River which is designated Critical Habitat by US Fish and Wildlife Service (USFWS) for four federally listed endangered species of fish (USFWS 1994). The Colorado pikeminnow and razorback sucker both occur in the Colorado River downstream of the project area. Critical habitat for these two species begins at the Colorado River Bridge in Rifle, CO downstream to Lake Powell (USFWS 1994).

### ***Raptors***

A minimum of eleven raptor species are expected to nest, reside, forage, or pass through the general project area (Table 3). The most common raptor species in the area are American Kestrel, Cooper's Hawk, Great Horned Owl, and Red-tailed Hawk.

**Table 3. Raptor species that may be present near the project area**

Common Name	Scientific Name	BCC*
American Kestrel	<i>Falco sparverius</i>	No
Cooper's Hawk	<i>Accipiter cooperii</i>	No
Flammulated Owl	<i>Otus flammeolus</i>	Yes
Great Horned Owl	<i>Bubo virginianus</i>	No
Long-eared Owl	<i>Asio otus</i>	No
Northern Goshawk	<i>Accipiter gentiles</i>	No
Northern Harrier	<i>Circus cyaneus</i>	No
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	No
Red-tailed Hawk	<i>Buteo jamaicensis</i>	No
Sharp-shinned Hawk	<i>Accipiter striatus</i>	No
Swainson's Hawk	<i>Buteo swainsoni</i>	No

\*U.S. Fish and Wildlife Service Bird of Conservation Concern

Potential raptor nesting habitat occurs in the mature oak groves that have taller trees and a thicker canopy on the hillsides around the pad. A few relict aspen stands are found on north-facing slopes but most of the mature trees are dead and provide no adequate nesting habitat. There is no cliff nesting habitat nearby. Raptors likely forage for small mammals on the site.

Nesting season for most species normally occurs between April 1<sup>st</sup> and August 15<sup>th</sup>. Eagles and some owls begin nesting as early as February. No raptor nests were discovered within 0.25 miles of the proposed project. No raptors were observed flying in the area during the survey.

### ***Migratory, Non-migratory, and Birds of Conservation Concern (other than raptors)***

WWE biologists surveyed the project area for the presence of any bird species that could potentially be affected by the project based on literature review of species distribution and presence (Andrews and Righter 1992, Kingery 1998, Poole 2005, Righter et. al. 2004) (Table 4). Particular attention was given to searching for birds that are listed as sensitive by the USFWS and the CPW. Birds of Conservation Concern (BCC) are species listed by the USFWS that are priorities for conservation action (USFWS 2008). The goal is to prevent or remove the need for

additional Endangered Species Act (ESA) bird listings by implementing proactive management and conservation actions.

**Table 4. BCC species that may be present in the project area**

Common Name	Scientific Name	Habitat & Breeding Records
Brewer's Sparrow	<i>Spizella breweri</i>	Sagebrush shrublands. Confirmed breeder in Garfield County.
Cassin's Finch	<i>Carpodacus cassinii</i>	Montane and subalpine coniferous forests, pinyon-juniper (P-J), aspen, and cottonwood habitats. Confirmed breeder in Garfield County
Lewis' Woodpecker	<i>Melanerpes lewis</i>	Open woodlands. Probable breeder in Garfield County.

The USFWS stipulates a 100-foot buffer around proposed developments for the protection of nesting migratory birds, excluding raptors. No birds were observed nesting within 100 feet of the project. Native vegetation was removed from the project site for previous developments and the lack of cover in the area precludes nesting by the species listed in Table 4. Some passerine species may choose to nest on the ground or on objects and equipment that are located in the well pad area.

The mountain shrub and oak community surrounding the project site provides nesting and foraging habitat for various migratory and non-migratory bird species, depending on the season of the year. American robins (*Turdus migratorius*), Virginia's Warblers (*Vermivora virginiae*), Mountain Bluebirds (*Sialia currucoides*), Green-tailed Towhees (*Pipilo chlorurus*) and a flycatcher (*Empidonax sp.*) were observed near the site.

#### ***American Elk and Mule Deer***

The project area is located within mule deer (*Odocoileus hemionus*) and American Elk (*Cervus canadensis*) summer range (NDIS 2012). Mule deer and elk sign, including droppings and fresh tracks, were observed in the project area. Elk and mule deer utilize the higher elevations on Old Mountain for fawning/calving but move to lower elevations as snow depths increase in early winter.

#### ***Black Bear and Mountain Lion***

Natural Diversity Information Source (NDIS) mapping shows the site to be within overall ranges for black bear and mountain lion (NDIS 2012). No bear or mountain lion sign was observed on the site. The project area is not mapped by NDIS as a potential mountain lion or bear conflict area.

Black bears are common in western Colorado. This species is omnivorous, but the majority of their diet consists of vegetation including grasses and forbs, berries, and acorns. Insects, carrion, and small mammals make up the remainder of food consumed during the year. Black bear typically hibernate from mid-November through May.

Mountain lions typically follow migrating deer herds which provide the lion's primary food source. They tend to have large territories and are highly mobile as they search for food or new territories. Mountain lions inhabit the general project area throughout the spring, summer and fall and move to lower elevations as snow depths increase in early winter.

### ***Small Mammals***

No sensitive or special status mammals would be affected by the project. Several bat species could forage in the area, including fringed myotis (Bureau of Land Management (BLM) sensitive—*Myotis thysanoides*), spotted bat (BLM sensitive—*Euderma maculatum*), and Townsend's big-eared bat (BLM sensitive—*Corynorhinus townsendii pallescens*), among others. No potential bat roost sites would be affected by the project. Common small mammal species in the project area include bobcat (*Lynx rufus*), coyote (*Canis latrans*), cottontail (*Sylvilagus* sp.), least chipmunk (*Tamias minimus*), and several rodent species (Armstrong et. al. 2011).

### ***Reptiles***

No reptiles were observed during the survey. Several species of reptiles possibly occurring in project area include gopher snake (*Pituophis catenifer*), western terrestrial garter snake (*Thamnophis elegans*) and short-horned lizard (*Phrynosoma hernandesi*) among others (Hammerson 1999).

### ***Amphibians***

No amphibians were observed during the survey, but it is possible that two species of amphibians occupy wet areas in the project vicinity including Northern leopard frog (BLM-Sensitive and CPW species of Concern—*Rana pipiens*) and tiger salamander (*Ambystoma tigrinum*) (Hammerson 1999).

## **SECTION 4-502 (8) (A) - DETERMINATION OF LONG AND SHORT-TERM EFFECTS ON FLORA AND FAUNA**

### **FAUNA**

#### **Raptors**

No occupied raptor nests were identified within 0.25 miles of the site. Because there are no mature trees located on the site, no direct impacts will occur to raptor nesting habitat and no nest sites are located where removal of the nest tree is a concern. Areas near the site likely provide foraging habitat for raptors. The impacts of project development would likely be negligible because there is a significant amount of higher quality foraging habitat nearby. Due to the scale and continuity of human activity in the area no other indirect impacts are expected.

#### **American Elk and Mule Deer**

The additional human activity associated with the project may affect mule deer and elk in the surrounding area by creating avoidance areas. The site was previously cleared of vegetation, so no additional loss of native forage or cover would result from development of the project. Due to the scale and continuity of other human activities nearby, the additional disturbance from this project is probably negligible to big game that has become at least partially accustomed to human presence.

### **Black Bear and Mountain Lion**

No vegetation will be lost in habitats that are important for black bear or mountain lion. Indirect effects from construction disturbance should not affect either species. Black bear encounters with construction personnel could occur if garbage or food is available on the site. If bears learn to associate human activity with creation of a food source, the resulting encounters sometimes result in the euthanasia of offending bears by the CPW.

### **Small Mammals, Birds (including BCC), and Reptiles**

Affects of habitat loss to these species are expected to be negligible due to conditions resulting from previous development of the project area and the large amount of habitat available in the surrounding area.

### **FLORA**

The small amount of vegetation removed as a result of this project will be primarily weedy annual species that have become established on previously disturbed soils. Vegetation surrounding the project area will not be affected and will likely remain in its current condition.

## **SECTION 4-502 (8) (C) (1) - DETERMINATION OF THE EFFECT ON SIGNIFICANT ENVIRONMENTAL RESOURCES – CRITICAL WILDLIFE HABITAT**

The development of the project is not expected to significantly affect any critical wildlife habitat for any wildlife species. Potential issues are outlined below.

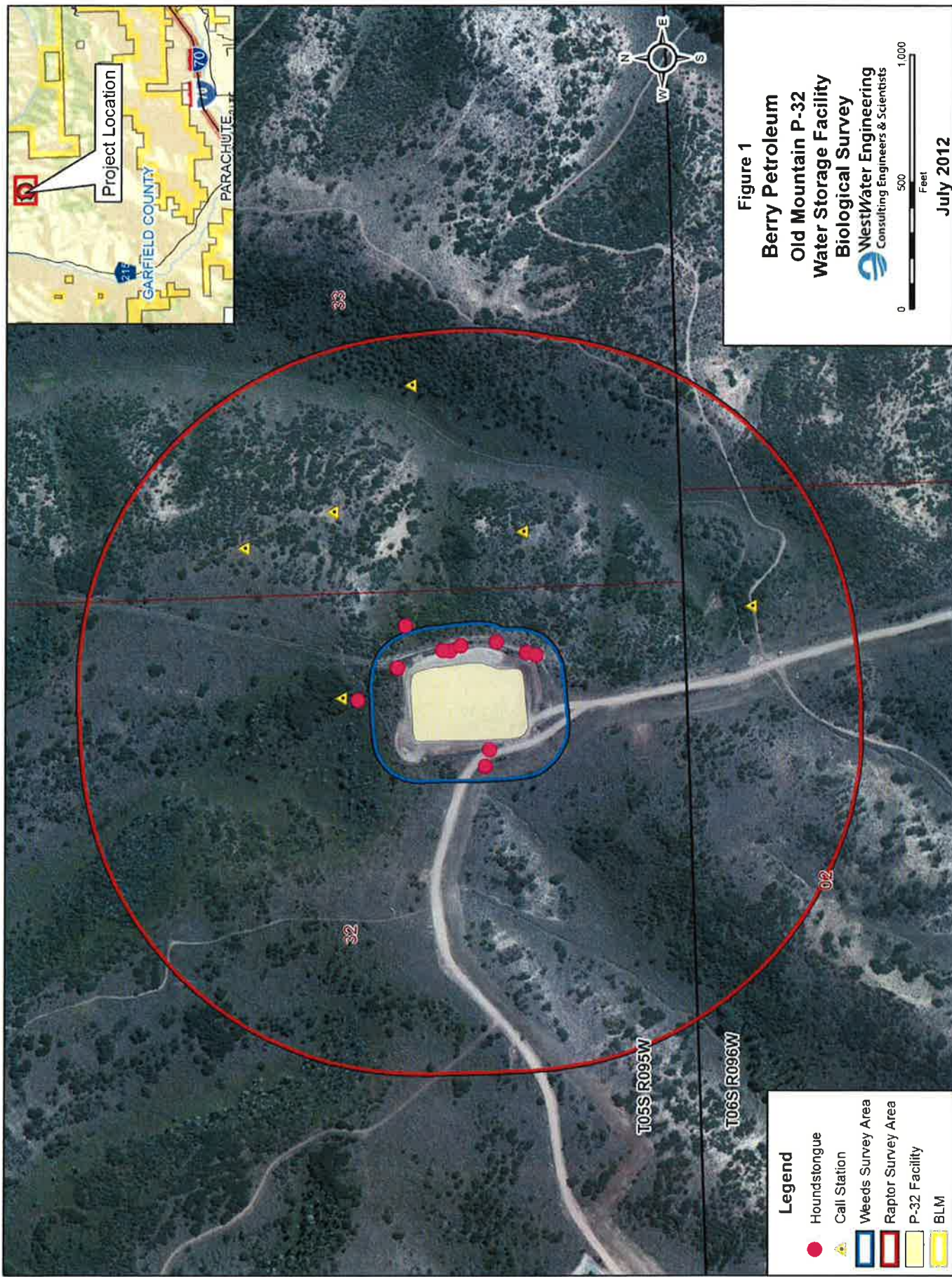
- **Creation of Hazardous Attractions:** If tanks are used to store the produced water, no project feature will introduce components that would inherently entrap or harm wildlife that occur in the area. Some passerine bird species may choose to nest in or on equipment or objects stored in the facility area. By closing or covering all ports, hatches, cavities, and openings (such as the ends of pipes) this potential is decreased. Most non-game bird species are protected under the Migratory Bird Treaty Act (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) and tampering with occupied nests could be considered a “take” resulting in a violation. If the produced water is stored in a pit, that body of water will attract all types of wildlife, including small and large mammals, songbirds, waterfowl and shorebirds during fall migration, and other species. The pit will require fencing and a cover to prevent wildlife species from becoming trapped in the pool or drinking the water.
- **Indirect Construction Effects:** The presence of construction personnel and noise has a low potential to affect wildlife in a negative manner, since the construction activities would occur adjacent to and within an area of considerable human activity and presence.
- **Alteration of Existing Vegetation:** Vegetation within the project footprint is composed of mostly non-native species due to prior disturbance. The area affected by the project would be cleared of native vegetation for the duration of its use as a water storage facility. No rare or special status species of plants would be affected.



- **Big Game Migration Corridors:** No migration corridors would be affected. Big game species are not restricted to specific movement corridors in this area and the CPW has not identified any migration corridors or highway crossings in the project area. Fencing could alter daily big game movements on a small scale and could pose a hazard to animals if not built with wildlife in mind.
- **Roadkill:** Although traffic volumes along the access road are likely to increase, low speed limits and good visibility should keep roadkill to a minimum.
- **Bird Nesting Habitat:** If the existing pad is not expanded, no natural bird nesting habitat would be lost due to project development.

## REFERENCES

- Andrews, R., and R. Righter. 1992. *Colorado Birds: A Reference to Their Distribution and Habitat*. Denver Museum of Natural History, Colorado.
- Armstrong, D.M., J.P. Fitzgerald, and C.A. Meaney. 2011. *Mammals of Colorado*, Second Edition. Denver Museum of Nature & Science and University Press of Colorado, Boulder.
- Hammerson, G. A. 1999. *Amphibians and Reptiles in Colorado*, Second Edition. Colorado Division of Wildlife, Denver.
- Kennedy, P.L. and D.W. Stahlecker. 1993. Responsiveness of nesting northern goshawks to taped broadcasts of three conspecific calls. *Journal of Wildlife Management* 57:249-257.
- Kingery, H. E. 1998. *Colorado Breeding Bird Atlas*. Colorado Bird Atlas Partnership, Colorado Division of Wildlife, Denver.
- NDIS. 2012. Natural Diversity Information Source—Colorado Division of Wildlife. Available online at: <http://ndis.nrel.colostate.edu/wildlife.asp>.
- Poole, A. (Editor). 2005. *The Birds of North America Online*: <http://bna.birds.cornell.edu/BNA/>. Cornell Laboratory of Ornithology, Ithaca, New York.
- Righter, R., R. Levad, C. Dexter, and K. Potter. 2004. *Birds of Western Colorado Plateau and Mesa Country*. Grand Valley Audubon Society, Grand Junction, Colorado.
- USFWS. 1994. Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat for the Colorado River Endangered Fishes; Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub. *Federal Register Rules and Regulations*, Vol. 59, No. 54, March 21, 1994.
- USFWS. 2008. *Birds of Conservation Concern 2008*. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia.





**BERRY PETROLEUM COMPANY**  
**OLD MOUNTAIN PAD P-32 WATER STORAGE FACILITY**  
**Mitigation Recommendations: Section 7-202 Protection of Wildlife Habitat**  
**Areas**  
**Garfield County Unified Land Use Resolution 2008**



*Cover photo: View of existing conditions at the facility site looking north from southern edge of well pad*

**Prepared for:**  
**Berry Petroleum Company**  
**Denver, Colorado**

**Prepared by:**  
**WestWater Engineering, Inc.**  
**2516 Foresight Circle, #1**  
**Grand Junction, CO 81505**

**July 2012**

## SECTION 7-202 - PROTECTION OF WILDLIFE HABITAT AREAS MITIGATION RECOMMENDATIONS

### WILDLIFE

#### Raptors

Activities associated with the project have minimal potential to impact raptor populations as no nesting was observed within 0.25 miles of the site. If project construction is not completed prior to the next nesting season (May 2013), the site should be re-inventoried by qualified biologists. The main area of concern would be the mature oak groves on the hillsides surrounding the pad; there are no aspen groves within 0.25 miles that provide trees of sufficient height and density to provide raptor nesting habitat.

If any raptors are found behaving in a manner consistent with nesting, WestWater Engineering (WWE) recommends the following temporal and spatial limitations for activities near those nests. These recommendations are based on Bureau of Land Management (BLM) literature (BLM 1997), Colorado Division of Parks and Wildlife (CPW) recommendations (Craig 2002 and Klute 2008) and literature review of nesting season timing for raptors in the region (Andrews and Righter 1992, Kingery 1998, Poole 2005, Righter et. al. 2004).

**Table 1. Timing and buffer recommendations for active raptor nests**

Species	Buffer Zone	Seasonal Restriction
American Kestrel	*	*
Cooper's Hawk	0.25 mile	1 April – 15 August
Flammulated Owl	0.25 mile	1 April – 1 August
Great Horned Owl	*	*
Long-eared Owl	0.25 mile	1 March - 15 July
Northern Goshawk	0.50 mile	1 March – 15 September
Northern Harrier	0.25 mile	1 April – 15 August
Northern Saw-whet Owl	0.25 mile	1 March – 15 July
Red-tailed Hawk	0.33 mile	15 February - 15 July
Sharp-shinned Hawk	0.25 mile	1 April – 15 August
Swainson's Hawk	0.25 mile	1 April - 15 July

\* Great Horned Owls and Kestrels are relatively tolerant of human activity. Keep activity to a minimum during breeding season

#### American Elk and Mule Deer

The plan for construction of the produced water storage facility in an area where vegetation has been cleared for other developments will reduce cumulative habitat loss and fragmentation and is a good mitigation technique.

Implementation of an aggressive noxious weed management plan would improve the existing condition of the area surrounding the proposed development. Elimination of annual weedy species and noxious weeds would allow for increased production of desirable plants for use by wildlife. If it is later determined that the facility is no longer necessary, implementation of a



simple reclamation and revegetation plan would benefit wildlife by establishing desirable plants in the disturbed area.

Wildlife should be considered before any fencing is designed or built around project features. Following wildlife friendly fencing standards reduces the costs of repairing fences damaged by wildlife, reduces the chance of mortality from animals becoming entangled in the fence, and allows for less restricted movements throughout an area. The CPW has published the following general guidelines for fence construction that reduces impacts to wildlife (Hanophy 2009):

- Place fence wires on the side of the fence posts facing livestock (outside of posts surrounding the facility);
- Use smooth wire on the top and bottom strands;
- The highest strand should be 42 inches or less from the ground on level ground (slopes increase the effective height of a fence);
- Allow at least 12 inches between top two strands;
- Allow at least 16 inches from bottom strand to the ground;
- Place posts no closer than 16-foot intervals;
- In areas favored for crossing by wildlife, consider engineered crossing points such as lowered top strands, higher bottom strands, gates, drop-downs, removable fence sections, etc.;
- Consider a rail, high-visibility wire, flagging, or other visual marker on the top strand of new fencing structures until animals become accustomed to the new fence.

### **Black Bear**

Black bear are relatively common on Old Mountain. Construction personnel at the site may be unfamiliar with wildlife in the area and should be informed of the potential for bear interactions. Personnel should not feed bears at any time. Bears should not be approached if encountered in the project area. All garbage and any food items should be disposed of in bear proof containers and removed from the site on a daily basis. Bears that become habituated to human related food sources often become dangerous and must be euthanized.

### **Mitigation of Habitat Loss to Birds**

Because the project site was previously cleared of vegetation and the abundance of bird nesting habitat in the area, mitigation for this class of wildlife will not be necessary. If any additional vegetation clearing is necessary outside existing disturbed areas, it should be done outside of the nesting season, which is generally considered to occur between May 1 and July 31 for most species in this area. June 1 to July 15 is the peak period when most incubation and brood rearing takes place. If vegetation clearing occurs prior to nesting season, most affected birds will relocate to alternate nest sites. After mid-to-late July, most fledging has occurred and vegetation clearing impacts would be minimized.

### **Small Mammals, Amphibians, and Reptiles**

There are no seasonal restrictions or special requirements for development related to these species.

### **PRESERVATION OF NATIVE VEGETATION**

The plan for construction of the produced water storage facility in an area where vegetation has been cleared for other developments will reduce cumulative loss and fragmentation of native vegetation and is a good mitigation technique. The best method to mitigate the loss of native vegetation is to increase the availability of native forage in the form of grasses, forbs, and shrubs by reseeding unneeded areas within the disturbance and reclaiming the area after it is no longer needed.

Revegetation with native species would provide the greatest benefit for wildlife. The development and application of an integrated vegetation and noxious weed management plan and implementation of a reclamation plan would provide the basis for appropriate mitigation.

### **Treatment and Control of Noxious Weed Infestations**

Noxious weeds aggressively compete with native vegetation. Most have come from Europe or Asia, either accidentally or as ornamentals that have escaped. Once established these species tend to spread quickly because the insects, diseases, and animals that normally control them are absent. Prevention is especially valuable in the case of noxious weed management.

Noxious weeds are spread by man, animals, water, and wind. Prime locations for the establishment of noxious weeds include roadsides, construction sites, wetlands, riparian corridors, and areas that are overused by animals or humans. Subsequent to soil disturbances, vegetation communities can be susceptible to infestations of invasive or exotic weed species.

Vegetation removal and soil disturbance during construction can create optimal conditions for the establishment of invasive and non-native species. Construction equipment traveling from weed-infested areas into weed-free areas could disperse noxious or invasive weed seeds and propagates, resulting in the establishment of these weeds in previously weed-free areas.

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

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

The highest priority for noxious weed management (eradication) is for houndstongue that is prevalent on the project site. Reclamation and revegetation with native desirable plants should be implemented within the disturbed area of the project site once it is no longer needed.

## REFERENCES

- Andrews, R., and R. Righter. 1992. Colorado Birds: A Reference to Their Distribution and Habitat. Denver Museum of Natural History, Colorado.
- BLM. 1997. Record of Decision and Approved White River Resource Area, Resource Management Plan. U.S. Bureau of Land Management, Meeker, Colorado.
- Craig, Gerald R. 2002. Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors. Colorado Division of Wildlife, Denver.
- Hanophy, W. 2009. Fencing with Wildlife in Mind. Colorado Division of Wildlife, Denver. Available online at:  
<http://wildlife.state.co.us/SiteCollectionDocuments/DOW/LandWater/PrivateLandPrograms/DOWFencingWithWildlifeInMind.pdf>
- Kingery, H. E. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership, Colorado Division of Wildlife, Denver.
- Klute, D. 2008. Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors. Colorado Division of Wildlife, Denver.
- Poole, A. (Editor). 2005. The Birds of North America Online:  
<http://bna.birds.cornell.edu/BNA/>. Cornell Laboratory of Ornithology, Ithaca, New York.
- Righter, R., R. Levad, C. Dexter, and K. Potter. 2004. Birds of Western Colorado Plateau and Mesa Country. Grand Valley Audubon Society, Grand Junction, Colorado.

## **ATTACHMENT H**



# Site Description and Responsibilities – Reference Section –

## PART 1

### Berry Petroleum Old Mountain Field Section III Master SWMP

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This Master Storm Water Management Plan (SWMP) was developed by Summit Services Group (SSG) for Berry Petroleum in April 2011. This SWMP refers to Old Mountain Section III only. The SWMP was produced in accordance with the applicable permits and guidelines from the State of Colorado and Colorado Oil and Gas Conservation Commission (COGCC). The existing Old Mountain SWMP is now archived and this revised SWMP will be utilized in its place. The area covered under the original SWMP was split into four different distinct areas which will allow for more site specific management of the project.

#### 1-a. Site Description

Old Mountain Section III project consists of an existing dirt access road, two existing natural gas well pads, access roads to the well pads from the overall access road, connection pipelines between the well pad sites and areas for future well pad development (as shown in Section 2 Figure 1). Future well pad and pipeline development will be added to this SWMP at the time the design of the pads and pipelines are completed.

The project site is located within the Colorado River Basin watershed.

#### 1-b. Proposed Sequence of Major Activities

Old Mountain Section III is an existing natural gas field. Below is a description of activities that may occur or have already occurred.

##### **Natural Gas Field Construction**

###### **Preliminary Site Investigation:**

Preliminary site investigation may include a site visit to investigate topography, vegetative cover, limits of construction, wildlife and wetland investigations and/or archeological surveys. All investigations will be conducted as dictated by site conditions. In the event any investigations will be conducted on site the appropriate paperwork and permits (if applicable) will be placed in Appendix C of the SWMP by the SWMP administrator.

###### **Site Preparation/Pre-Construction:**

Site preparation includes but may not be limited to the following; location and installation of Best Management Practices (BMP(s)) as perimeter controls, BMP location and installation along proposed and/or existing access roads. Refer to the Site Specific Section of this SWMP, Appendix F, for locations of BMPs installed during this phase.

###### **Construction:**

Activities in this phase include but may not be limited to the following; clearing and grubbing, topsoil stripping and storage (on or offsite as applicable), excavation and grading of access roads, well pads and/or other facilities, installation of site specific BMPs such as; berms, diversion

# Site Description and Responsibilities – Reference Section –

## PART 1

### Berry Petroleum Old Mountain Field Section III Master SWMP

ditches, sediment traps, outfall structures, construction of onsite facilities and utility installation. Site specific BMPs will be installed as needed during construction activities. Perimeter BMPs should be evaluated for on-going effectiveness. Maintain or replace as needed. Temporary stabilization BMPs should be implemented on all disturbed areas that are not subject to active construction. Temporary stabilization BMPs include but may not be limited to the following; erosion control blanket, seed and mulch. Temporary stabilization BMPs will be implemented as needed during construction. Refer to the Site Specific Section of this SWMP, Appendix F, for locations of BMPs installed during this phase.

#### **Interim Reclamation:**

Activities include but may not be limited to the following; gravel surfacing, stabilization of disturbed areas no longer actively needed for facility operation. Perimeter BMPs should be evaluated for on-going effectiveness. Maintain, replace or uninstall as needed. Refer to the Site Specific Section of this SWMP, Appendix F, for locations of BMPs installed during this phase.

#### **Final Stabilization:**

Activities include completion of all operations to a specific area (well pad, access road, pipeline, and/or other facilities). Upon completion of activities final stabilization measures will be installed in newly disturbed areas, and/or any areas needing stabilization. Installation of permanent BMPs may occur during this phase as well. Permanent BMPs include but are not limited to the following; gravel, road base, permanent outfall structures, seed. Refer to the Site Specific Section of this SWMP, Appendix F, for locations of BMPs installed during this phase.

## 1-c. Project Location and Estimates of Area to be Disturbed

Old Mountain Section III is located north of Parachute, Colorado in Garfield County Township 5South, Range 95 West, Section 32

A latitude and longitude mark was taken at the center of Old Mountain Section I and is as follows:

Latitude:  Longitude:

The total project area for Section III is estimated to be near 1125 acres. The existing total disturbed area is 15.01 acres. As new areas may be developed or reclaimed the total disturbed area may increase or decrease as dictated by activity. The SWMP Administrator will update the SWMP when the total disturbed acreage incurs a change.

**Offsite disturbance:** There are no anticipated offsite activities associated with this site. There is no planned offsite borrow or disposal activities associated with this site. Should offsite disturbance occur or become necessary, the SWMP and site map shall be amended by the SWMP Administrator.

Approximate limits of disturbance are indicated on the project BMP map in Part 2 of this SWMP.

## 1-d. Data Source for Site BMP Plans and Soil Data

The existing Old Mountain Field SWMP was provided by Berry Petroleum for use in development of the Old Mountain Section III SWMP.

# Site Description and Responsibilities – Reference Section –

## PART 1

### Berry Petroleum Old Mountain Field Section III Master SWMP

Soils were evaluated utilizing data from the NRCS and existing data from the Old Mountain Field SWMP developed in 2007.

#### Old Mountain Section I Soils:

- *Parachute-Rhone loam* is classified as a Hydrological Soil Group of B, giving it a moderately deep to deep and moderately well to well drained soil characteristic. The soil has a moderate rate of water transmission. The soil is made up of a surface layer of brown loam and the subsoil consists of loam mixed with sand and clay. Permeability of the soil is moderate. Surface runoff is slow to medium and it has an erosion hazard of slight to moderate.
- *Irigul Channery loam* is classified as a Hydrological Soil Group of D, giving it a slow infiltration rate and a high shrink-swell potential soil characteristic. The soil has a very slow rate of water transmission. Surface runoff potential is high and it has a moderate erosion hazard.
- *Silas loam* is classified as a Hydrologic Soil Group of B, giving it a moderately deep to deep and moderately well to well drained soil characteristic. The soil has a moderate rate of water transmission. The surface runoff is low and has slight erosion hazard. These soils are primarily located within the drainage channels located on site.

#### 1-e. Existing Vegetative Cover

The site was previously developed in areas for existing well pads and access roads. Vegetative cover varies throughout the site. The existing vegetative ground cover of undisturbed areas is estimated to be around 90%. The native vegetation consists of needle-grass, elk sage, sagebrush, gambel oak, serviceberry and snowberry. Vegetation that is located at the drainage crossings is primarily made up of wild rye, wheatgrass, needle-grass and small amounts of forbs and shrubs. Along exposed bedrock and the rocky colluvial slopes vegetation is sparse to non-existent.

**Past Land Use:** Old Mountain Section III in the past has been and is currently being used for grazing and wildlife habitat.

#### 1-f. Potential Pollution Sources

Potential pollution sources have the potential to impact Storm Water runoff. Potential pollution sources were evaluated for this site and are detailed in this section. Sources and locations may change throughout the project. The SWMP Administrator should make appropriate modifications to this section as changes occur.

See Table 1-f located in Appendix A for identification of potential pollution sources for this project.

### 1-g. Allowable Non-Stormwater Discharges

Only those discharges specifically authorized by the permit are allowed from a construction site. Authorized discharges include all Stormwater runoff as well as the non-Stormwater discharges detailed in this section. Additional permits may be necessary for activities not covered by this section.

1. Emergency firefighting activities
2. Release from uncontaminated springs
  - There are no known springs or sources of ground water associated with this site.
3. Landscape irrigation return flow
  - Landscape irrigation return flow is not anticipated for this project.
4. Construction Dewatering (see Part 3-c.8 of this SWMP for more information)
  - Construction dewatering may be necessary if Stormwater accumulates in an excavation area. No other dewatering activities are anticipated at this time.
  - If necessary, Stormwater accumulations may be pumped out of excavation areas and conveyed over the project in a non-erosive manner. Waters should either infiltrate or be discharged to a sediment trap or similar structure. If the discharge waters are turbid, a filter bag or similar filtering device must be used.
  - Discharges from this activity may not leave the site as surface runoff or enter a water of the state.
  - Discharges may not be made to the street or storm drain system at the site if they exist.
  - Other dewatering activities may require a dewatering permit. Consult Part 3 of the SWMP and the state dewatering permit requirements for more information.
5. Discharges to the ground of concrete wash waters
  - Concrete wash waters are not anticipated to occur on this site. Appropriate measures shall be taken to control concrete wash waters in accordance with the permit if concrete wash waters will be anticipated. (see Part 3-c.7 of this SWMP for more details.)

### 1-h. Receiving Waters

The drainage of stormwater runoff will be conveyed through roadside ditches, diversions and/or culverts alongside access roads. Stabilized outfall structures and/or sediment traps will receive the runoff from the access roads. Stormwater runoff from the well pads will be conveyed through diversion ditches and will be received by sediment traps. The runoff will either, percolate into the ground, evaporate and/or discharge through stabilized outfall structures.

The ultimate receiving water for Old Mountain Section III is Parachute Creek located approximately 2.5 miles west of the project area.

Stormwater discharging from the well pads and Access Roads may be received by the following drainages:

- Pete Spring Gulch to the north, Cherry Gulch to the northeast and Grassy Gulch to the northeast are tributaries of East Fork Creek which is a tributary of Parachute Creek.

Parachute Creek is not listed on the Colorado 303(d) list for any impairments or Total Maximum Daily Loads (TMDLS).



# Site Description and Responsibilities – Reference Section –

## PART 1

### Berry Petroleum Old Mountain Field Section III Master SWMP

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- **Wetlands:** Wetlands are not directly associated with this project
- **Sec. 303d:** The waterways associated with this project are not on the state 303d list of impaired water ways.
- **Sec 404:** Current activities on this site do not require a 404 permit.

#### 1.1 Adjacent Construction Activities/ Land Use

The project is directly adjacent to other oil and gas facilities. The surrounding areas are primarily grazing and wildlife habitats.

#### 1.2 Upstream Run-on Potential

Upstream run-on potential is expected to impact this project. Observations of the area will be made as a part of the regular site inspections. Upstream run-on potential will be captured and/or conveyed by diversion ditches, culverts and roadside drainage ditches.

#### 1.3 Responsibilities

Ultimately the owner or operator holding the permit is responsible for activities associated with this construction project. The permittee must comply with the most stringent of the regulations from the federal and state programs as well as any local requirements. The SWMP Administrator is responsible for the day to day SWMP maintenance and updates.

The permittee may elect to share or delegate responsibility of certain compliance items to other parties such as contractors or third party consultants. Refer to Table 1.6 located in Appendix A of this SWMP for a breakdown of responsibilities.

## Master SWMP Site Maps–Other

### PART 2

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Berry Petroleum Company Old Mountain Field Section III Master SWMP

## **P-32 Water Impoundment Facility**

### **Site-Specific Stormwater Management Plan**

This section identifies and describes the appropriate BMPs that will be implemented at the proposed Water Impoundment Facility on Old Mountain P32 595. The BMPs for this site include procedural and structural BMPs to minimize erosion, sediment transport, and pollution from stormwater runoff. On-site inspections of BMPs will ensure proper function, installation, and effectiveness.

The water impoundment pit will have a 60 mil primary synthetic liner and a 24 mil secondary synthetic liner that will cover the bottom and interior sides of the pit, with the edges secured around the pit perimeter. A leak detection system will be installed to monitor for any leaks. A water level monitor will be used to ensure a 2 foot freeboard.

#### Drainage Ditches

The drainage ditches surrounding the pad site will remain in place for the life of the project, until reclamation of the pad is complete. These are used to direct and control stormwater runoff from the site in a non-erosive manner. The drainage ditches will contain numerous sediment traps for velocity control and sediment drop-out. The ditches for the site are shown in Figures 10a and 10b as dashed blue lines with arrows showing direction of flow.

#### Sediment Trap

Sediment traps are used to intercept, trap, and retain sediment suspended in runoff. The runoff slowly drains, infiltrates, or both as it is held in the trap. This BMP is formed by excavating below grade and protecting the trap with appropriately sized riprap to prevent further erosion. These will be placed in numerous locations in the drainage ditched surrounding the pad site. The locations for these at the site are shown in Figures 10a and 10b as blue circles.

#### Check Dams

Check dams are placed in drainage ditches to limit erosivity of stormwater by reducing flow velocity. Check dams will be constructed of rock socks and sediment control logs, such as straw wattles. Rock socks will be placed at regularly spaced intervals with enough height to create a small “pond” upstream from the dam. Straw Wattles will be held in place by small wooden stakes. Accumulated sediment will be removed before the depth is one-half the height of the log. Check dams will be inspected to ensure no damage has occurred.

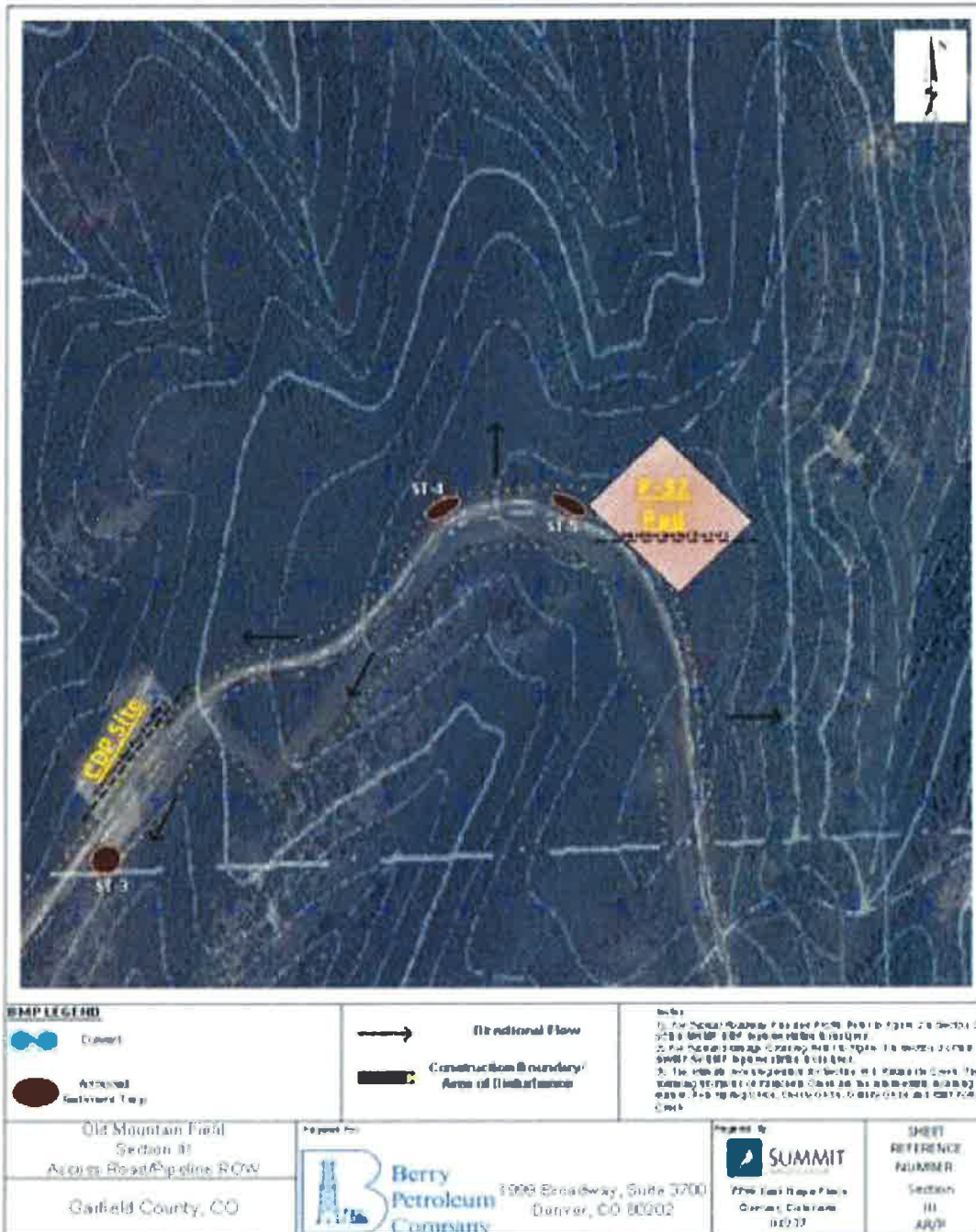
#### Earthen Berms

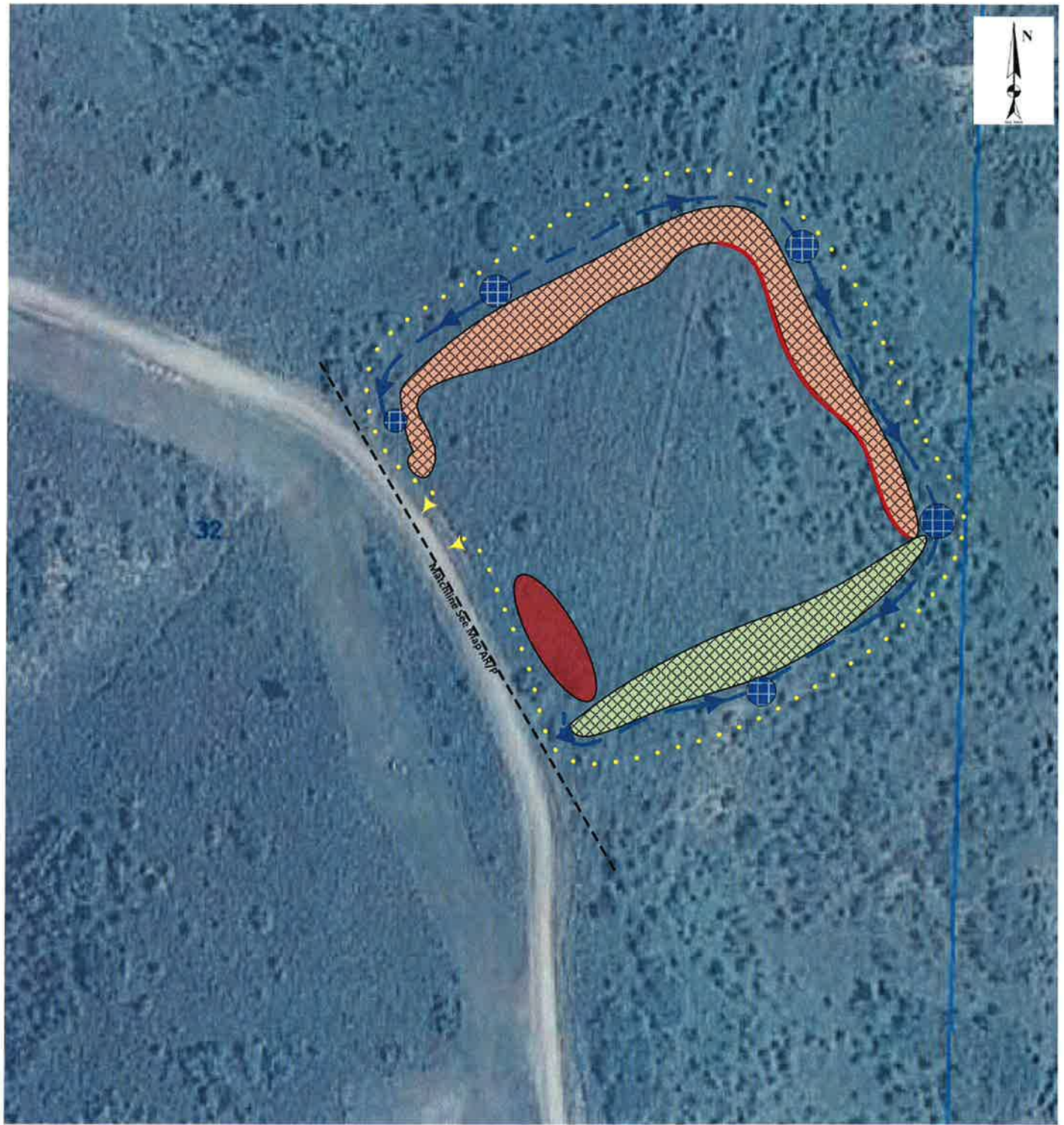
A berm is a ridge of compacted soil located at the top a sloping disturbed area to contain and divert runoff and/or spilled material. The purpose of the berm is to slow runoff velocity and divert the water toward the drainage ditches surrounding the site. The earthen berm proposed on the site is shown as the red line in Figures 10a and 10b.

### Gravel Surfacing

Gravel surfacing is used as a soil cover for the pad site. Gravel surfacing forms a protective layer on the pad surface that minimizes soil erosion and vehicle soil tracking.







**LEGEND**

	Fill Slope		Drainage Ditch		Sediment Trap		Dirt Berm
	Cut Slope		Topsoil Stockpile		Construction Boundary/ Area of Disturbance		Stockpile
	Lined Reserve Pit		Directional Flow		Material Staging Area		
	Wellhead						

Old Mountain Field  
Section III  
P-32

Garfield County, CO

Prepared For:



1999 Broadway, Suite 3700  
Denver, CO 80202

Prepared By:



7796 East Napa Place  
Denver, Colorado  
80237

SHEET  
REFERENCE  
NUMBER:

Pad Site  
2 of 2





**LEGEND**

- |                   |                  |                       |                       |
|-------------------|------------------|-----------------------|-----------------------|
| Fill Slope        | Drainage Ditch   | Sediment Trap         | Dirt Berm             |
| Cut Slope         | Topped Stockpile | Construction Boundary | Stockpile             |
| Lined Reserve Pit | Wellhead         | Area of Disturbance   | Material Staging Area |
|                   |                  | Directional Flow      |                       |

Old Mountain Field  
Section III  
P-32

Garfield County, CO

Prepared For:



Berry  
Petroleum  
Company

1999 Broadway, Suite 3700  
Denver, CO 80202

Prepared By:



3770 East Maple Place  
Denver, Colorado  
80231

SHEET  
REFERENCE  
NUMBER

Pad Site  
2 of 2

# STATE OF COLORADO

John W. Hickenlooper, Governor  
Christopher E. Urbina, MD, MPH  
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S. Laboratory Services Division  
Denver, Colorado 80246-1530 8100 Lowry Blvd.  
Phone (303) 692-2000 Denver, Colorado 80230-6928  
Located in Glendale, Colorado (303) 692-3090

<http://www.cdphe.state.co.us>



Colorado Department  
of Public Health  
and Environment

July 5, 2011

James T Albi, Asset Mgr  
Berry Petroleum Co  
1999 Broadway Ste 3700  
Denver, CO 80202

**RE: Certification, Colorado Discharge Permit System**  
**Permit No., COR030000, Certification Number: COR03H906**

Dear Mr./Ms. Albi;

The Water Quality Control Division (the Division) has reviewed the application submitted for the Old Mountain Field Section III facility and determined that it qualifies for coverage under the CDPS General Permit for Stormwater Discharges Associated with Construction Activities (the permit). Enclosed please find a copy of the permit certification, which was issued under the Colorado Water Quality Control Act.

**Facility:** Old Mountain Field Section III

Garfield County

**Construction Activities** Oil and Gas Production and/or Exploration,

**Legal Contact** (receives all legal documentation pertaining to the permit certification):

James T Albi, Asset Mgr  
Berry Petroleum Co  
1999 Broadway Ste 3700  
Denver, CO 80202

Phone number: 303-999-4400

Email: [jta@bry.com](mailto:jta@bry.com)

**Facility Contact** (contacted for general inquiries regarding the facility):

Bryan Burns, Env Specialist

Phone number: 303-999-4245

Email: [bob@bry.com](mailto:bob@bry.com)

**Billing Contact** (receives the invoice pertaining to the permit certification):

James T Albi Asset Mgr  
Berry Petroleum Co  
1999 Broadway Ste 3700  
Denver, CO 80202

Phone number: 303-999-4400

Email: [jta@bry.com](mailto:jta@bry.com)

Any changes to the contacts listed above must be provided to the Division on a Change of Contact form. This form is available on the Division's website at [coloradowaterpermits.com](http://coloradowaterpermits.com).

The Annual Fee for this certification is \$245.00 is invoiced every July. Do Not Pay This Now. The initial prorated invoice will be sent to the legal contact shortly.

Please read the enclosed permit and certification. If you have any questions please contact Matt Czahor, Environmental Protection Specialist, at (303) 692-3575.

Sincerely,

Debbie Jessop, Program Assistant  
WATER QUALITY CONTROL DIVISION

Enclosures: Certification page; General Permit; Highlight Sheet; Termination form

xc: Permit File

/dkj cert



# STATE OF COLORADO

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT  
WATER QUALITY CONTROL DIVISION  
TELEPHONE: (303) 692-3500



**CERTIFICATION TO DISCHARGE  
UNDER  
CDPS GENERAL PERMIT COR-0300000  
STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITIES**

Certification Number: **COR03H906**

**This Certification to Discharge specifically authorizes:**

**Berry Petroleum Co**

to discharge stormwater from the facility identified as

**Old Mountain Field Section III**

**to:**

**Pete Spring Gulch, Cherry Gulch, Grassy Gulch - East Fork Creek - Parachute Creek**

**Facility Industrial Activity :** Oil and Gas Production and/or Exploration,

**Facility Located at:** County Rd 215 & Wheeler Gulch, Unincorporated  
Garfield County, CO 00000  
Latitude 39.564, Longitude -108.076

**Certification is effective:** 7/5/2011

**Certification Expires:** 6/30/2012

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.

Signed,

Nathan Moore  
Construction/MS4/Pretreatment Unit Manager  
Water Quality Control Division

# HIGHLIGHTS

## CONSTRUCTION ACTIVITY STORMWATER GENERAL PERMIT

### PERMIT REQUIREMENTS:

- \* ***Inspections:*** Inspection of stormwater management system required at least every 14 days **and** after any precipitation or snowmelt event that causes surface erosion. (See Inspections, page 12 of the permit, enclosed.)
- \* ***Records:*** Records of inspections must be kept and be available for review by the Division.
- \* ***Stormwater Management Plan (SWMP):*** A copy of the SWMP must be kept on the construction site at all times.

### PERMIT FEE:

- \* Send payment only when you receive an invoice (sent once a year).

### PERMIT TERMINATION AND TRANSFER:

- \* If the facility is *finally stabilized*, you may inactivate the permit, using the enclosed Division form.
- \* “*Final stabilization*” is reached when all the construction is complete, paving is finished, and the vegetation (grass, etc.) is established, ***not just reseeded***. See permit, page 9.
- \* If the ***entire*** site changes ownership, you should transfer the permit to the new owner.
- \* If ***part*** of the site will be sold to a new owner, you will need to reassign permit coverage.
- \* Forms for these actions are available on our website, below. Also see page 5 of the permit.

### QUESTIONS?

- \* [www.coloradowaterpermits.com](http://www.coloradowaterpermits.com)
- \* Email [cdphe.wqstorm@state.co.us](mailto:cdphe.wqstorm@state.co.us)
- \* Or call (303)692-3517, ask for Matt Czahor or Kathy Rosow

# STATE OF COLORADO

Bill Ritter, Jr., Governor  
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.  
Denver, Colorado 80246-1530  
Phone (303) 692-2000  
TDD Line (303) 691-7700  
Located in Glendale, Colorado

Laboratory Services Division  
8100 Lowry Blvd.  
Denver, Colorado 80230-6928  
(303) 692-3090

<http://www.cdphe.state.co.us>



Colorado Department  
of Public Health  
and Environment

## Colorado Water Quality Control Division Notice of Termination

### Construction Stormwater Inactivation Notice

[www.coloradowaterpermits.com](http://www.coloradowaterpermits.com)

Print or type all information. All items must be filled out completely and correctly. If the form is not complete, it will be returned. All permit terminations dates are effective on the date approved by the Division.

MAIL ORIGINAL FORM WITH INK SIGNATURES TO THE FOLLOWING ADDRESS:

Colorado Dept of Public Health and Environment  
Water Quality Control Division  
4300 Cherry Creek Dr South, WQCD-P-B2  
Denver, CO 80246-1530

FAXED OR EMAILED FORMS WILL NOT BE ACCEPTED.

- **PART A. IDENTIFICATION OF PERMIT** Please write the permit certification number to be terminated

Permit Certification Number (four digits, not "0000"): COR03 \_ \_ \_ \_

- **PART B. PERMITTEE INFORMATION**

Company Name \_\_\_\_\_

Mailing Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip code \_\_\_\_\_

Legal Contact Name \_\_\_\_\_ Phone number \_\_\_\_\_

Title \_\_\_\_\_ Email \_\_\_\_\_

- **PART C. FACILITY/PROJECT INFORMATION**

Facility/Project Name \_\_\_\_\_

Location (address) \_\_\_\_\_

City \_\_\_\_\_ County \_\_\_\_\_ Zip code \_\_\_\_\_

Local Contact Name \_\_\_\_\_ Phone number \_\_\_\_\_

Title \_\_\_\_\_ Email \_\_\_\_\_

CDPS GENERAL PERMIT  
STORMWATER DISCHARGES ASSOCIATED WITH  
CONSTRUCTION ACTIVITY  
AUTHORIZATION TO DISCHARGE UNDER THE  
COLORADO DISCHARGE PERMIT SYSTEM

In compliance with the provisions of the Colorado Water Quality Control Act, (25-8-101 et seq., CRS, 1973 as amended) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), this permit authorizes the discharge of stormwater associated with construction activities (and specific allowable non-stormwater discharges in accordance with Part I.D.3 of the permit) certified under this permit, from those locations specified throughout the State of Colorado to specified waters of the State. Such discharges shall be in accordance with the conditions of this permit.

This permit specifically authorizes the facility listed on page 1 of this permit to discharge, as of this date, in accordance with permit requirements and conditions set forth in Parts I and II hereof. All discharges authorized herein shall be consistent with the terms and conditions of this permit.

This permit and the authorization to discharge shall expire at midnight, **June 30, 2012.**

Issued and Signed this 31<sup>st</sup> day of May, 2007

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT



Janet S. Kieler  
Permits Section Manager  
Water Quality Control Division

**SIGNED AND ISSUED MAY 31, 2007**

**EFFECTIVE JULY 1, 2007**



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PART I

A. COVERAGE UNDER THIS PERMIT

1. **Authority to Discharge**

Under this permit, facilities are granted authorization to discharge stormwater associated with construction activities into waters of the state of Colorado. This permit also authorizes the discharge of specific allowable non-stormwater discharges, in accordance with Part I.D.3 of the permit, which includes discharges to the ground. This includes stormwater discharges from areas that are dedicated to producing earthen materials, such as soils, sand and gravel, for use at a single construction site (i.e., borrow or fill areas). This permit also authorizes stormwater discharges from dedicated asphalt batch plants and dedicated concrete batch plants. (Coverage under the construction site permit is not required for batch plants if they have alternate CDPS permit coverage.) This permit does not authorize the discharge of mine water or process water from such areas.

- a) **Applicable Sections:** In accordance with Part I.A.3 of this permit, some parts of this permit do not apply to sites covered under a Qualifying Local Program, as defined in I.A.2.d. For sites not covered by a Qualifying Local Program, all parts of the permit apply except Part I.A.3. The permittee will be responsible for determining and then complying with the applicable sections.
- b) **Oil and Gas Construction:** Stormwater discharges associated with construction activities directly related to oil and gas exploration, production, processing, and treatment operations or transmission facilities are regulated under the Colorado Discharge Permit System Regulations (5CCR 1002-61), and require coverage under this permit in accordance with that regulation. However, references in this permit to specific authority under the Federal Clean Water Act (CWA) do not apply to stormwater discharges associated with these oil and gas related construction activities, to the extent that the references are limited by the federal Energy Policy Act of 2005.

2. **Definitions**

- a) **Stormwater:** Stormwater is precipitation-induced surface runoff.
- b) **Construction activity:** Construction activity refers to ground surface disturbing activities, which include, but are not limited to, clearing, grading, excavation, demolition, installation of new or improved haul roads and access roads, staging areas, stockpiling of fill materials, and borrow areas. Construction does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.
- c) **Small construction activity:** Stormwater discharge associated with small construction activity means the discharge of stormwater from construction activities that result in land disturbance of equal to or greater than one acre and less than five acres. Small construction activity also includes the disturbance of less than one acre of total land area that is part of a larger common plan of development or sale, if the larger common plan will ultimately disturb equal to or greater than one and less than five acres.
- d) **Qualifying Local Program:** This permit includes conditions that incorporate qualifying local erosion and sediment control program (Qualifying Local Program) requirements by reference. A Qualifying Local Program is a municipal stormwater program for stormwater discharges associated with small construction activity that has been formally approved by the Division.

Other Definitions: Definitions of additional terms can be found in Part I.E. of this permit.

3. **Permit Coverage Without Application – for small construction activities under a Qualifying Local Program only**

If a small construction site is within the jurisdiction of a Qualifying Local Program, the operator of the construction activity is authorized to discharge stormwater associated with small construction activity under this general permit without the submittal of an application to the Division.

- a) **Applicable Sections:** For sites covered by a Qualifying Local Program, only Parts I.A.1, I.A.2, I.A.3, I.D.1, I.D.2, I.D.3, I.D.4, I.D.7, I.D.8, I.D.11, I.E and Part II of this permit, with the exception of Parts II.A.1, II.B.3, II.B.8, and II.B10, apply.

A. **COVERAGE UNDER THIS PERMIT (cont.)**

- b) **Automatic Coverage:** If the applicant does not receive a request for additional information or a notification of denial from the Division dated within ten calendar days of receipt of the application by the Division, authorization to discharge in accordance with the conditions of this permit shall be deemed granted.
- c) **Individual Permit Required:** If, after evaluation of the application (or additional information, such as the SWMP), it is found that this general permit is not appropriate for the operation, then the application will be processed as one for an individual permit. The applicant will be notified of the Division's decision to deny certification under this general permit. For an individual permit, additional information may be requested, and 180 days may be required to process the application and issue the permit. At the Division's discretion, temporary coverage under this general permit may be allowed until the individual permit goes into effect.
- d) **General vs. Individual Permit Coverage:** Any permittee authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual CDPS permit. The permittee shall submit an individual application, with reasons supporting the request, to the Division at least 180 days prior to any discharge.
- e) **Local Agency Authority:** This permit does not pre-empt or supersede the authority of local agencies to prohibit, restrict, or control discharges of stormwater to storm drain systems or other water courses within their jurisdiction.

6. **Inactivation Notice**

When a site has been finally stabilized in accordance with the SWMP, the permittee must submit an **Inactivation Notice** form that is signed in accordance with Part I.F.1. of this permit. The Inactivation Notice form is available from the Division and includes:

- a) Permit certification number;
- b) The permittee's name, address, telephone number;
- c) Name, location, and county for the construction site for which the inactivation notice is being submitted; and
- d) Certification that the site has been finally stabilized, and a description of the final stabilization method(s).

7. **Transfer of Permit**

When responsibility for stormwater discharges at a construction site changes from one entity to another, the permittee shall submit a completed **Notice of Transfer and Acceptance of Terms** form that is signed in accordance with Part I.F.1. of this permit. The Notice of Transfer form is available from the Division and includes:

- a) Permit certification number;
- b) Name, location, and county for the construction site for which the Notice of Transfer is being submitted;
- c) Identifying information for the new permittee;
- d) Identifying information for the current permittee; and
- e) Effective date of transfer.

If the new responsible party will not complete the transfer form, the permit may be inactivated upon written request to the Division and completion of the Inactivation Notice if the permittee has no legal responsibility, through ownership or contract, for the construction activities at the site. In this case, the new owner or operator would be required to obtain permit coverage separately.

8. **Reassignment of Permit**

When a permittee no longer has control of a specific portion of a permitted site, and wishes to transfer coverage of that portion of the site to a second party, the permittee shall submit a completed **Notice of Reassignment of Permit Coverage** form that is signed in accordance with Part I.F.1. of this permit. The Notice of Reassignment of Permit Coverage form is available from the Division and includes:

- a) Current permit certification number;
- b) Identifying information and certification as required by Part I.A.4.b for the new permittee;
- c) Identifying information for the current permittee, revised site information and certification for reassignment; and
- d) Effective date of reassignment.

B. STORMWATER MANAGEMENT PLAN (SWMP) – **GENERAL REQUIREMENTS** (cont.)

2. The SWMP shall:
  - a) Identify all potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges associated with construction activity from the facility;
  - b) Describe the practices to be used to reduce the pollutants in stormwater discharges associated with construction activity at the facility; and ensure the practices are selected and described in accordance with good engineering practices, including the installation, implementation and maintenance requirements; and
  - c) Be properly prepared, and updated in accordance with Part I.D.5.c, to ensure compliance with the terms and conditions of this permit.
3. Facilities must implement the provisions of the SWMP as written and updated, from commencement of construction activity until final stabilization is complete, as a condition of this permit. The Division reserves the right to review the SWMP, and to require the permittee to develop and implement additional measures to prevent and control pollution as needed.
4. The SWMP may reflect requirements for Spill Prevention Control and Countermeasure (SPCC) plans under section 311 of the CWA, or Best Management Practices (BMPs) Programs otherwise required by a separate CDPS permit, and may incorporate any part of such plans into the SWMP by reference, provided that the relevant sections of such plans are available as part of the SWMP consistent with Part I.D.5.b.
5. For any sites with permit coverage before June 30, 2007, the permittee's SWMP must meet the new SWMP requirements as summarized in Section II.I of the rationale. Any needed changes must be made by **October 1, 2007**.

C. STORMWATER MANAGEMENT PLAN (SWMP) – **CONTENTS**

The SWMP shall include the following items, at a minimum.

1. **Site Description.** The SWMP shall clearly describe the construction activity, to include:
  - a) The nature of the construction activity at the site.
  - b) The proposed sequence for major activities.
  - c) Estimates of the total area of the site, and the area and location expected to be disturbed by clearing, excavation, grading, or other construction activities.
  - d) A summary of any existing data used in the development of the site construction plans or SWMP that describe the soil or existing potential for soil erosion.
  - e) A description of the existing vegetation at the site and an estimate of the percent vegetative ground cover.
  - f) The location and description of all potential pollution sources, including ground surface disturbing activities (see Part I.A.2.b), vehicle fueling, storage of fertilizers or chemicals, etc.
  - g) The location and description of any anticipated allowable sources of non-stormwater discharge at the site, e.g., uncontaminated springs, landscape irrigation return flow, construction dewatering, and concrete washout.
  - h) The name of the receiving water(s) and the size, type and location of any outfall(s). If the stormwater discharge is to a municipal separate storm sewer system, the name of that system, the location of the storm sewer discharge, and the ultimate receiving water(s).
2. **Site Map.** The SWMP shall include a legible site map(s), showing the entire site, identifying:
  - a) construction site boundaries;
  - b) all areas of ground surface disturbance;
  - c) areas of cut and fill;
  - d) areas used for storage of building materials, equipment, soil, or waste;
  - e) locations of dedicated asphalt or concrete batch plants;
  - f) locations of all structural BMPs;
  - g) locations of non-structural BMPs as applicable; and
  - h) locations of springs, streams, wetlands and other surface waters.



C. STORMWATER MANAGEMENT PLAN (SWMP) – CONTENTS (cont.)

- 3) Phased BMP Implementation. The SWMP shall clearly describe the relationship between the phases of construction, and the implementation and maintenance of both structural and non-structural stormwater management controls. The SWMP must identify the stormwater management controls to be implemented during the project phases, which can include, but are not limited to, clearing and grubbing; road construction; utility and infrastructure installation; vertical construction; final grading; and final stabilization.
- 4) Materials Handling and Spill Prevention. The SWMP shall clearly describe and locate all practices implemented at the site to minimize impacts from procedures or significant materials (see definitions at Part I.E.) that could contribute pollutants to runoff. Such procedures or significant materials could include: exposed storage of building materials; paints and solvents; fertilizers or chemicals; waste material; and equipment maintenance or fueling procedures.

Areas or procedures where potential spills can occur must have spill prevention and response procedures identified in the SWMP.

- 5) Dedicated Concrete or Asphalt Batch Plants. The SWMP shall clearly describe and locate all practices implemented at the site to control stormwater pollution from dedicated concrete batch plants or dedicated asphalt batch plants covered by this certification.
- 6) Vehicle Tracking Control. The SWMP shall clearly describe and locate all practices implemented at the site to control potential sediment discharges from vehicle tracking. Practices must be implemented for all areas of potential vehicle tracking, and can include: minimizing site access; street sweeping or scraping; tracking pads; graveled parking areas; requiring that vehicles stay on paved areas on-site; wash racks; contractor education; and/or sediment control BMPs, etc.
- 7) Waste Management and Disposal, Including Concrete Washout.
  - i) The SWMP shall clearly describe and locate the practices implemented at the site to control stormwater pollution from all construction site wastes (liquid and solid), including concrete washout activities.
  - ii) The practices used for concrete washout must ensure that these activities do not result in the contribution of pollutants associated with the washing activity to stormwater runoff.
  - iii) Part I.D.3.c of the permit authorizes the conditional discharge of concrete washout water to the ground. The SWMP shall clearly describe and locate the practices to be used that will ensure that no washout water from concrete washout activities is discharged from the site as surface runoff or to surface waters.
- 8) Groundwater and Stormwater Dewatering.
  - i) The SWMP shall clearly describe and locate the practices implemented at the site to control stormwater pollution from the dewatering of groundwater or stormwater from excavations, wells, etc.
  - ii) Part I.D.3.d of the permit authorizes the conditional discharge of construction dewatering to the ground. For any construction dewatering of groundwater not authorized under a separate CDPS discharge permit, the SWMP shall clearly describe and locate the practices to be used that will ensure that no groundwater from construction dewatering is discharged from the site as surface runoff or to surface waters.

4. Final Stabilization and Long-term Stormwater Management

- a) The SWMP shall clearly describe the practices used to achieve final stabilization of all disturbed areas at the site, and any planned practices to control pollutants in stormwater discharges that will occur after construction operations have been completed at the site.
- b) Final stabilization practices for obtaining a vegetative cover should include, as appropriate: seed mix selection and application methods; soil preparation and amendments; soil stabilization practices (e.g., crimped straw, hydro mulch or rolled erosion control products); and appropriate sediment control BMPs as needed until final stabilization is achieved; etc.

D. TERMS AND CONDITIONS (cont.)

3. **Prohibition of Non-Stormwater Discharges**

- a) Except as provided in paragraphs b, c, and d below, **all discharges covered by this permit shall be composed entirely of stormwater associated with construction activity.** Discharges of material other than stormwater must be addressed in a separate CDPS permit issued for that discharge.
- b) Discharges from the following sources that are combined with stormwater discharges associated with construction activity may be authorized by this permit, provided that the non-stormwater component of the discharge is identified in the SWMP (see Part I.C.1.g of this permit):
  - emergency fire fighting activities
  - landscape irrigation return flow
  - uncontaminated springs
- c) Discharges to the ground of concrete washout water from washing of tools and concrete mixer chutes may be authorized by this permit, provided that:
  - 1) the source is identified in the SWMP;
  - 2) BMPs are included in the SWMP in accordance with Part I.C.3(c)(7) and to prevent pollution of groundwater in violation of Part I.D.1.a; and
  - 3) these discharges do not leave the site as surface runoff or to surface waters
- d) Discharges to the ground of water from construction dewatering activities may be authorized by this permit, provided that:
  - 1) the source is groundwater and/or groundwater combined with stormwater that does not contain pollutants in concentrations exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42;
  - 2) the source is identified in the SWMP;
  - 3) BMPs are included in the SWMP, as required by Part I.C.3(c)(8); and
  - 4) these discharges do not leave the site as surface runoff or to surface waters.

Discharges to the ground from construction dewatering activities that do not meet the above criteria must be covered under a separate CDPS discharge permit. Contaminated groundwater requiring coverage under a separate CDPS discharge permit may include groundwater contaminated with pollutants from a landfill, mining activity, industrial pollutant plume, underground storage tank, or other source.

4. **Releases in Excess of Reportable Quantities**

This permit does not relieve the permittee of the reporting requirements of 40 CFR 110, 40 CFR 117 or 40 CFR 302. Any discharge of hazardous material must be handled in accordance with the Division's Noncompliance Notification Requirements (see Part II.A.3 of the permit).

5. **SWMP Requirements**

- a) **SWMP Preparation and Implementation:** The SWMP shall be prepared prior to applying for coverage under the general permit, and certification of its completion submitted with the application. The SWMP shall be implemented prior to commencement of construction activities. The plan shall be updated as appropriate (see paragraph c, below), below). SWMP provisions shall be implemented until expiration or inactivation of permit coverage.
- b) **SWMP Retention Requirements:** A copy of the SWMP must be retained on site unless another location, specified by the permittee, is approved by the Division.
- c) **SWMP Review/Changes:** The permittee shall amend the SWMP:
  - 1) when there is a change in design, construction, operation, or maintenance of the site, which would require the implementation of new or revised BMPs; or
  - 2) if the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with construction activity; or

D. TERMS AND CONDITIONS (cont.)

- 3) **Winter Conditions Inspections Exclusion** – Inspections are not required at sites where construction activities are temporarily halted, snow cover exists over the entire site for an extended period, and melting conditions posing a risk of surface erosion do not exist. This exception is applicable only during the period where melting conditions do not exist, and applies to the routine 14-day and monthly inspections, as well as the post-storm-event inspections. The following information must be documented in the inspection record for use of this exclusion: dates when snow cover occurred, date when construction activities ceased, and date melting conditions began. Inspections, as described above, are required at all other times.

When site conditions make the schedule required in this section impractical, the permittee may petition the Division to grant an alternate inspection schedule.

b) **Inspection Requirements**

- 1) **Inspection Scope** - The construction site perimeter, all disturbed areas, material and/or waste storage areas that are exposed to precipitation, discharge locations, and locations where vehicles access the site shall be inspected for evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system, or discharging to state waters. All erosion and sediment control practices identified in the SWMP shall be evaluated to ensure that they are maintained and operating correctly.
- 2) **Inspection Report/Records** - The permittee shall keep a record of inspections. Inspection reports must identify any incidents of non-compliance with the terms and conditions of this permit. Inspection records must be retained for three years from expiration or inactivation of permit coverage. At a minimum, the inspection report must include:
- i) The inspection date;
  - ii) Name(s) and title(s) of personnel making the inspection;
  - iii) Location(s) of discharges of sediment or other pollutants from the site;
  - iv) Location(s) of BMPs that need to be maintained;
  - v) Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
  - vi) Location(s) where additional BMPs are needed that were not in place at the time of inspection;
  - vii) Deviations from the minimum inspection schedule as provided in Part I.D.6.a above;
  - viii) Description of corrective action for items iii, iv, v, and vi, above, dates corrective action(s) taken, and measures taken to prevent future violations, including requisite changes to the SWMP, as necessary; and
  - viii) After adequate corrective action(s) has been taken, or where a report does not identify any incidents requiring corrective action, the report shall contain a signed statement indicating the site is in compliance with the permit to the best of the signer's knowledge and belief.
- c) **Required Actions Following Site Inspections** – Where site inspections note the need for BMP maintenance activities, BMPs must be maintained in accordance with the SWMP and Part I.D.7 of the permit. Repair, replacement, or installation of new BMPs determined necessary during site inspections to address ineffective or inadequate BMPs must be conducted in accordance with Part I.D.8 of the permit. SWMP updates required as a result of deficiencies in the SWMP noted during site inspections shall be made in accordance with Part I.D.5.c of the permit.

7. **BMP Maintenance**

All erosion and sediment control practices and other protective measures identified in the SWMP must be maintained in effective operating condition. Proper selection and installation of BMPs and implementation of comprehensive Inspection and Maintenance procedures, in accordance with the SWMP, should be adequate to meet this condition. BMPs that are not adequately maintained in accordance with good engineering, hydrologic and pollution control practices, including removal of collected sediment outside the acceptable tolerances of the BMPs, are considered to be no longer operating effectively and must be addressed in accordance with Part I.D.8, below. A specific timeline for implementing maintenance procedures is not included in this permit because BMP maintenance is expected to be proactive, not responsive. Observations resulting in BMP maintenance activities can be made during a site inspection, or during general observations of site conditions.

E. ADDITIONAL DEFINITIONS

For the purposes of this permit:

1. **Best Management Practices (BMPs):** schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, pollution prevention, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from material storage.
2. **Dedicated asphalt plants and concrete plants:** portable asphalt plants and concrete plants that are located on or adjacent to a construction site and that provide materials only to that specific construction site.
3. **Final stabilization:** when all ground surface disturbing activities at the site 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. For purposes of this permit, establishment of a vegetative cover capable of providing erosion control equivalent to pre-existing conditions at the site will be considered final stabilization.
4. **Municipal separate storm sewer system:** a conveyance or system of conveyances (including: roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains), owned or operated by a State, city, town, county, district, or other public body (created by state law), having jurisdiction over disposal of sewage, industrial waste, stormwater, or other wastes; designed or used for collecting or conveying stormwater.
5. **Operator:** the entity that has day-to-day supervision and control of activities occurring at the construction site. This can be the owner, the developer, the general contractor or the agent of one of these parties, in some circumstances. It is anticipated that at different phases of a construction project, different types of parties may satisfy the definition of 'operator' and that the permit may be transferred as the roles change.
6. **Outfall:** a point source at the point where stormwater leaves the construction site and discharges to a receiving water or a stormwater collection system.
7. **Part of a larger common plan of development or sale:** a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules.
8. **Point source:** any discernible, confined and discrete conveyance from which pollutants are or may be discharged. Point source discharges of stormwater result from structures which increase the imperviousness of the ground which acts to collect runoff, with runoff being conveyed along the resulting drainage or grading pattern.
9. **Pollutant:** dredged spoil, dirt, slurry, solid waste, incinerator residue, sewage, sewage sludge, garbage, trash, chemical waste, biological nutrient, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, or any industrial, municipal or agricultural waste.
10. **Process water:** any water which, during manufacturing or processing, comes into contact with or results from the production of any raw material, intermediate product, finished product, by product or waste product. This definition includes mine drainage.
11. **Receiving Water:** any classified stream segment (including tributaries) in the State of Colorado into which stormwater related to construction activities discharges. This definition includes all water courses, even if they are usually dry, such as borrow ditches, arroyos, and other unnamed waterways.
12. **Significant Materials** include, but are not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical the facility is required to report pursuant to section 313 of title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with stormwater discharge.
13. **Stormwater:** precipitation-induced surface runoff.

## PART II

### A. MANAGEMENT REQUIREMENTS

#### 1. Amending a Permit Certification

The permittee shall inform the Division (Permits Section) in writing of changes to the information provided in the permit application, including the legal contact, the project legal description or map originally submitted with the application, or the planned total disturbed acreage. The permittee shall furnish the Division with any plans and specifications which the Division deems reasonably necessary to evaluate the effect on the discharge and receiving stream. If applicable, this notification may be accomplished through submittal of an application for a CDPS process water permit authorizing the discharge. The SWMP shall be updated and implemented prior to the changes (see Part I.D.5.c).

Any discharge to the waters of the State from a point source other than specifically authorized by this permit or a different CDPS permit is prohibited.

#### 2. Special Notifications - Definitions

- a) **Spill:** An unintentional release of solid or liquid material which may cause pollution of state waters.
- b) **Upset:** An exceptional incident in which there is unintentional and temporary noncompliance with permit discharge limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

#### 3. Noncompliance Notification

- a) The permittee shall report the following instances of noncompliance:
  - 1) Any noncompliance which may endanger health or the environment;
  - 2) Any spill or discharge of hazardous substances or oil which may cause pollution of the waters of the state.
  - 3) Any discharge of stormwater which may cause an exceedance of a water quality standard.
- b) For all instances of noncompliance based on environmental hazards and chemical spills and releases, all needed information must be provided orally to the Colorado Department of Public Health and Environment spill reporting line (24-hour number for environmental hazards and chemical spills and releases: 1-877-518-5608) within 24 hours from the time the permittee becomes aware of the circumstances.

For all other instances of noncompliance as defined in this section, all needed information must be provided orally to the Water Quality Control Division within 24 hours from the time the permittee becomes aware of the circumstances.

For all instances of noncompliance identified here, a written submission shall also be provided within 5 calendar days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of:

- 1) The noncompliance and its cause;
- 2) The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue;
- 3) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.



A. **MANAGEMENT REQUIREMENTS (cont.)**

9. **Reduction, Loss, or Failure of Stormwater Controls**

The permittee has the duty to halt or reduce any activity if necessary to maintain compliance with the permit requirements. Upon reduction, loss, or failure of any stormwater controls, the permittee shall, to the extent necessary to maintain compliance with its permit, control production, or remove all pollutant sources from exposure to stormwater, or both, until the stormwater controls are restored or an alternative method of treatment/control is provided.

It shall not be a defense for a permittee in an enforcement action that it would be necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

10. **Proper Operation and Maintenance**

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

B. **RESPONSIBILITIES**

1. **Inspections and Right to Entry**

The permittee shall allow the Director of the State Water Quality Control Division, the EPA Regional Administrator, and/or their authorized representative(s), upon the presentation of credentials:

- a) To enter upon the permittee's premises where a regulated facility or activity is located or in which any records are required to be kept under the terms and conditions of this permit;
- b) At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit and to inspect any monitoring equipment or monitoring method required in the permit; and
- c) To enter upon the permittee's premises to investigate, within reason, any actual, suspected, or potential source of water pollution, or any violation of the Colorado Water Quality Control Act. The investigation may include, but is not limited to, the following: sampling of any discharge and/or process waters, the taking of photographs, interviewing permittee staff on alleged violations and other matters related to the permit, and access to any and all facilities or areas within the permittee's premises that may have any effect on the discharge, permit, or any alleged violation.

2. **Duty to Provide Information**

The permittee shall furnish to the Division, within the time frame specified by the Division, any information which the Division may request to determine whether cause exists for modifying, revoking and reissuing, or inactivating coverage under this permit, or to determine compliance with this permit. The permittee shall also furnish to the Division, upon request, copies of records required to be kept by this permit.

3. **Transfer of Ownership or Control**

Certification under this permit may be transferred to a new permittee if:

- a) The current permittee notifies the Division in writing when the transfer is desired as outlined in Part I.A.7; and
- b) The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage and liability between them; and
- c) The current permittee has met all fee requirements of the Colorado Discharge Permit System Regulations, Section 61.15.

B. RESPONSIBILITIES (cont.)

5. **Permit Violations**

Failure to comply with any terms and/or conditions of this permit shall be a violation of this permit.

Dischargers of stormwater associated with industrial activity, as defined in the EPA Stormwater Regulation (40 CFR 122.26(b)(14) and Section 61.3(2) of the Colorado Discharge Permit System Regulations, which do not obtain coverage under this or other Colorado general permits, or under an individual CDPS permit regulating industrial stormwater, will be in violation of the federal Clean Water Act and the Colorado Water Quality Control Act, 25-8-101, as amended. Failure to comply with CDPS permit requirements will also constitute a violation.

6. **Legal Responsibilities**

The issuance of this permit does not convey any property or water rights in either real or personal property, or stream flows, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority granted by Section 510 of the Clean Water Act.

7. **Severability**

The provisions of this permit are severable. If any provisions of this permit, or the application of any provision of this permit to any circumstance, are held invalid, the application of such provision to other circumstances and the application of the remainder of this permit shall not be affected.

8. **Renewal Application**

If the permittee desires to continue to discharge, a permit renewal application shall be submitted at least ninety (90) days before this permit expires. If the permittee anticipates that there will be no discharge after the expiration date of this permit, the Division should be promptly notified so that it can inactivate the certification in accordance with Part II.B.4.d.

9. **Confidentiality**

Except for data determined to be confidential under Section 308 of the Federal Clean Water Act and Colorado Discharge Permit System Regulations, Section 61.5(4), all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division. The permittee must state what is confidential at the time of submittal.

Any information relating to any secret process, method of manufacture or production, or sales or marketing data which has been declared confidential by the permittee, and which may be acquired, ascertained, or discovered, whether in any sampling investigation, emergency investigation, or otherwise, shall not be publicly disclosed by any member, officer, or employee of the Commission or the Division, but shall be kept confidential. Any person seeking to invoke the protection of this section shall bear the burden of proving its applicability. This section shall never be interpreted as preventing full disclosure of effluent data.

10. **Fees**

The permittee is required to submit payment of an annual fee as set forth in the Water Quality Control Act. Failure to submit the required fee when due and payable is a violation of the permit and will result in enforcement action pursuant to Section 25-8-601 et. seq., C.R.S. 1973 as amended.

4300 Cherry Creek Drive South  
Denver, Colorado 80246-1530

## **RATIONALE**

### **STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY**

#### **GENERAL PERMIT IN COLORADO THIRD RENEWAL COLORADO DISCHARGE PERMIT NUMBER COR-030000**

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#### **I. INTRODUCTION**

*This permit is for the regulation of stormwater runoff from construction activities, and specific allowable non-stormwater discharges in accordance with Part I.D.3 of the permit. The term "construction activity" includes ground surface disturbing activities, including, but not limited to, clearing, grading, excavation, demolition, installation of new or improved haul and access roads, staging areas, stockpiling of fill materials, and borrow areas. "Stormwater" is precipitation-induced surface runoff. This rationale will explain the background of the Stormwater program, activities which are covered under this permit, how to apply for coverage under this permit, and the requirements of this permit.*

***The forms discussed in the rationale and permit are available on the Water Quality Control Division's website at: [www.cdphe.state.co.us/wq/PermitsUnit](http://www.cdphe.state.co.us/wq/PermitsUnit)***

#### **II. CHANGES IN THIS GENERAL PERMIT**

*Several notable changes from the previous General Permit for Construction Activities have been incorporated into this permit. Significant changes are listed below. Numerous other minor changes were made for clarification purposes only.*

##### ***A. Authority to Discharge***

*This section has been restructured to list all of the types of activities covered by this permit, and to be consistent with the definition of "construction activity." The definition of construction activity has been expanded to provide clarification. See Part I.A.1 of the permit.*

## II. CHANGES IN THIS GENERAL PERMIT (cont.)

### I. Stormwater Management Plan (SWMP) – Contents

The SWMP Contents section has been modified. Some of the changes are limited to organization of information, which does not require modification of an existing permittee's current SWMP. Most of the SWMP changes involve either clarifications, reformatting, or taking recommendations from the Division's SWMP guide and making them permit requirements (e.g., vehicle tracking controls, BMP installation specifications). If an **existing permittee (i.e., those with permit coverage before June 30, 2007)** followed the recommendations in the SWMP guide (Appendix A of the permit application), then their SWMP will presumably meet the new requirements. However, for any existing permittees who did not follow the applicable SWMP guide recommendations, their SWMP must be amended to include the new required items:

-SWMP Administrator

-Identification of potential pollutant sources

-Best Management Practices descriptions and installation specifications, including dedicated concrete or asphalt batch plants; vehicle tracking control; and waste management and disposal (including concrete washout activities).

For existing permittees, any SWMP changes based on the change in permit requirements must be completed by **October 1, 2007**. The plan is not to be submitted to the Division unless requested, but must be available on site as outlined in Part I.D.5(b) of the permit.

The BMP requirement clarifications included in this renewed permit in no way imply that adequate BMPs to address all pollutant sources at a permitted site were not required in previous permits. The revised requirements are intended only to better clarify SWMP content requirements and provide improved direction to permittees.

The SWMP changes are listed below. All new applicants (after June 30, 2007) for permit coverage for their sites must fully comply with the new SWMP organization, plan requirements, and implementation.

1. **Site Description:** The requirement to provide an estimate of the run-off coefficient has been removed. The run-off coefficient as currently utilized in the SWMP may not contribute sufficiently to permit compliance to justify the effort in determining accurate values. See Part I.C.1 of the permit. However, the Division still encourages use of the coefficient as needed to adequately evaluate site-specific BMP selection and design criteria (e.g., pond capacities, BMP location, etc.) See Section C.2 of the SWMP guidance (Appendix A of the permit application).
2. **Site Map:** The requirement to identify boundaries of the 100-year flood plain has been removed. The boundaries as currently utilized in the SWMP may not contribute sufficiently to permit compliance to justify the effort in determining their location. See Part I.C.2 of the permit.
3. **Stormwater Management Controls:** This section has been modified to require identification of a SWMP Administrator and all potential pollutants sources in the SWMP. See Part I.C.3 of the permit.
  - a) The SWMP Administrator is a specific individual(s), position or title who is responsible for the process of developing, implementing, maintaining, and revising the SWMP. This individual serves as the comprehensive point of contact for all aspects of the facility's SWMP. **This requirement may necessitate changes to existing permittees' SWMPs.**

II. CHANGES IN THIS GENERAL PERMIT (cont.)

*Where adequate management practices are not followed to protect groundwater quality, the Department may require discharges to unlined pits to cease, or require the entity to obtain alternate regulatory approval through notice from either the Water Quality Control Division or the Hazardous Materials and Waste Management Division.*

*In addition, Part I.D.1(b) of the permit has been revised to clearly state that the permit does not authorize on-site permanent disposal of concrete washout waste, only temporary containment of concrete washout water from washing of tools and concrete mixer chutes. Upon termination of use of the washout site, accumulated solid waste, including concrete waste and any contaminated soils, must be removed from the site to prevent on-site disposal of solid waste.*

- v) *Construction Dewatering. Part I.D.3(d) of the permit has been revised to conditionally authorize discharges to the ground of water from construction dewatering activities when appropriate BMPs are implemented. The permit does not authorize the discharge of groundwater from construction dewatering to surface waters or to storm sewer systems. Part I.C.3(c)(8) of the permit requires that BMPs be in place to prevent surface discharges. The permittee may apply for coverage under a separate CDPS discharge permit, such as the Construction Dewatering general permit, if there is a potential for discharges to surface waters.*

*The Division has determined that potential pollutant sources introduced into groundwater from construction dewatering operations do not have a reasonable potential to result in exceedance of groundwater standards when the discharge is to the ground. The primary pollutant of concern in uncontaminated groundwater is sediment. Although technology-based standards for sediment do exist in 5 CCR 1002-41, the discharge of sediment to the ground as part of construction dewatering does not have the reasonable potential to result in transport of sediment to the groundwater table so as to result in an exceedance of those standards.*

*For a discharge of water contaminated with other pollutants that are present in concentrations that may cause an exceedance of groundwater standards, separate CDPS discharge permit coverage is required. Contaminated groundwater may include that contaminated with pollutants from a landfill, mining activity, industrial pollutant plume, underground storage tank, or other source of human-induced groundwater pollution and exceeding the State groundwater standards in Regulations 5 CCR 1002-41 and 42.*

J. Terms and Conditions, General Limitations and Design Standards

*This section reiterates the requirement that facilities select, install, implement, and maintain appropriate BMPs, following good engineering, hydrologic and pollution control practices. In addition, requirements for protection of water quality standards (see Part I.D.1.(a) of the permit) and requirements to adequately design BMPs to prevent pollution or degradation of State waters (see Part I.D.2 of the permit) have been revised and are fully discussed in Part III.B of the rationale, below. Additional language was also added to Section III.B of the rationale further clarifying the expectations for compliance with this permit.*

I. Management of Site Waste

*This section has been modified to clarify that on-site waste must be properly managed to prevent potential pollution of State waters, and that this permit does not authorize on-site waste disposal. Solid waste disposal is regulated by the Hazardous Materials and Waste Management Division.*



II. CHANGES IN THIS GENERAL PERMIT (cont.)

3. *The Inspection Report/Records section (Part I.D.6(b)(2)) was added to clarify requirements for inspection reports generated during an inspection conducted in accordance with Part I.D.6 of the permit. Inspection reports must be signed by the inspector, or the individual verifying the corrective action indicated in the inspection report, on behalf of the permittee. Inspection reports are not typically required to be submitted to the Division, and therefore, are not required to be signed and certified for accuracy in accordance with Part I.F.1 of the permit. However, any inspection reports that are submitted to the Division must follow the signatory requirements contained in that section.*

N. Terms and Conditions, Maintenance, Repair, and Replacement of Control Practices

*These sections have been added to clarify requirements for maintaining the BMPs identified in the SWMP and for addressing ineffective or failed BMPs. BMP maintenance and site assessment to determine the overall adequacy of stormwater quality management at the site must occur proactively, in order to ensure adequate control of pollutant sources at the site. In most cases, if BMPs are already not operating effectively, or have failed, the issue must be addressed immediately, to prevent discharge of pollutants. See Parts I.D.7 and I.D.8 of the permit.*

O. Total Maximum Daily Load (TMDL)

*A section on TMDLs has been added. This section gives a general outline of the additional requirements that may be imposed by the Division if the facility discharges to a waterbody for which a stormwater-related TMDL is in place. See Section VIII.C of the rationale and Part I.D.11 of the permit.*

P. Additional Definitions

*Part I.E of the permit has been modified to remove the definition of runoff coefficient, as it is no longer a permit requirement. The definition for state waters has also been deleted, but can be found in Regulation 61.*

Q. Changes in Discharge

*The section on the types of discharge or facility changes that necessitate Division notification has been clarified. See Part II.A.1 of the permit.*

R. Non-Compliance Notification

*The section on notification to the Division regarding instances of non-compliance has been amended to clarify which types of noncompliance require notification. See Part II.A.3 of the permit.*

S. Short Term Certifications

*The previous permit allowed small short-term construction activities to be authorized for a predetermined period from 3 to 12 months, and then automatically expire (an inactivation request did not need to be submitted). The issuance of these certifications has led to significant confusion and incidents of noncompliance resulting from permittees unintentionally letting their certifications expire prior to final stabilization, as well as issues regarding billing. Therefore, the provisions for short-term certifications have been deleted.*

T. Bypass

*The Division has revised the Bypass conditions in Part II.A.5 of the permit to be consistent with the requirements of Regulation 61.8(3)(i). The revised language addresses under what rare occurrences BMPs may be bypassed at a site.*

### III. BACKGROUND (cont.)

*Some construction sites may be required to comply with a Qualifying Local Program in place of meeting several of the specific requirements in this permit. Sites covered by a Qualifying Local Program may not be required to submit an application for coverage or a notice of inactivation and may not be required to pay the Division's annual fee. See Section VII of the rationale.*

#### C. Violations/Penalties

*Dischargers of stormwater associated with industrial activity, as defined in the CDPS regulations (5CCR 1002-61), that do not obtain coverage under this or other Colorado general permits, or under an individual CDPS permit regulating industrial stormwater, will be in violation of the Federal Clean Water Act and the Colorado Water Quality Control Act, 25-8-101. For facilities covered under a CDPS permit, failure to comply with any CDPS permit requirement constitutes a violation. As of the time of permit issuance, civil penalties for violations of the Act or CDPS permit requirements may be up to \$10,000 per day, and criminal pollution of state waters is punishable by fines of up to \$25,000 per day.*

### IV. STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY

*The stormwater regulations (CDPS regulations (5CCR 1002-61)), require that stormwater discharges associated with certain industrial activities be covered under the permit program. Construction activity that disturbs one acre or more during the life of the project is specifically included in the listed industrial activities. This permit is intended to cover most stormwater discharges from construction facilities required by State regulation to obtain a permit.*

#### A. Construction Activity

*Construction activity includes ground surface disturbing activities including, but not limited to, clearing, grading, excavation, demolition, installation of new or improved haul and access roads, staging areas, stockpiling of fill materials, and dedicated borrow/fill areas. Construction does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility. (The maintenance exclusion is intended for projects such as road resurfacing, and where there will be less than one acre of additional ground disturbed. Improvements or upgrades to existing facilities or roads, where at least one acre is disturbed, would not qualify as "routine maintenance.")*

*Definitions of additional terms can be found in Part I.E of the permit.*

*Stormwater discharges from all construction activity require permit coverage, except for operations that result in the disturbance of less than one acre of total land area and which are not part of a larger common plan of development or sale. A "larger common plan of development or sale" is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules.*

#### B. Types of Discharges/Activities Covered

1. **Stormwater:** *This permit is intended to cover most new or existing discharges composed **entirely** of stormwater from construction activities that are required by State regulation to obtain a permit. This includes stormwater discharges associated with areas that are dedicated to producing earthen materials, such as soils, sand, and gravel, for use at a single construction site. These areas may be located at the construction site or at some other location. This permit does not authorize the discharge of mine water or process water from borrow areas. This permit may also cover stormwater discharges associated with dedicated asphalt plants and concrete plants located at a specific construction site.*

## VII. QUALIFYING LOCAL PROGRAMS

*For stormwater discharges associated with small construction activity (i.e., one to five acre disturbed area sites), the permit includes conditions that incorporate approved qualifying local erosion and sediment control program (Qualifying Local Program) requirements by reference. A Qualifying Local Program is a municipal stormwater program for stormwater discharges associated with small construction activity that has been formally approved by the Division. The requirements for Qualifying Local Programs are outlined in Part 61.8(12) of the Colorado Discharger Permit System Regulations (also see the Division's "Qualifying Local Programs for Small Construction Sites - Application Guidance"). Such programs must impose requirements to protect water quality that are at least as stringent as those required in this permit.*

### A. Approval Termination

*A Qualifying Local Program may be terminated by either the Division or the municipality. Upon termination of Division approval of a Qualifying Local Program, any small construction activity required to obtain permit coverage under Section 61.3(2)(h) of the CDPS regulations (SCCR 1002-61), shall submit an application form as provided by the Division, with a certification that the Stormwater Management Plan (SWMP) is complete as required by Part I.A.3 of the permit, within 30 days of Division notification.*

### B. Approval Expiration

*Division approval of a Qualifying Local Program will expire with this general permit on June 30, 2012. Any municipality desiring to continue Division approval of their program must reapply by March 31, 2012. The Division will determine if the program may continue as an approved Qualifying Local Program.*

## VIII. TERMS AND CONDITIONS OF PERMIT

### A. Coverage under a Qualifying Local Program – For Small Construction Sites Only

*For small construction sites (disturbing less than 5 acres) covered under a Qualifying Local Program (see Section VII, above), only certain permit requirements apply, as outlined below. The local program must have been formally designated by the Division to qualify. Most municipalities have some type of local program and may require permits and fees. However, simply having a program in place does not necessarily mean that it is a qualifying program and that a State permit is not required. The local municipality is responsible for notifying operators and/or owners that they are covered by a Qualifying Local Program. As of May 31, 2007, the only approved Qualifying Local Programs within the state are for Golden, Durango and Lakewood. An updated list of municipalities with Qualifying Local Programs, including contact information, is available on the Division's website at: <http://www.cdphe.state.co.us/wq/PermitsUnit/stormwater/construction.html>.*

*The Division reserves the right to require any construction owner or operator within the jurisdiction of a Qualifying Local Program covered under this permit to apply for and obtain coverage under the full requirements of this permit.*

1. **Permit Coverage:** *If a construction site is within the jurisdiction of a Qualifying Local Program, the owner or operator of the construction activity is authorized to discharge stormwater associated with small construction activity under this general permit **without** the submittal of an application to the Division. The permittee also is not required to submit an inactivation notice or payment of an annual fee to the Division.*

VIII. TERMS AND CONDITIONS OF PERMIT (cont.)

**Master SWMP**

Often, a large construction project will involve multiple smaller construction sites that are within a common plan of development, or multiple well pads under construction within an oil and gas well field. Pollutant sources and the types of BMPs used can be relatively consistent in such cases. A permittee could significantly streamline the SWMP development process through the use of a master SWMP. SWMP information must be developed and maintained for all construction activities that exceed one acre (or are part of a common plan of development exceeding one acre) conducted within the permitted area. By developing a single master plan, the permittee can eliminate the need to develop repetitive information in separate plans. Such a plan could include two sections, one containing a reference section with information applicable to all sites (e.g., installation details and maintenance requirements for many standard BMPs, such as silt fence and erosion blankets), and the second containing all of the information specific to each site (e.g., site BMP map, drainage plans, details for BMPs requiring site specific design, such as retention ponds).

As new activities begin, information required in the SWMP is added to the plan, and as areas become finally stabilized, the related information is removed. Records of information related to areas that have been finally stabilized that are removed from the active plan must be maintained for a period of at least three years from the date that the associated site is finally stabilized.

C. Total Maximum Daily Load (TMDL)

If the designated use of a stream or water body has been impaired by the presence of a pollutant(s), development of a Total Maximum Daily Load (TMDL) may be required. A TMDL is an estimate of allowable loading in the waterbody for the pollutant in question. Types of discharges that are or have the potential to be a significant source of the pollutant are also identified. If a TMDL has been approved for any waterbody into which the permittee discharges, and stormwater discharges associated with construction activity have been assigned a pollutant-specific Wasteload Allocation (WLA) under the TMDL, the Division will either:

1. Notify the permittee of the TMDL, and amend the permittee's certification to add specific BMPs and/or other requirements, as appropriate; or
2. Ensure that the TMDL is being implemented properly through alternative local requirements, such as by a municipal stormwater permit. (The only current example of this is the Cherry Creek Reservoir Control Regulation (72.0), which mandates that municipalities within the basin require specific BMPs for construction sites.)

See Part I.D.11 of the permit for further information.

D. Monitoring

Sampling and testing of stormwater for specific parameters is not required on a routine basis under this permit. However, the Division reserves the right to require sampling and testing on a case-by-case basis, in the event that there is reason to suspect that compliance with the SWMP is a problem, or to measure the effectiveness of the BMPs in removing pollutants in the effluent. See Part I.D.1(e) of the permit.

E. Facility Inspections

Construction sites typically must inspect their stormwater management controls at least every 14 days and within 24 hours after the end of any precipitation or snowmelt event that causes surface erosion. At sites or portions of sites where ground-disturbing construction has been completed but a vegetative cover has not been established, these inspections must occur at least once per month. (At sites where persistent snow cover conditions exist, inspections are not required during the period that melting conditions do not exist. These

VIII. TERMS AND CONDITIONS OF PERMIT (cont.)

2. **Transfer of Permit:** When responsibility for stormwater discharges for an entire construction site changes from one individual to another, the permit shall be transferred in accordance with Part I.A.7 of the permit. The permittee shall submit a completed **Notice of Transfer form**, which is available from the Division, and at [www.cdphe.state.co.us/wq/PermitsUnit](http://www.cdphe.state.co.us/wq/PermitsUnit). If the new responsible party will not complete the transfer form, the permit may be inactivated if the permittee has no legal responsibility, through ownership or contract, for the construction activities at the site. In this case, the new owner or operator would be required to obtain permit coverage separately.
3. **Reassignment of Permit:** When a permittee no longer has control of a specific portion of a permitted site, and wishes to transfer coverage of that portion of the site to a second party, the permittee shall submit a completed **Notice of Reassignment of Permit Coverage form**, which is available from the Division, and at [www.cdphe.state.co.us/wq/PermitsUnit](http://www.cdphe.state.co.us/wq/PermitsUnit). The form requires that both the existing permittee and new permittee complete their respective sections. See Part I.A.8 of the permit.

J. Duration of Permit

The general permit will expire on June 30, 2012. The permittee's authority to discharge under this permit is approved until the expiration date of the general permit. Any permittee desiring continued coverage under the general permit past the expiration date must apply for recertification under the general permit at least 90 days prior to its expiration date.

Kathleen Rosow  
December 18, 2006

IX. PUBLIC NOTICE – 12/22/06

The permit was sent to public notice on December 22, 2006. A public meeting was requested, and was held on February 2, 2007. Numerous comments were received on the draft permit. Responses to those comments, and a summary of changes made to the draft permit, are in a separate document entitled "Division Response To Public Comments." The permit will be sent to a second public notice on March 23, 2007. Any changes resulting from the second public notice will be summarized in the rationale.

Kathleen Rosow  
March 22, 2007

X. PUBLIC NOTICE – 3/23/07

The permit was sent to public notice for a second time on March 23, 2007. Numerous comments were received on the second draft permit. Responses to those comments, and a summary of the additional changes made to the draft permit, are contained in a separate document entitled "Division Response To Public Comments Part II". This document is part of the rationale. Any changes based on the Division response are incorporated into the rationale and permit. The response document is available online at <http://www.cdphe.state.co.us/wq/PermitsUnit/stormwater/construction.html>, or by emailing [cdphe.wqstorm@state.co.us](mailto:cdphe.wqstorm@state.co.us), or by calling the Division at 303-692-3517.

Kathleen Rosow  
May 31, 2007



## Berm (B)



### Description

A berm is a ridge of compacted soil located at the top or base of a sloping disturbed area to contain or divert surface runoff. Berms may be constructed from either excavated topsoil or subsoil.

The purpose of a berm is to control runoff velocity, divert onsite surface runoff to a sediment trapping device, and/or divert clean water away from disturbed areas.

### Applicability

Berms are usually appropriate for drainage basins smaller than five acres, but with modifications they can be capable of servicing areas as large as ten acres. With regular maintenance, earthen berms have a useful life span of approximately 18 months. Berms are applicable for the following applications:

- At the perimeter of a well pad (particularly the outer edge) to ensure that runoff remains on the pad and is diverted to a well pad detention pond, if available.
- Along the outside shoulder of an insloped road to ensure that runoff from the roadway drains inward and to protect the fill slope from continual disturbances during road blading and maintaining. See Grading Techniques (GT).
- Upslope of cut or fill slopes to divert flows away from disturbed areas.
- Downslope of cut or fill slopes to divert onsite runoff to a stabilized outlet or sediment trapping device, although diversions are more commonly used for this application. See Diversion (D).

### Limitations

- Berms may erode if not properly compacted and stabilized with vegetation. Berms which are adjacent to concentrated flows will require erosion blanketing.
- If a berm crosses a vehicle roadway or entrance, its effectiveness can be reduced. Wherever possible, berms should be designed to avoid crossing vehicle pathways.

### Design criteria

No formal design is required.

## Construction Specifications

1. Prior to berm construction, remove all trees, brush, stumps and other objects in the path of the berm and till the base of the berm before laying the fill. Fill may consist of topsoil or subsoil excavated during the construction of nearby roads or well pads. If fill material is excavated adjacent to berm, following the specification for Diversion (D).
2. Construct the berm according to Figure B-1 for the appropriate drainage area. For points where vehicles will cross the berm, the side slope should be no steeper than 3:1 and the mound may be constructed of gravel rather than soil. This will prolong the life of the berm and increase effectiveness at the point of vehicle crossing. For well pad perimeter installation the pad side of the berm should be sloped at 1.5:1 to help prevent vehicles from backing over the edge of the pad.
3. To remain effective, berms should be compacted with tracked equipment, if possible.
4. All berms shall have positive drainage to a stabilized outlet so that runoff does not collect in ponds on the upslope side of the berm, but instead flows along the berm until it reaches a stabilized outlet. Field location should be adjusted as needed. Stabilized outlet may be a well-vegetated area or a sediment control such as a silt fence or sediment trap where sediment can settle out of the runoff before being discharged to surface waters.
5. If the expected life span of the berm is greater than 15 days, it is strongly recommended that the berm be stabilized with vegetation or an erosion control blanket immediately after construction. Stabilization is required where concentrated flows are expected. See Table B-1 for recommended stabilization methods for berms on various slopes.
6. Berms should be constructed and fully stabilized prior to commencement of major upslope land disturbance. This will maximize the effectiveness of the structure as a storm water control device.

## Maintenance considerations

The frequency of inspections should be in accordance with the Storm Water Management Plan (SWMP). Berms should be inspected for evidence of erosion or deterioration to ensure continued effectiveness. Berms should also be maintained at the original height. Any decrease in height due to settling or erosion, which impacts the effectiveness of the BMP, should be repaired immediately.

## Removal

Berms should remain in place and in good condition until all upslope disturbed areas are permanently stabilized. There is no need to formally remove the berm on completion of stabilization until interim or final reclamation.

## References

Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES). Construction Site Storm Water Runoff Control. Washington, D.C., February, 2003.  
<[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)>

New York State Department of Environmental Conservation, New York Guidelines for Urban Erosion and Sediment Control. New York. Fourth Edition, 1997.  
<http://www.dec.state.ny.us/website/dow/toolbox/escstandards>

**Table B-1**  
**Temporary Berm Stabilization**

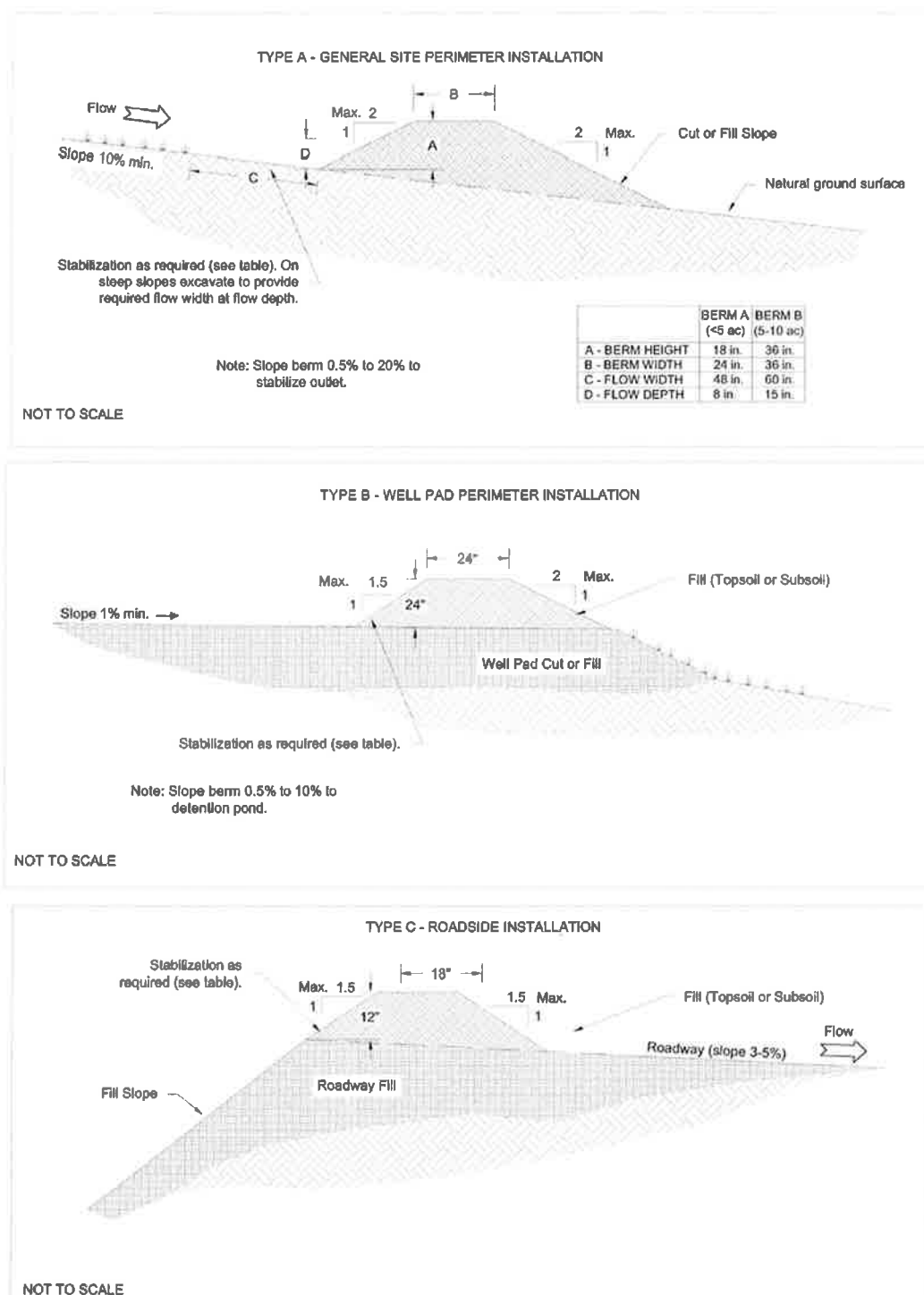
<b>Type of Treatment</b>	<b>Channel Grade<sup>1</sup></b>	<b>A (&lt;5 Ac.)</b>	<b>B (5-10 Ac)</b>
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.0-5.0%	Seed & Straw Mulch	Seed and cover with erosion control blanket, or lined with 2-inch stone
3	5.0-8.0%	Seed and cover with erosion control blanket, or line with 2-inch stone	Line with 4 to 8-inch stone or rock <sup>2</sup>
4	8.0-20.0%	Line with 4 to 8-inch or stone or rock <sup>2</sup>	Engineering Design

**Notes:**

<sup>1</sup> In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.

<sup>2</sup> Site rock if available, shall be broken into the required size.

**Figure B-1**  
**Berm Installation**



## Stabilized Construction Entrance (SCE)



### Description

A stabilized construction entrance (also called a tracking pad) is a pad of gravel over filter cloth where construction traffic leaves a site. The purpose of a stabilized entrance to a site is to minimize the amount of tracked mud and dust that leaves a site. As a vehicle drives over the gravel pad, mud and sediment are removed from the vehicle's wheels and offsite transport of soil is reduced. The gravel pad also reduces erosion and rutting on the soil beneath the stabilization structure. The filter fabric separates the gravel from the soil below, preventing the gravel from being ground into the soil. The fabric also reduces the amount of rutting caused by vehicle tires by spreading the vehicle's weight over a larger soil area than just the tire width.

### Applicability

Typically, stabilized construction entrances are installed at locations where construction traffic leaves or enters an existing paved road. However, the applicability of site entrance stabilization should be extended to any roadway or entrance where vehicles will access or leave the site.

### Limitations

- Although stabilizing a construction entrance is a good way to help reduce the amount of sediment leaving a site, some soil may still be deposited from vehicle tires onto paved surfaces. To further reduce the chance of these sediments polluting stormwater runoff, sweeping of the paved area adjacent to the stabilized site entrance is recommended.
- Sediment traps or other secondary sediment controls are needed to capture that sediment that accumulates at the pad and may run off during storm events.

### Design criteria

No formal design is required.



## Construction Specifications

See Figure SCE-1 for installation details.

1. Locate the pad approximately 60 feet back from the entrance at any county road.
2. If the pad is constructed on a crowned road, a roadside ditch with check dams or sediment traps shall be located on both sides of the road to collect runoff from the pad. If the road slopes to only one side of the road then only one roadside ditch with sediment controls will be needed.
3. Place woven or non-woven fabric filter cloth over the entire area prior to placing the stone. Piping of surface water under entrance shall be provided as required.
4. Place a matrix of 1" and 2" stone gravel, or reclaimed or recycled concrete equivalent, to a minimum thickness of six (6) inches, a minimum width of 12 feet and a minimum length of 50 feet.
5. All surface water flowing or diverted toward construction entrance shall be piped across the entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.

## Maintenance considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Stabilization of site entrances should be maintained until the remainder of the construction site has been fully stabilized. Stone and gravel might need to be periodically added to each stabilized construction site entrance to keep the entrance effective. Soil that is tracked offsite should be swept up immediately for proper disposal.

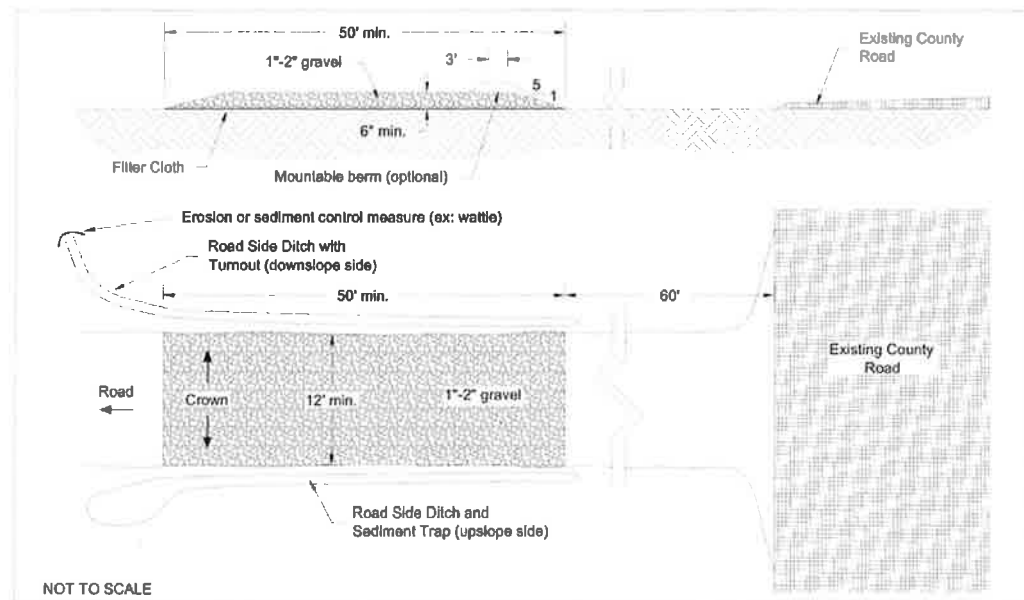
## References

Colorado Department of Transportation (CDOT), *Erosion Control and Stormwater Quality Guide*. 2002.  
<<http://www.dot.state.co.us/environmental/envWaterQual/wqms4.asp>>

Environmental Protection Agency (EPA), *National Pollutant Discharge Elimination System (NPDES). Construction Site Storm Water Runoff Control*. Washington, D.C., February, 2003.  
<[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)>

Horizon Environmental Services, Inc, *Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites*. April 2004.

**Figure SCE-1**  
**Stabilized Construction Entrance Installation**



## Grading Techniques (GT)



### Description

Grading involves reshaping the ground surface to planned grades as determined by an engineering survey, evaluation, and layout. Grading provides more suitable topography for well pads and pipelines and helps to control surface runoff, soil erosion, and sedimentation during and after construction in these areas. This BMP shall include the following:

- Proper cut and fill techniques to ensure road and well pads remains stable over time.
- Road crowning or sloping to properly route runoff off the roadway.
- Surfacing the road with gravel to avoid mud, rutting, and large quantities of sediment that will wash away during storms.
- Surface roughening to reduce runoff velocity and erosion, trap sediment, and prepare the soil for seeding and planting.

### Applicability

- This BMP is applicable to the construction and maintenance of any road or well pad, but particularly those located on steep topography or easily erodible soils.
- Road gravel is applicable to all roads with "soft" sections, steep grades, highly erosive soils, or where all-weather access is needed. Road gravel may be used as "fill" material in ruts or as a full structural section over the entire road.
- Soil roughening is most effective for areas of one acre or less, and works well for any slope (but particularly fill slopes greater than 3:1), areas with highly erodible soils, and for soils that are frequently disturbed.

### Limitations

- Improper cut and fill slopes that disrupt natural storm water patterns might lead to poor drainage, high runoff velocities, and increased peak flows during storm events.
- Rutting and wash boarding may develop if surface gravel is not designed properly or if road is not sloped.

- Flat-blading to maintain the roadway must be done properly to avoid changes in gravel thickness, road slope, and road grade.
- Soil roughening is not appropriate for rocky slopes, and is likely to be ineffective in for anything more than a gentle or shallow depth rain. If roughening is washed away in a heavy storm, the surface will have to be re-roughened and new seed laid.

## **Design criteria**

### **Grading plan**

A grading plan should be prepared that establishes the extent to which the road or well pad will be graded, how drainage patterns will be directed, and how runoff velocities will affect receiving waters. The grading plan also includes information regarding when earthwork will start and stop, establishes the degree and length of finished slopes, and dictates where and how excess material will be disposed of (or where borrow materials will be obtained if needed). Practices must be developed for erosion control, slope stabilization, and safe disposal of runoff water and drainage, such as ditches and culverts, grade stabilization structures, retaining walls, and surface drains. Berms, roadside ditches, and other storm water practices that require excavation and filling also should be incorporated into the grading plan.

Land grading should be based upon well pad and pipeline layouts that fit and utilize existing topography and desirable natural surroundings to avoid extreme grade modifications. Clearing and grading should only occur at those areas necessary for well pad activities and equipment traffic. Maintaining undisturbed temporary or permanent buffer zones in the grading operation provides a low-cost sediment control measure that will help reduce runoff and off-site sedimentation.

### **Slope failures**

Landslides and failed cuts and fills can be a major source of sediment, they can close the road or require major repairs, and they can greatly increase maintenance costs. Slope failures, or landslides, typically occur where a slope is over-steep, where fill material is not compacted, or where cuts in natural soils encounter groundwater or zones of weak material. Good road location can often avoid landslide areas and reduce slope failures. When failures do occur, the slide area should be stabilized by removing the slide material, flattening the slope, adding drainage, or using structures, as discussed below. Designs are typically site specific and may require input from geotechnical engineers and engineering geologists. Failures that occur typically impact road operations and can be costly to repair. Failures near streams and channel crossings have an added risk of impact to water quality.

### **Road slope**

See Figure GT-1. All roads should be designed with one of the following three slope types:

- Outsloped roads minimize the concentration of water and minimize road width by avoiding the need for an inside ditch, but may require roadway surface and fill slope stabilization. Outsloped roads with clay rich, slippery road surface materials often require surface stabilization with gravel or limited use during rainy periods to assure traffic safety. On road grades over 10 to 12 percent and on steep hill slope areas, outsloped roads are difficult to drain and can feel unsafe.
- Insloped roads are the best method to control surface water. However, insloped roads also concentrate water and require a system of ditches and turnouts or cross-draining culverts.
- Crowned roads are appropriate for higher standard, two lane roads on gentle grades. They may or may not require roadside ditches, turnouts, and/or cross-drains. It is difficult to create and maintain a crown on a narrow road, so generally insloped or outsloped road drainage is more effective.

## Construction Specifications

### Cut and fill slopes

1. All applicable perimeter erosion and sediment control practices and measures (berms, diversions, silt fence, or wattles) shall be constructed prior to any grading activities, and maintained in accordance with this BMP and the SWMP. Perimeter controls should remain in place until all graded or disturbed areas, including slopes, are adequately stabilized.
2. All areas to be disturbed (both cut and fill) shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.
3. Fill material shall be free of brush, logs, stumps, roots, or other objectionable materials that would interfere with, or prevent, construction of satisfactory fills. This material can be set aside and later used at the toe of fill slopes as filter berms. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.
4. Table GT-1 presents a range of commonly used cut and fill slope ratios appropriate for the soil and rock types described. Figures GT-2 and GT-3 present typical cut slope and fill slope design options for varying slope and site conditions. Vertical cut slopes should not be used unless the cut is in rock or very well cemented soil. Ideally, both cut and fill slopes should be constructed with a 2:1 or flatter slope to promote growth of vegetation, but cut slopes in dense, sterile soils or rocky material are often difficult to vegetate.
5. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems.
6. Topsoil required for the establishment of vegetation shall be stockpiled in the amount necessary to complete finished grading of all exposed areas. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.
7. All graded cut and fill areas shall be stabilized, either structurally or vegetatively, immediately following finished grading. Some common slope stabilization options appropriate for roads include hydroseeding, hydromulching, erosion control blankets, riprap, and retaining walls.

### Road slope

1. See Figure GT-1. Compact soil or road base material to direct runoff.
2. If crowning a road, runoff is directed to both sides of the road requiring two roadside ditches, unless runoff will drain directly to well stabilized areas.
3. If using an inslope design, runoff is directed toward the hillside and requires a roadside ditch with periodic turnouts or cross drain culvert installation.
4. If using an outslope design, ensure a moderate road slope with dense vegetative cover.

### Surface gravel

1. Gradation of gravel should be according to Figure GT-4. This figure shows the typical gradation ranges of aggregates used in road construction, how the materials, ranging from coarse to fine, best perform for a road, and the approximate limitations to the desirable gradation ranges. Ideally, aggregate surfacing material is (1) hard, durable, and crushed or screened to a minus 2 inch size; (2) well graded to achieve maximum density; (3) contains 5-15% clayey binder to prevent raveling; and (4) has a Plasticity Index of 2 to 10.
2. Gravel should be placed to a thickness of at least twice the diameter of the largest stone with a minimum thickness of four inches. Over very weak soils gravel thickness can be reduced with the use of geotextile or geogrid subgrade reinforcement. Also, geotextile layers are useful over soft



soils to separate the gravel from the soil, keep it uncontaminated, and extend the useful life of the gravel.

3. Compact the aggregate during construction and maintenance to achieve a dense, smooth road surface and thus reduce the amount of water that can soak into the road.
4. "Spot" stabilize local wet areas and soft areas with four to six inches of coarse rocky material. Add more rock as needed.
5. Blend coarse aggregate and fine clay-rich soil (when available) to produce a desirable composite roadway material that is coarse yet well-graded with 5-15 % fines for binder.

### Surface roughening

1. To slow erosion, roughening should be done as soon as possible after grading activities have ceased (temporarily or permanently) in an area. All cut and fill slopes should be roughened wherever possible. Do not blade or scrape the final fill slope face. Excessive compacting of the soil surface should be avoided during roughening, and areas should be seeded as quickly as possible after roughening is complete. Compact the aggregate during construction and maintenance to achieve a dense, smooth road surface and thus reduce the amount of water that can soak into the road.
2. Corrugating (Figure GT-5) uses machinery to create a series of ridges and depressions that run across the slope on the contour. Groove using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth of a front-end loader bucket. Do not make the grooves less than 3 inches deep or more than 15 inches apart.
3. Tracking (Figure GT-6) is the most common method of soil roughening and is sometimes used as a method to hold down mulch. However, tracking is generally not as effective as corrugating. Tracking should be used primarily in sandy soils to avoid undue compaction of the soil surface. Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

### Maintenance considerations

The frequency of inspections should be in accordance with the Storm Water Management Plan (SWMP). Inspect cut and fill slopes for rills or other indications of erosion. Maintain all crowns, outslopes, inslopes, and surface gravel.

The road surface and shoulders should be periodically smoothed and reshaped with a grader blade (flat-blading). This should be done when the gravel is moist. Maintain the proper road slope and grade while flat-blading. Also be sure to avoid plugging roadside ditches or altering adjacent drainage structures, as this may cause them to not function properly. Flat-blading may also cause road gravel to be pushed off the main roadway and onto the shoulders. To avoid this, blade toward the center of the road.

Roughening might need to be repeated after storm events. Inspections of roughened slopes will indicate where additional erosion and sediment control measures are needed. If rills appear, they should be filled, graded again, and reseeded as soon as possible. Proper dust control methods should be used.

### References

Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES). Construction Site Storm Water Runoff Control. Washington, D.C., February, 2003.  
<[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)>

Horizon Environmental Services, Inc, Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites. April 2004.

Keller, Gordon, and James Sherar, Low-Volume Roads Engineering, Best Management Practices Field Guide. United States Department of Agriculture (USDA), Forest Service, US Agency of International Development (USAID), 2005. <<http://www.blm.gov/bmp/field%20guide.htm>>

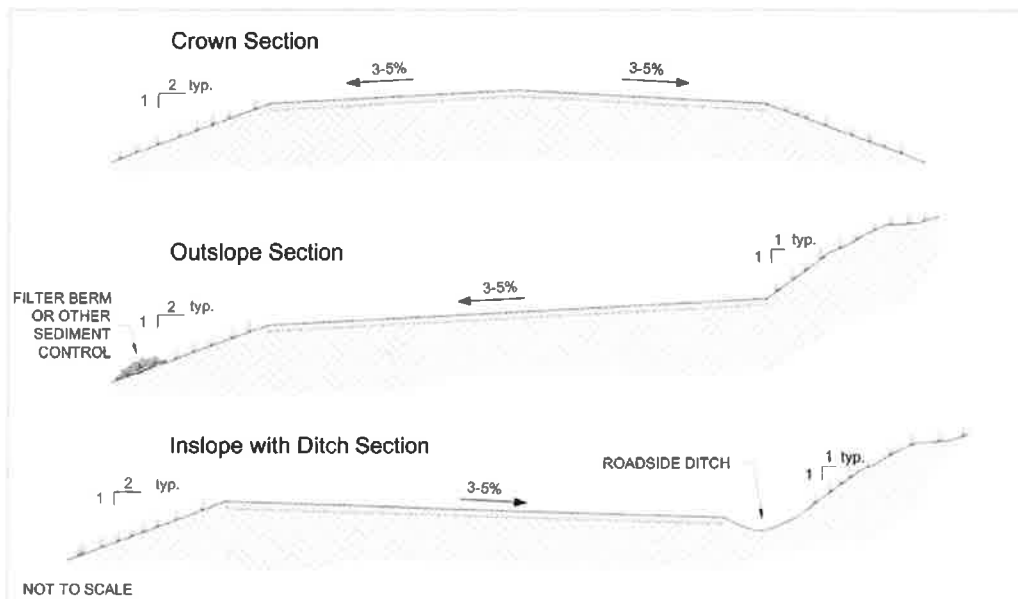
New York State Department of Environmental Conservation, New York Guidelines for Urban Erosion and Sediment Control. New York. Fourth Edition, 1997.  
<<http://www.dec.state.ny.us/website/dow/toolbox/escstandards>>

United States Department of the Interior and United States Department of Agriculture. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development "Gold Book". BLM/WO/ST-06/021+3071. Bureau of Land Management (BLM). Denver, Colorado. Fourth Edition, 2006.

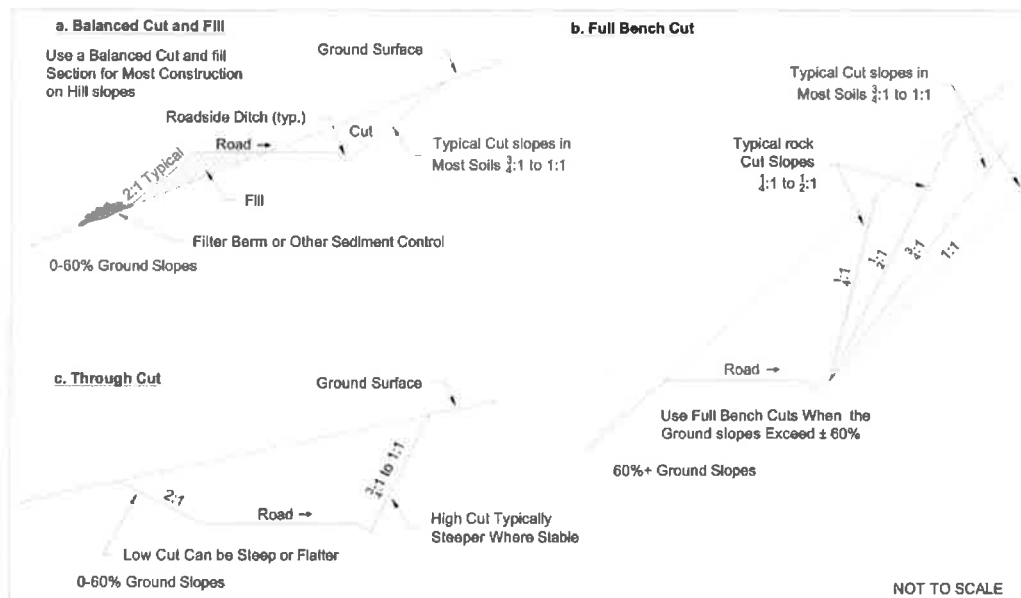
**Table GT-1**  
**Stable Slope Ratios for Various Conditions**

Soil/Rock Condition	Slope Ratio (Hor:Vert)
Most rock	¼:1 to ½:1
Very well cemented soils	¼:1 to ½:1
Most in-place soils	¾:1 to 1:1
Very fractured rock	1:1 to 1 ½: 1
Loose coarse granular soils	1 ½: 1
Heavy clay soils	2:1 to 3:1
Soft clay rich zones or wet seepage areas	2:1 to 3:1
Fills of most soils	1 ½:1 to 2:1
Fills of hard, angular rock	1 1/3 :1
Low cuts and fills (<10 ft high)	2:1 or flatter (for revegetation)

**Figure GT-1**  
**Typical Road Surface Drainage Options**



**Figure GT-2**  
**Cut Slope Design Options**



**Figure GT-3**  
**Fill Slope Design Options**

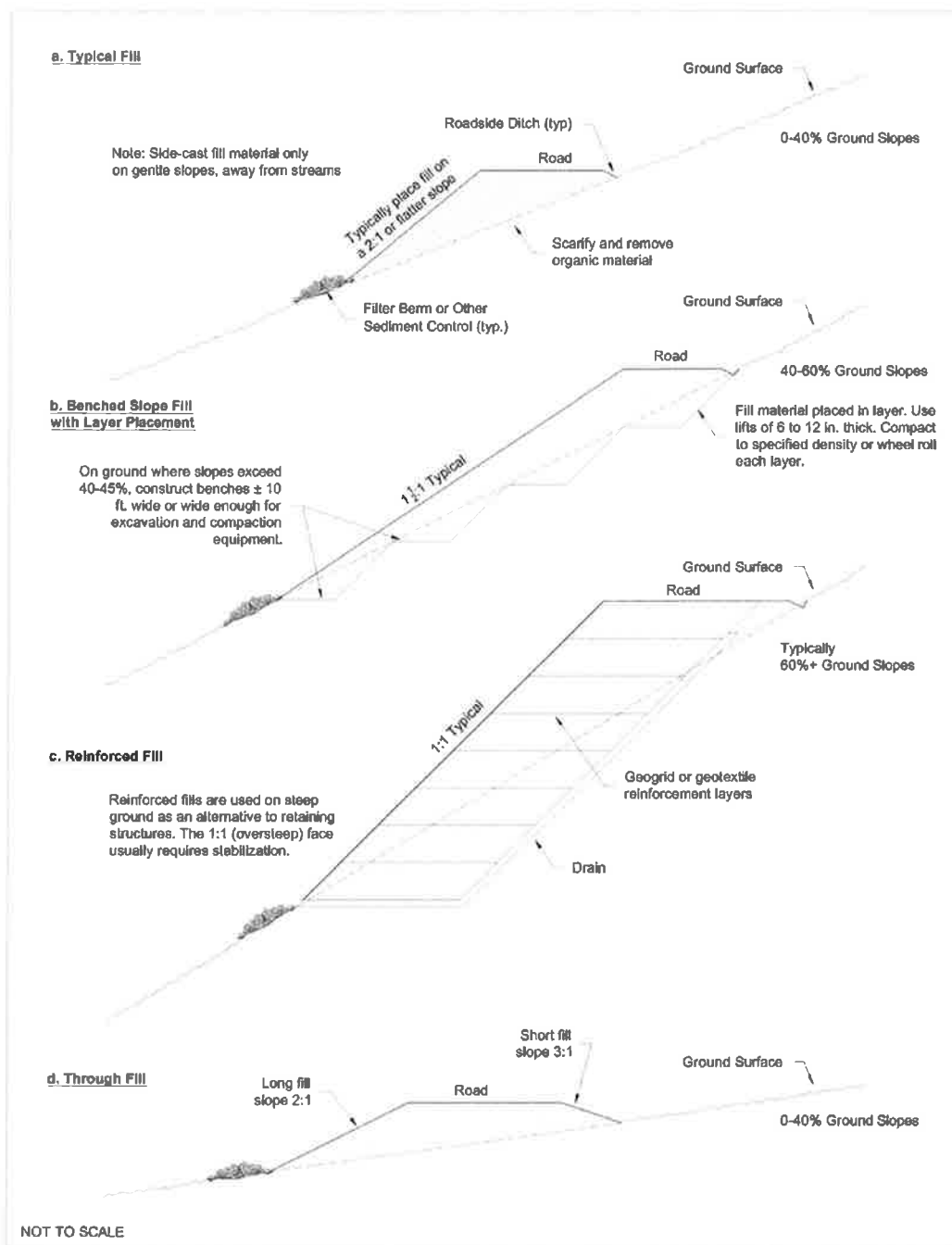
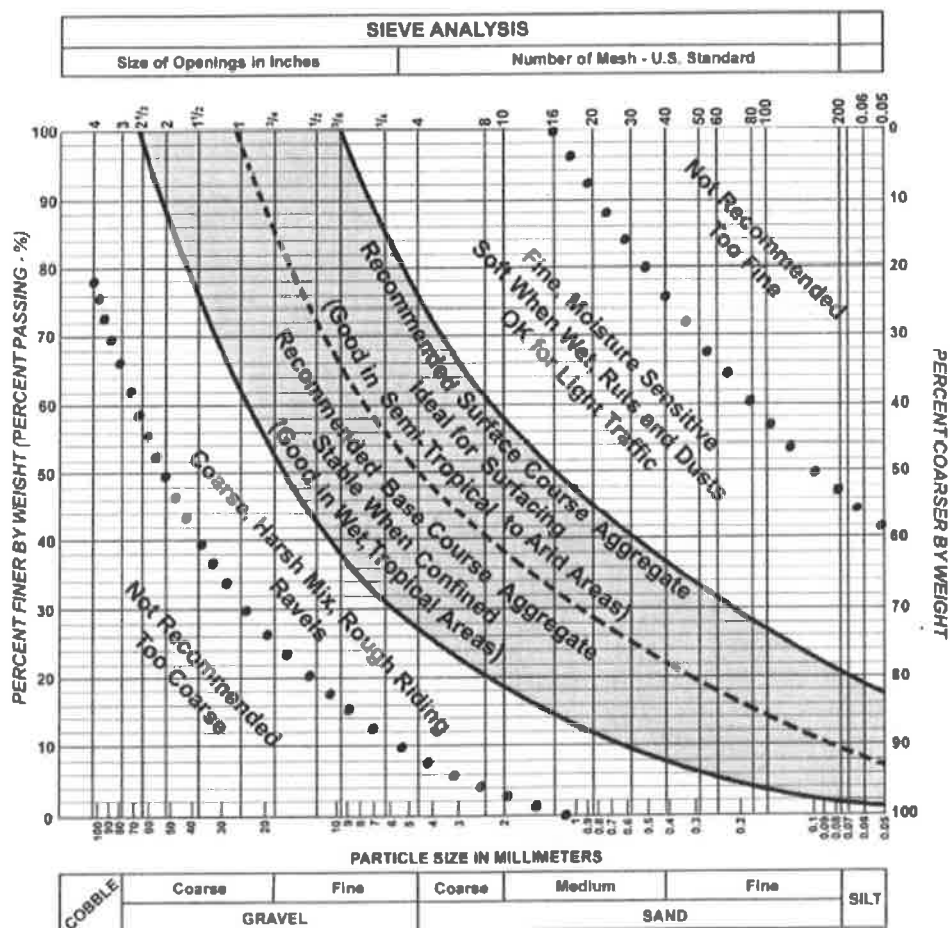


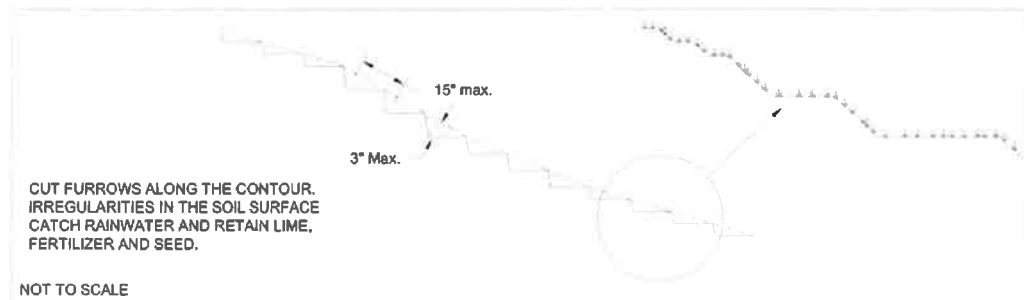
Figure GT-4  
Gradation and Performance of  
Roadway Surfacing Materials



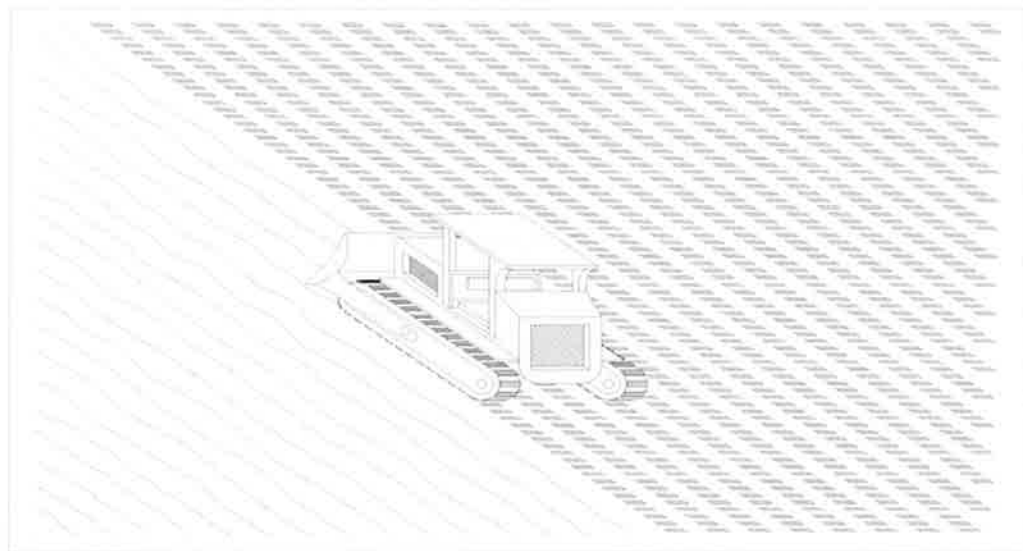
NOTE: Gradation Ranges Shown Are Approximate.



**Figure GT-5  
Corrugating**



**Figure GT-6  
Tracking**



## Silt Fence (SF)



### Description

Silt fences are used as temporary perimeter controls around sites where there will be soil disturbance due to construction activities. They consist of a length of filter fabric stretched between anchoring posts spaced at regular intervals along the site perimeter.

### Applicability

Silt fences are generally applicable to construction sites with relatively small drainage areas. They are appropriate in areas where runoff will be occurring as low-level shallow flow, not exceeding 0.5 cfs. The drainage area for silt fences generally should not exceed 0.25 acre per 100-foot fence length. Slope length above the fence should not exceed 100 feet.

### Limitations

- Silt fences should not be installed along areas where rocks or other hard surfaces will prevent uniform anchoring of fence posts and entrenching of the filter fabric. This will greatly reduce the effectiveness of silt fencing and can create runoff channels leading off site.
- Silt fences are not suitable for areas where large amounts of concentrated runoff are likely.
- Open areas where wind velocity is high may present a maintenance challenge, as high winds may accelerate deterioration of the filter fabric.
- Silt fences should not be installed across streams, ditches, or waterways.
- When the pores of the fence fabric become clogged with sediment, pools of water are likely to form on the uphill side of fence. Siting and design of the silt fence should account for this and care should be taken to avoid unnecessary diversion of storm water from these pools that might cause further erosion damage.

## Design criteria

The fence should be designed to withstand the runoff from a 10-year peak storm event.

## Construction Specifications

1. Erect silt fence according to Figure SF-1.
2. If standard strength fabric is used in combination with wire mesh, the support posts should be spaced no more than 10 feet apart. If extra-strength fabric is used without wire mesh reinforcement, the support posts should be spaced no more than 6 feet apart.
3. Stakes used to anchor the filter fabric should be either wooden or metal. Wooden stakes should be at least three feet long and have a minimum diameter of two inches if a hardwood such as oak is used. Softer woods such as pine should be at least four inches in diameter. When using metal post in place of wooden stakes, they should have a minimum weight of 1.00 to 1.33 lb/linear foot. If metal posts are used, attachment points are needed for fastening the filter fabric using wire ties. The height of the fence posts should be between 16 and 34 inches above the original ground surface.
4. Material for silt fences should be a pervious sheet of synthetic fabric such as polypropylene, nylon, polyester, or polyethylene yarn, chosen based on minimum synthetic fabric requirements, as shown in the following table:

Physical Property	Requirements
Filtering Efficiency	75 – 85% (minimum): highly dependent on local conditions
Tensile Strength at 20% (maximum) Elongation	Standard Strength: 30 lbs/linear inch (minimum) Extra Strength: 50 lbs/linear inch (minimum)
Ultraviolet Radiation	90% (minimum)
Slurry Flow Rate	0.3 gal/ft <sup>2</sup> /min (minimum)

5. Use a continuous roll of fabric to eliminate unwanted gaps in the fence. If a continuous roll of fabric is not available, the fabric should overlap from both directions only at stakes or posts with a minimum overlap of six inches.
6. Extend silt fence across grade and upslope for a short distance.
7. Compact backfill at base of fabric.
8. A trench should be excavated to bury the bottom of the fabric fence at least 6 inches below the ground surface. This will help prevent gaps from forming near the ground surface that would render the fencing useless as a sediment barrier.

## Maintenance considerations

The frequency of inspections should be in accordance with the Storm Water Management Plan (SWMP). Inspect silt fences to ensure that they are intact and that there are no gaps at the fence-ground interface or tears along the length of the fence. If gaps or tears which impact the effectiveness of the BMP are found, they should be repaired or the fabric should be replaced immediately. Accumulated sediments should be removed from the fence base when the sediment reaches one-third to one-half the height of the fence. Sediment removal should occur more frequently if accumulated sediment is creating noticeable strain on the fabric and there is the possibility of the fence failing from a sudden storm event.

## Removal

Remove silt fences and all accumulated sediment after uphill drainage areas are stabilized by vegetation or other means.

## References

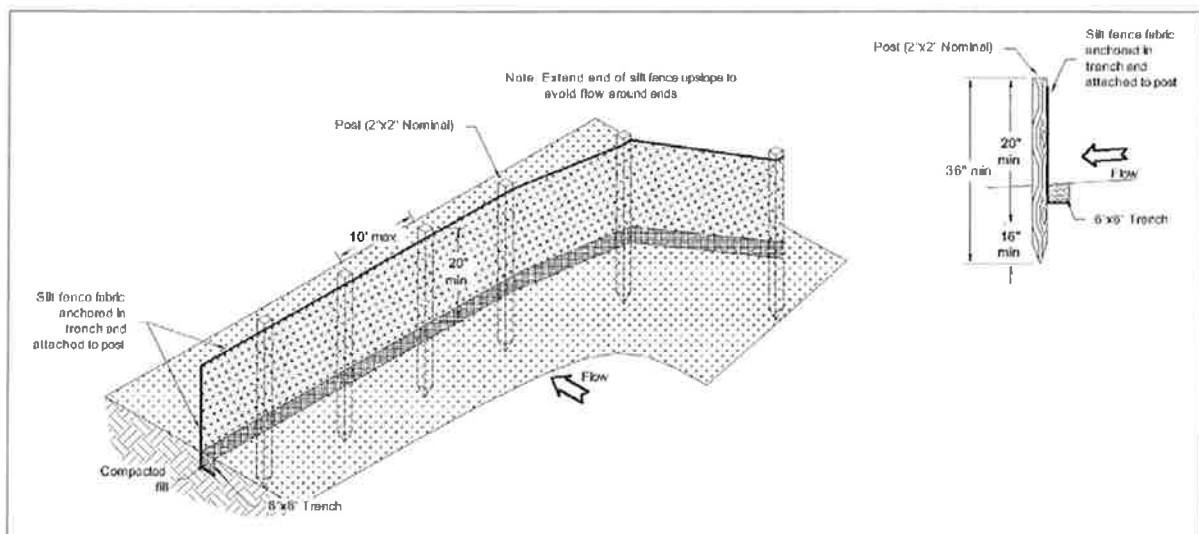
Colorado Department of Transportation (CDOT), Erosion Control and Stormwater Quality Guide. 2002.  
<<http://www.dot.state.co.us/environmental/envWaterQual/wqms4.asp>>

Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES).  
Construction Site Storm Water Runoff Control. Washington, D.C., February, 2003.  
<[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)>

Horizon Environmental Services, Inc, Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites. April 2004.

Keller, Gordon, and James Sherar, Low-Volume Roads Engineering, Best Management Practices Field Guide.  
United States Department of Agriculture (USDA), Forest Service, US Agency of International Development (USAID), 2005. <<http://www.blm.gov/bmp/field%20guide.htm>>

**Figure SF-1**  
**Silt Fence Installation**



## Diversion (D)



### Definition

A diversion is a drainage way of parabolic or trapezoidal cross-section with a supporting ridge on the lower side that is constructed across the slope. The purpose of a diversion is to prevent off site storm runoff from entering a disturbed area, to prevent sediment laden storm runoff from leaving the construction site or disturbed area, to prevent flows from eroding slopes, and to direct sediment laden flows to a trapping device.

### Applicability

Diversions may be designed for temporary or permanent use. The maximum drainage area for temporary, uncompacted diversions is two acres. For drainage areas larger than two acres but less than ten acres, the diversion should be compacted. For undisturbed drainage areas larger than ten acres, a permanent diversion may be designed to handle larger flows. Diversions may be used for the following applications:

- Upslope of cut or fill slopes to convey or divert flows away from disturbed areas.
- Down slope of cut or fill slopes to divert onsite runoff to a stabilized outlet or sediment trapping device.
- At the outer edge of a well pad to ensure that runoff remains on the pad and is diverted to a well pad detention pond, if available.
- Where runoff from higher areas has potential for causing erosion, or interfering with, or preventing the establishment of, vegetation on lower areas.
- Where the length of slopes needs to be reduced so that soil loss will be kept to a minimum.
- At the perimeter of a site or disturbed area.

### Limitations

- The area around the diversion channel that is disturbed by its construction must be stabilized (with vegetation or other erosion control) so that it is not subject to similar erosion as the steep slope the channel is built to protect.
- To alleviate erosion capability, diversions must be directed into a stabilized outlet or well-vegetated area or to sediment trapping devices, where erosion sediment can settle out of the runoff before being discharged to surface waters.
- Temporary diversions should be designed to avoid crossing vehicle pathways.



- Diversions should be used with caution on soils subject to slippage.

## Design criteria

For a temporary diversion (drainage area less than 10 acres), no formal design is necessary. For permanent diversions (drainage area larger than 10 acres) the following guidelines apply:

### Location

Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, and the development layout.

### Capacity

Peak rates of runoff values used in determining the capacity requirements shall be as outlined by TR-55, Urban Hydrology for Small Watersheds. The constructed diversion shall have capacity to carry, as a minimum, the peak discharge from a ten-year frequency rainfall event with freeboard of not less than 0.3 feet.

### Cross section

See Figure D-2 for details. The diversion channel shall be parabolic or trapezoidal in shape, if possible. The diversion shall be designed to have stable side slopes. The side slopes shall not be steeper than 2:1 and shall be flat enough to ensure ease of maintenance of the diversion and its protective vegetative cover. The ridge shall have a minimum width of four feet at the design water elevation; a minimum of 0.3 feet freeboard and a reasonable settlement factor (10%) shall be provided.

### Velocity and grade

The permissible velocity for the specific soil type will determine the maximum grade. The maximum permissible velocity for sand and silt vegetated channels is 3 ft/sec, and 5 ft/sec for clay vegetated channels. Diversions are not usually applicable below high sediment producing areas unless structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with, or before, the diversions.

## Construction Specifications

### General

1. All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the diversion.
2. All diversions shall have uninterrupted positive grade to an outlet.
3. Each diversion must have an adequate outlet where outflow will not cause damage. Diverted runoff from a disturbed area shall be conveyed to a sediment trapping device. Diverted runoff from an undisturbed area shall outlet to a sediment trapping device or into an undisturbed stabilized area at non-erosive velocities. Vegetated outlets shall be installed before diversion construction, if needed, to ensure establishment of vegetative cover in the outlet channel.

### Temporary diversion (drainage area <10 acres)

See Figure D-1.

1. The diversion shall be excavated or shaped to line, grade, and cross section as required to meet the specified criteria. The diversion does not need to be compacted if the contributing drainage area is less than 2 acres.

2. Stabilization with vegetation is not required as long as sediment traps (see Sediment Trap [ST]) or other sediment control devices are provided.

### **Permanent diversion (drainage area >10 acres)**

See Figure D-2.

1. The diversion shall be excavated or shaped to line, grade, and cross section as required to meet the criteria specified herein, and be free of bank projections or other irregularities which will impede normal flow.
2. Parabolic and triangular-shaped, grass-lined channels should not have a top width of more than 30 feet. Trapezoidal, grass-lined channels may not have a bottom width of more than 15 feet unless there are multiple or divided waterways, they have a riprap center, or other methods of controlling the meandering of low flows are provided.
3. If grass-lined channels have a base flow, a stone center or subsurface drain or another method for managing the base flow must be provided.
4. Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the complete diversion.
5. All earth removed and not needed in construction shall be spread or disposed of on the well pad side of the diversion so that it will not interfere with the functioning of the diversion.
6. Immediately after the ridge and channel are constructed, they must be seeded or hydro-seeded and mulched according to Revegetation (RV) and Mulching (M) along with any disturbed areas that drain into the diversion.
  - a. For design velocities less than 3.5 ft/sec, seeding and mulching may be used for establishment of the vegetation. It is recommended that, when conditions permit, temporary diversions or other means should be used to prevent water from entering the diversion during the establishment of the vegetation.
  - b. For design velocities or more than 3.5 ft/sec, the diversion shall be stabilized with seeding protected by Jute or Excelsior matting, or with seeding and mulching including temporary diversion of the water until the vegetation is established.

### **Maintenance considerations**

The frequency of inspections should be in accordance with the Storm Water Management Plan (SWMP). Channels should be cleared of sediment, repairs made when necessary, and seeded areas reseeded if a vegetative cover is not established. Maintain diversion capacity, ridge height, and outlet elevations especially if high sediment yielding areas are in the drainage area above the diversion. Establish necessary cleanout requirements. Redistribute sediment as necessary to maintain the capacity of the diversion.

### **Removal**

Temporary and un-compacted diversions shall remain in place only until the disturbed areas are permanently stabilized. Permanent diversions shall remain in place until final reclamation.

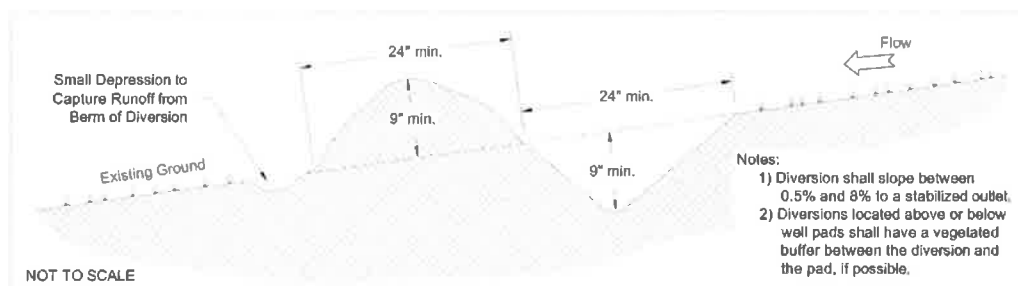
### **References**

Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES). Construction Site Storm Water Runoff Control. Washington, D.C., February, 2003.  
<[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)>

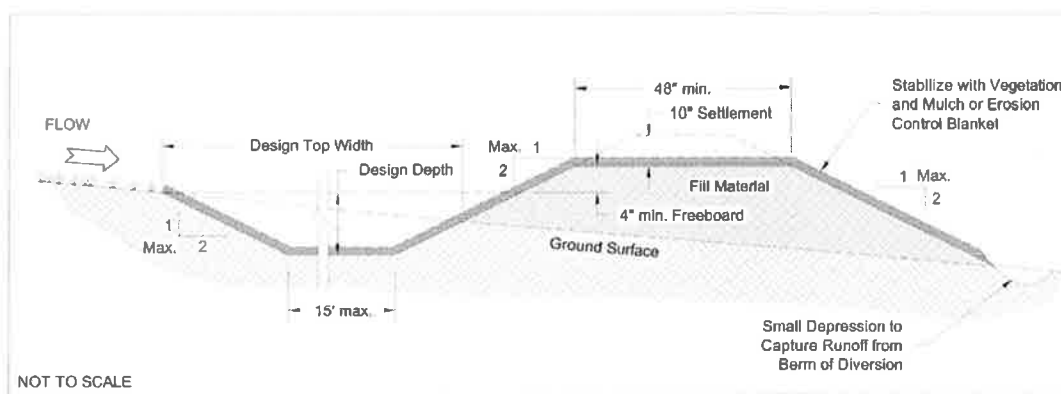
New York State Department of Environmental Conservation, New York Guidelines for Urban Erosion and Sediment Control. New York. Fourth Edition, 1997.  
<<http://www.dec.state.ny.us/website/dow/toolbox/escstandards>>

United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), Field Office Technical Guide. 2002.  
<[www.nrcs.usda.gov/technical/efotg](http://www.nrcs.usda.gov/technical/efotg)>

**Figure D-1**  
**Temporary Diversion Installation**



**Figure D-2**  
**Permanent Diversion Installation**



## Sediment Trap (ST)



### Description

Sediment traps are small ponding areas that allow sediment to settle out of runoff water. They are usually installed in a drainage way or other point of discharge from a disturbed area. Sediment traps are formed by excavating below grade and/or by constructing an earthen embankment with a lined spillway to slow the release of runoff.

### Applicability

Sediment traps are generally temporary control measures used at the outlets of storm water diversion structures, channels, slope drains, construction site entrance wash racks, or any other runoff conveyance that discharges waters containing erosion sediment and debris. Sediment traps should be used for drainage areas less than five acres. The effective life span of these temporary structures is usually limited to 24 months. Traps may be located in series to allow for backup control in case one trap fails.

### Limitations

- Regular maintenance is needed to remove sediment. Traps should be located near roads or where accessible to remove sediment.
- Although sediment traps allow for settling of eroded soils, because of their short detention periods for storm water they typically do not remove fine particles such as silts and clays.
- Water may remain in trap for extended periods causing an ideal spot for mosquitoes and other insects to gather. Locate the trap in a sunny spot if possible.
- Never construct a sediment trap on a live flowing stream or in wetlands.

### Design criteria

#### Location

Traps should be located at points of discharge from disturbed areas. The location will be determined by the natural terrain, drainage pattern of the runoff, and the accessibility for maintenance. Sediment traps should not be located in areas where their failure due to storm water runoff excess can lead to further erosive damage of the landscape. Alternative diversion pathways should be designed to accommodate these potential overflows. Sediment trap locations should also allow for easy maintenance access for the periodic removal of accumulated sediment.

#### Storage capacity

A sediment trap should be designed to maximize surface area for infiltration and sediment settling. This will increase the effectiveness of the trap and decrease the likelihood of backup during and after periods of high runoff intensity. The approximate storage capacity of each trap should be 3,600 ft<sup>3</sup> per acre of contributing

drainage area. Half of this volume may be in the form of wet storage (a permanent pool) and the other half may be in the form of dry storage. When possible, the wet storage volume should be contained within the excavated portion of the trap. The volume of a natural sedimentation trap can be approximated by the following equation:

$$\text{Volume (ft}^3\text{)} = 0.4 \times \text{surface area (ft}^2\text{)} \times \text{maximum pool depth (ft)}$$

## Construction Specifications

See Figure ST-1 for installation details.

1. If possible, sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.
2. Traps should be located above the floodplain, where possible. If there are space constraints, several small sediment traps may be constructed in series.
3. Area under embankment shall be cleared, grubbed, and stripped of any vegetation and root mat. The pool area shall be cleared.
4. The fill material for the embankment shall be free of roots and other woody vegetation as well as oversized stones, rocks, organic material or other objectionable material. The embankment shall be compacted by traversing with equipment while it is being constructed. Seeding of the embankment should be performed as soon as possible after construction of the sediment trap. Erosion control blanketing may also be used to cover the embankment in combination with seeding or during time periods when seeding is ineffective.
5. The spillway may consist of a stone section in the embankment formed by a combination coarse aggregate/riprap to provide for filtering/detention capability. Riprap shall be 4- to 8-inch rock, while the coarse aggregate shall be 1/2 to 3/4 inches. A geotextile may be placed at the stone-soil interface to act as a separator.
6. Another option for the spillway is to use straw bales or wattles at the overflow point in the trap and line the rest of the spillway with an erosion control blanket (see applicable BMP).

## Maintenance considerations

The frequency of inspections should be in accordance with the Storm Water Management Plan (SWMP). The primary maintenance consideration for temporary sediment traps is the removal of accumulated sediment from the basin to ensure the continued effectiveness of the sediment trap. Sediments should be removed when the basin reaches approximately 50 percent sediment capacity. Inspectors should also ensure that the trap is draining properly and check the structure for damage from erosion. The depth of the spillway should be checked and maintained at a minimum of 1.5 feet below the low point of the trap embankment.

## Removal

The structure shall be removed and the area stabilized when the drainage area has been properly stabilized.

## References

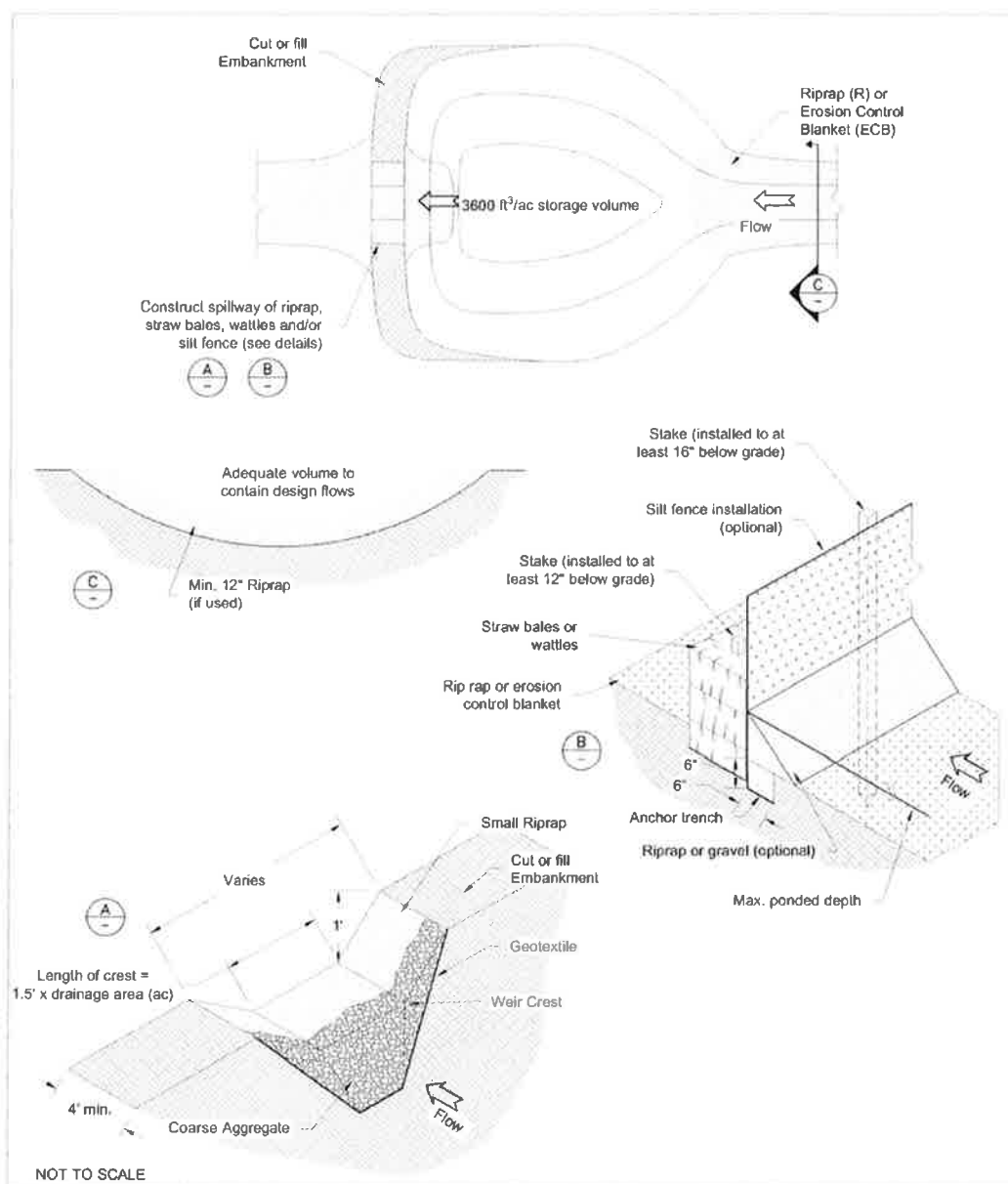
Colorado Department of Transportation (CDOT), Erosion Control and Stormwater Quality Guide. 2002.  
<<http://www.dot.state.co.us/environmental/envWaterQual/wqms4.asp>>



Environmental Protection Agency (EPA), National Pollutant Discharge Elimination System (NPDES).  
Construction Site Storm Water Runoff Control. Washington, D.C., February, 2003.  
<[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con\\_site.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm)>

Horizon Environmental Services, Inc, Guidance Document Reasonable and Prudent Practices for Stabilization (RAPPS) of Oil and Gas Construction Sites. April 2004.

**Figure ST-1**  
**Sediment Trap Installation**



## Wattles (W)



### Description

A wattle (also called a fiber roll) consists of straw, flax, or other similar materials bound into a tight tubular roll. When wattles are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

### Applicability

Wattles may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- At the overflow locations of sediment traps
- As check dams in unlined ditches
- Around temporary stockpiles

### Limitations

- Wattles are not effective unless trenched.
- Wattles at the toe of slopes greater than 5:1 (H:V) should be a minimum of 20-in. diameter or installations achieving the same protection (i.e. stacked smaller diameter wattles, etc.).
- Difficult to move once saturated.
- If not properly staked and trenched in, wattles could be transported by high flows.
- Wattles have a very limited sediment capture zone.
- Wattles should not be used on slopes subject to creep, slumping, or landslide.
- Wattles should not be used where periodic road or surface maintenance activities are expected.

## Design criteria

No formal design is required.

## Construction Specifications

Wattles should be either prefabricated rolls or rolled tubes of erosion control blanket. (If using an erosion control blanket, roll the length of erosion control blanket into a tube of minimum 8 in. diameter and bind roll at each end and every 4 ft along length of roll with jute-type twine.)

See Figure W-1 for wattles used to control erosion along slopes.

1. Locate wattles on level contours spaced as follows:
  - a. Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - b. Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - c. Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
2. Turn the ends of the wattles up slope to prevent runoff from going around the roll.
3. Stake wattles into a 2 to 4 in. deep trench with a width equal to the diameter of the wattle. Drive stakes at the end of each wattle and spaced 4 ft maximum on center.
4. If more than one wattle is placed in a row, the rolls should be overlapped, not abutted.

## Maintenance considerations

The frequency of inspections should be in accordance with the Stormwater Management Plan (SWMP). Repair or replace split, torn, unraveling, or slumping rolls. If the wattle is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates must be periodically removed in order to maintain wattle effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage depth, usually one-half the distance between the top of the wattle and the adjacent ground surface.

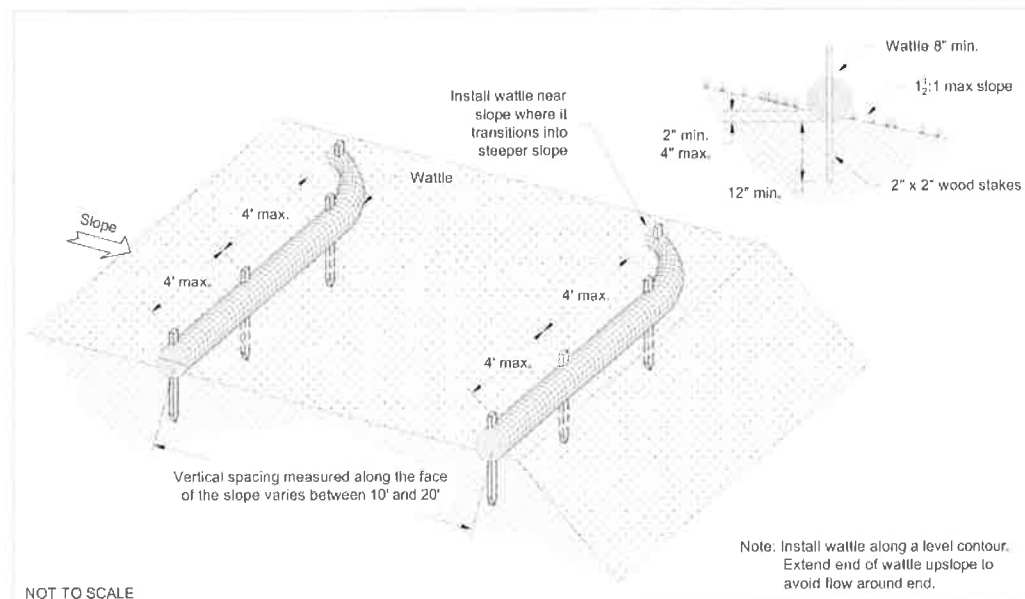
## Removal

Wattles are typically left in place. If wattles are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

## References

California Stormwater Quality Association, Stormwater Best Management Practice (BMP) Handbook – Construction. January, 2003.  
<http://www.cabmphandbooks.com/Construction.asp>

**Figure W-1**  
**Wattle Installation**



Date:	Name of Inspector:	Title of Inspector:
<b>Type of Inspection and Area(s) Inspected (sections of roadway):</b>		
<input type="checkbox"/> Active <div style="margin-left: 20px;"> <input type="checkbox"/> Preconstruction    <input type="checkbox"/> Construction         </div> <div style="margin-left: 40px;"> <input type="checkbox"/> 14 days since last inspection (list areas inspected) _____         </div> <div style="margin-left: 40px;"> <input type="checkbox"/> Within 24 hours of a rain/snowmelt event that causes surface erosion _____         </div> <div style="margin-left: 40px;"> <input type="checkbox"/> Within 72 hours of a rain/snowmelt event that causes surface erosion (for temporarily idle sites) _____         </div>		
<input type="checkbox"/> Completed (1 month since last inspection) _____		
<div style="margin-left: 20px;"> <input type="checkbox"/> Interim Reclamation    <input type="checkbox"/> Final Reclamation         </div>		
<input type="checkbox"/> Sustained Snow Cover _____		
<div style="margin-left: 20px;"> <input type="checkbox"/> Preconstruction    <input type="checkbox"/> Construction    <input type="checkbox"/> Interim Reclamation    <input type="checkbox"/> Final Reclamation         </div>		
Date snow occurred: _____ Date construction ceased: _____ Date melting began: _____		

Site Revegetated: Yes <input type="checkbox"/> No <input type="checkbox"/>
Pre-disturbance Vegetation: _____% (estimate from undisturbed surrounding areas)
Vegetation Growth uniform and at least 70% of pre-disturbance levels: Yes <input type="checkbox"/> No <input type="checkbox"/>
Comments and/or Required Action & Date Performed:

Erosion/Sediment Control:		Comments and/or Required Action & Date Performed:	
All other erosion and sediment controls in compliance with permit?		Yes <input type="checkbox"/> N/A (no other controls are used) <input type="checkbox"/>	

Location/Observation:				Comments and/or Required Action & Date Performed:
Site perimeter/discharge points inspected?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
All disturbed areas inspected?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
Vehicles entrance(s)/exit(s) inspected?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
Material storage areas inspected?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
Acceptable waste management* procedures?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
Acceptable vehicle/equipment maintenance?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
Acceptable control of dust?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	
Any sediment/pollutant discharged off-site?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>	

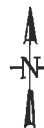
Date \_\_\_\_\_



## **ATTACHMENT I**



**BERRY WATERLINE PIPELINE SYSTEM**  
**OLD MOUNTAIN**  
 CARFIELD COUNTY, COLORADO



**LEGEND**

- 8"-10" WATER LINE
- locations of pads affected by project



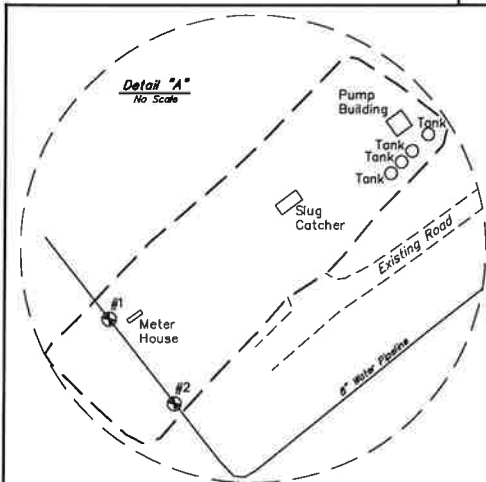
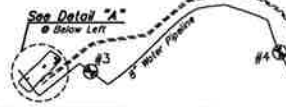
CONSTRUCTION SURVEYS, INC.  
 8812 SUNRISE BLVD  
 SILTY, CO 81657  
 970-876-5153

SURVEYED BY: LM	DRAWN BY: GW	CHECKED BY: US
DATE: 01/23/2012	ENG: BERRY\JASON\BERRY-PIPE.dwg	

SHEET 1 OF 1

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R96W, 6th P.M.

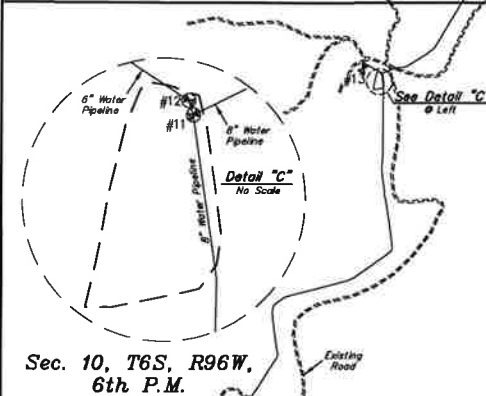
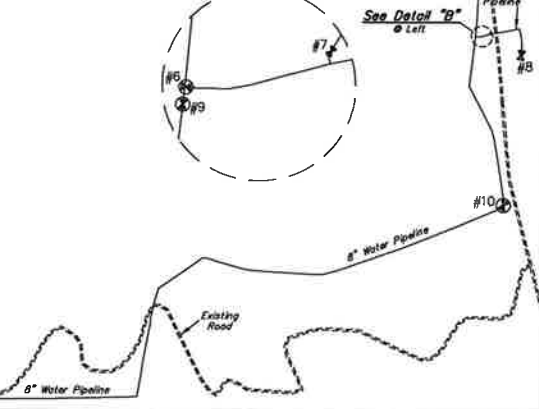
T5S  
T6S



Sec. 3, T6S, R96W, 6th P.M.

Sec. 2, T6S, R96W, 6th P.M.

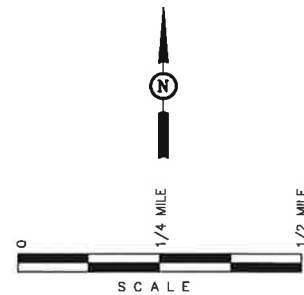
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Sec. 10, T6S, R96W,  
6th P.M.

# BERRY PETROLEUM COMPANY AS-BUILT WATER PIPELINE VALVES (For OLD MOUNTAIN PIPELINE)

LOCATED IN SECTION 32, T5S, R96W, 6th P.M. &  
SECTIONS 2, 3, 10, 15, 21 & 22, T6S, R96W, 6th P.M.  
UNTACH COUNTY, UTAH



## BASIS OF BEARINGS

BASIS OF BEARINGS IS A G.P.S. OBSERVATION.

VALVE #	NAD 83 LATITUDE	NAD 83 LONGITUDE	DESCRIPTION
1	39°33'49.95442"N	108°04'45.20289"W	ON 8" WATER PL/VALVE #1
2	39°33'49.14502"N	108°04'44.38245"W	WATER PL/FROM CDF TANKS-VALVE
3	39°33'50.60421"N	108°04'37.47856"W	ON 8" WATER PL/FUTURE CONNECT #1
4	39°33'52.43076"N	108°04'15.08802"W	ON 8" WATER PL/FUTURE CONNECT #2
5	39°33'42.87366"N	108°04'11.76210"W	ON 8" WATER PL/FUTURE CONNECT #3
6	39°33'15.53322"N	108°04'10.31171"W	ON 8" WATER PL/FRESH WATER PIT-VALVE
7	39°33'10.78511"N	108°04'08.84253"W	ON FRESH WATER PIT-PAD VALVE
8	39°33'13.81063"N	108°04'04.98103"W	103 FRAC PIT-PAD VALVE
9	39°33'15.47935"N	108°04'10.31970"W	ON 8" WATER PL/VALVE #2
10	39°32'59.94652"N	108°04'08.97483"W	ON 8" WATER PL/FUTURE CONNECT #3
11	39°32'34.41773"N	108°05'23.28915"W	ON 8" WATER PL/VALVE #3
12	39°32'34.48483"N	108°05'23.32450"W	ON 8" WATER PL/B10 CONNECT-VALVE
13	39°32'34.83419"N	108°05'25.46058"W	WATER PL/B10-PAD VALVE
14	39°31'47.01202"N	108°05'50.54312"W	ON 8" WATER PL/FUTURE CONNECT #4
15	39°31'24.88924"N	108°05'43.29116"W	ON WATER PL/K15 CONNECT-VALVE
16	39°31'24.80919"N	108°05'43.39279"W	ON WATER PL/M15 CONNECT-VALVE
17	39°31'17.08380"N	108°06'00.39161"W	ON WATER PL/M15-PAD VALVE
18	39°31'21.99749"N	108°05'47.54371"W	WATER PL/K15-PAD VALVE
19	39°31'24.71498"N	108°05'43.48824"W	ON WATER PL/A21 CONNECT-VALVE
20	39°30'53.46945"N	108°06'17.67682"W	ON 8" WATER POLY/A21 PAD VALVE

## LEGEND:

- Valve
- Valve in Can
- Existing Water Line
- Existing Road

UNTACH ENGINEERING & LAND SURVEYING  
85 SOUTH 200 EAST - VERNAL, UTAH 84078  
(435) 789-1017

PARTY	B.J.	K.G.	DATE SURVEYED:	DATE DRAWN:
WEATHER	COOL		12-14-08	04-28-09
			FILE	BERRY PETROLEUM COMPANY

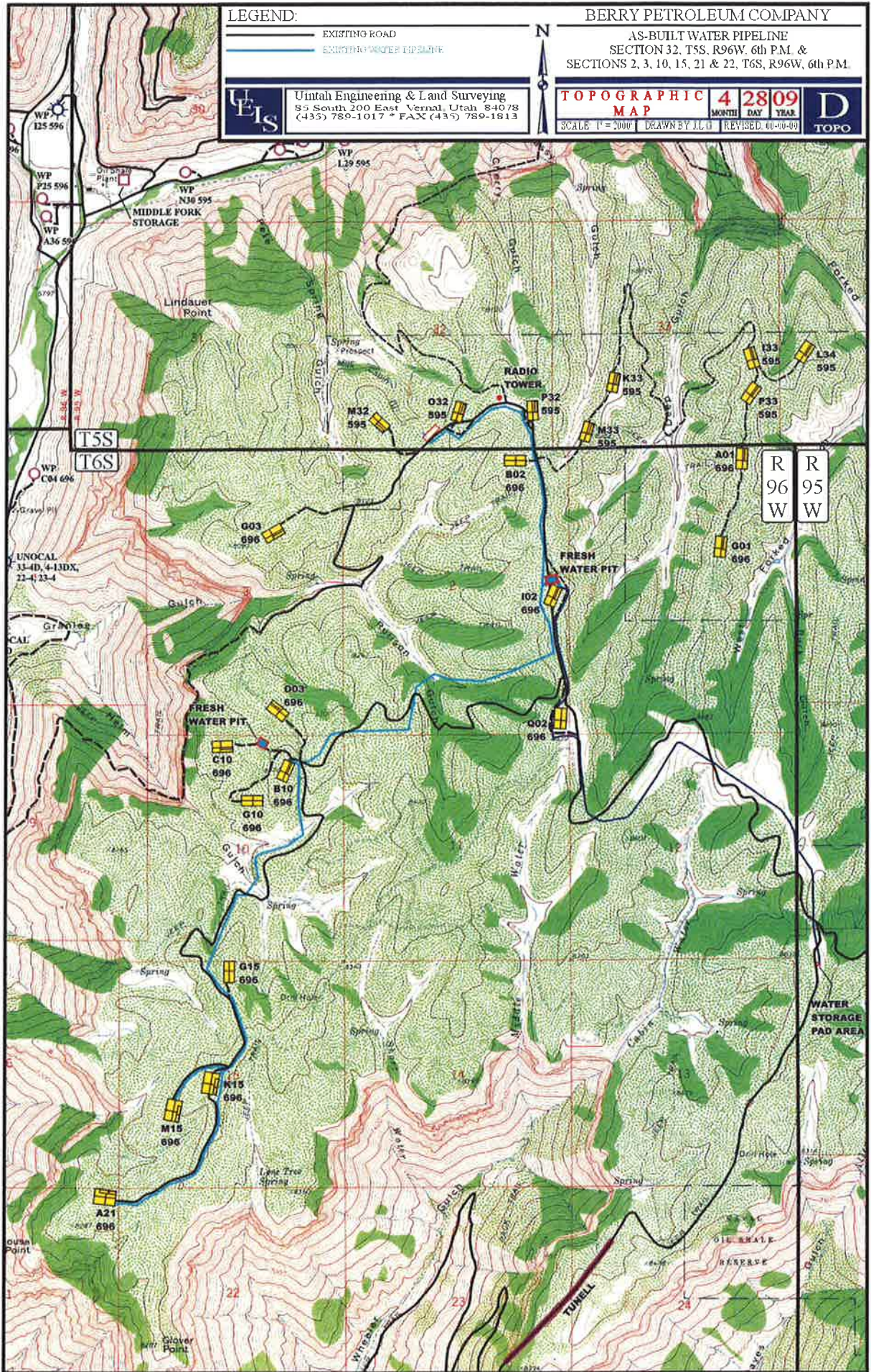
Sec. 21, T6S, R96W, 6th P.M.

Sec. 15, T6S, R96W,  
6th P.M.



Sec. 22, T6S, R96W, 6th P.M.







## **ATTACHMENT J**



State of Colorado  
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109



FOR OGCC USE ONLY

**SOURCE OF PRODUCED WATER FOR DISPOSAL**

This form must be completed for any new disposal site and for any change in sources of produced water for an existing disposal site.

**Complete the  
Attachment Checklist**

Oper OGCC

OGCC Operator Number: <u>10091</u>	Contact Name and Telephone:
Name of Operator: <u>Berry Petroleum Company</u>	<u>Bryan Burns</u>
Address: <u>1999 Broadway, Suite 3700</u>	No: <u>303-999-4245</u>
City: <u>Denver</u> State: <u>CO</u> Zip: <u>80202</u>	Fax:

Chemical Analysis of fluid		

OGCC Disposal Facility Number: _____	
Operator's Disposal Facility Name: <u>MILK CABIN</u>	Operator's Disposal Facility Number: <u>P32 595</u>
Location (QtrQtr, Sec, Twp, Rng, Meridian): <u>SESE, Sec. 32, T5S, R9SW</u>	
Address: <u>N/A</u>	
City: <u>N/A</u>	State: <u>CO</u> Zip: _____ County: <u>Garfield</u>

If more space is required,  
attach additional sheet.

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504512880 Well Name & No: GRANLEE OM 10D I02 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: SENE Section: 2 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504512881 Well Name & No: GRANLEE OM 16A I02 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: SENE Section: 2 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504512882 Well Name & No: GRANLEE OM 09D I02 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: SENE Section: 2 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504512883 Well Name & No: GRANLEE OM 09C I02 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: SENE Section: 2 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504512847 Well Name & No: GRANLEE OM 02C B10 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: NWNE Section: 10 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504512848 Well Name & No: GRANLEE OM 01A B10 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: NWNE Section: 10 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Bryan Burns Signed: \_\_\_\_\_

Title: Environmental Specialist Date: \_\_\_\_\_

OGCC Approved: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

CONDITIONS OF APPROVAL, IF ANY:

FORM

26

Rev 6/99

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax: (303)894-2109



FOR OGCC USE ONLY

## SOURCE OF PRODUCED WATER FOR DISPOSAL

This form must be completed for any new disposal site and for any change in sources of produced water for an existing disposal site.

Complete the  
Attachment Checklist

OGCC Operator Number: <u>10091</u>	Contact Name and Telephone:
Name of Operator: <u>Berry Petroleum Company</u>	<u>Bryan Burns</u>
Address: <u>1999 Broadway, Suite 3700</u>	No: <u>303-999-4245</u>
City: <u>Denver</u> State: <u>CO</u> Zip: <u>80202</u>	Fax: _____
OGCC Disposal Facility Number: _____	
Operator's Disposal Facility Name: <u>MILK CABIN</u>	Operator's Disposal Facility Number: <u>P32 595</u>
Location (QtrQtr, Sec, Twp, Rng, Meridian): <u>SESE, Sec. 32, T5S, R95W</u>	
Address: <u>N/A</u>	
City: <u>N/A</u> State: <u>CO</u> Zip: _____ County: <u>Garfield</u>	

Chemical Analysis of fluid	Oper	OGCC

If more space is required,  
attach additional sheet.

<b>Add Source:</b>	OGCC Lease No: _____	API No: <u>0504512851</u>	Well Name & No: <u>GRANLEE OM 01C B10 696</u>
<input checked="" type="checkbox"/>	Operator Name: <u>Berry Petroleum Company</u>	Operator No: <u>10091</u>	
<b>Delete Source:</b>	Location: QtrQtr: <u>NWNE</u> Section: <u>10</u> Township: <u>6S</u> Range: <u>96W</u> Producing Formation: <u>WILLIAMS FORK</u>		
<input type="checkbox"/>	Analysis Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	Transported to disposal site via: <input checked="" type="checkbox"/> Pipeline <input type="checkbox"/> Truck TDS: _____	
<b>Add Source:</b>	OGCC Lease No: _____	API No: <u>0504512852</u>	Well Name & No: <u>GRANLEE OM 08A B10 696</u>
<input checked="" type="checkbox"/>	Operator Name: <u>Berry Petroleum Company</u>	Operator No: <u>10091</u>	
<b>Delete Source:</b>	Location: QtrQtr: <u>NWNE</u> Section: <u>10</u> Township: <u>6S</u> Range: <u>96W</u> Producing Formation: <u>WILLIAMS FORK</u>		
<input type="checkbox"/>	Analysis Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	Transported to disposal site via: <input checked="" type="checkbox"/> Pipeline <input type="checkbox"/> Truck TDS: _____	
<b>Add Source:</b>	OGCC Lease No: _____	API No: <u>0504512853</u>	Well Name & No: <u>GRANLEE OM 01DR B10 696</u>
<input checked="" type="checkbox"/>	Operator Name: <u>Berry Petroleum Company</u>	Operator No: <u>10091</u>	
<b>Delete Source:</b>	Location: QtrQtr: <u>NWNE</u> Section: <u>10</u> Township: <u>6S</u> Range: <u>96W</u> Producing Formation: <u>WILLIAMS FORK</u>		
<input type="checkbox"/>	Analysis Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	Transported to disposal site via: <input checked="" type="checkbox"/> Pipeline <input type="checkbox"/> Truck TDS: _____	
<b>Add Source:</b>	OGCC Lease No: _____	API No: <u>0504512854</u>	Well Name & No: <u>GRANLEE OM 18C B10 696</u>
<input checked="" type="checkbox"/>	Operator Name: <u>Berry Petroleum Company</u>	Operator No: <u>10091</u>	
<b>Delete Source:</b>	Location: QtrQtr: <u>NWNE</u> Section: <u>10</u> Township: <u>6S</u> Range: <u>96W</u> Producing Formation: <u>WILLIAMS FORK</u>		
<input type="checkbox"/>	Analysis Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	Transported to disposal site via: <input checked="" type="checkbox"/> Pipeline <input type="checkbox"/> Truck TDS: _____	
<b>Add Source:</b>	OGCC Lease No: _____	API No: <u>0504513250</u>	Well Name & No: <u>GRANLEE OM 02D B10 696</u>
<input checked="" type="checkbox"/>	Operator Name: <u>Berry Petroleum Company</u>	Operator No: <u>10091</u>	
<b>Delete Source:</b>	Location: QtrQtr: <u>NWNE</u> Section: <u>10</u> Township: <u>6S</u> Range: <u>96W</u> Producing Formation: <u>WILLIAMS FORK</u>		
<input type="checkbox"/>	Analysis Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	Transported to disposal site via: <input checked="" type="checkbox"/> Pipeline <input type="checkbox"/> Truck TDS: _____	
<b>Add Source:</b>	OGCC Lease No: _____	API No: <u>0504514963</u>	Well Name & No: <u>SCHOOL HOUSE POINT OM 11B K15 696</u>
<input checked="" type="checkbox"/>	Operator Name: <u>Berry Petroleum Company</u>	Operator No: <u>10091</u>	
<b>Delete Source:</b>	Location: QtrQtr: <u>NESW</u> Section: <u>15</u> Township: <u>6S</u> Range: <u>96W</u> Producing Formation: <u>WILLIAMS FORK</u>		
<input type="checkbox"/>	Analysis Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No	Transported to disposal site via: <input checked="" type="checkbox"/> Pipeline <input type="checkbox"/> Truck TDS: _____	

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Bryan Burns Signed: \_\_\_\_\_

Title: Environmental Specialist Date: \_\_\_\_\_

OGCC Approved: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

CONDITIONS OF APPROVAL, IF ANY:

FORM

26

Rev 6/99

# State of Colorado Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203 (303)894-2100 Fax:(303)894-2109



FOR OGCC USE ONLY

## SOURCE OF PRODUCED WATER FOR DISPOSAL

This form must be completed for any new disposal site and for any change in sources of produced water for an existing disposal site.

Complete the  
Attachment Checklist

Oper. OGCC

OGCC Operator Number: <u>10091</u>	Contact Name and Telephone:
Name of Operator: <u>Berry Petroleum Company</u>	<u>Bryan Burns</u>
Address: <u>1999 Broadway, Suite 3700</u>	No: <u>303-999-4245</u>
City: <u>Denver</u> State: <u>CO</u> Zip: <u>80202</u>	Fax: _____

Chemical Analysis of fluid		

OGCC Disposal Facility Number: _____
Operator's Disposal Facility Name: <u>MILK CABIN</u> Operator's Disposal Facility Number: <u>P32 595</u>
Location (QtrQtr, Sec, Twp, Rng, Meridian): <u>SESE, Sec. 32, T5S, R95W</u>
Address: <u>N/A</u>
City: <u>N/A</u> State: <u>CO</u> Zip: _____ County: <u>Garfield</u>

If more space is required,  
attach additional sheet.

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504514974 Well Name & No: SCHOOL HOUSE POINT OM 10B K15 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: NEWE Section: 15 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504514977 Well Name & No: SCHOOL HOUSE POINT OM 14A K15 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: NESE Section: 15 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: 0504514978 Well Name & No: SCHOOL HOUSE POINT OM 11DR K15 696  
☒ Operator Name: Berry Petroleum Company Operator No: 10091

**Delete Source:** Location: QtrQtr: NESE Section: 15 Township: 6S Range: 96W Producing Formation: WILLIAMS FORK  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☒ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_  
☐ Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_  
☐ Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: \_\_\_\_\_

**Add Source:** OGCC Lease No: \_\_\_\_\_ API No: \_\_\_\_\_ Well Name & No: \_\_\_\_\_  
☐ Operator Name: \_\_\_\_\_ Operator No: \_\_\_\_\_

**Delete Source:** Location: QtrQtr: \_\_\_\_\_ Section: \_\_\_\_\_ Township: \_\_\_\_\_ Range: \_\_\_\_\_ Producing Formation: \_\_\_\_\_  
☐ Analysis Attached? ☐ Yes ☐ No Transported to disposal site via: ☐ Pipeline ☐ Truck TDS: \_\_\_\_\_

I hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.

Print Name: Bryan Burns Signed: \_\_\_\_\_

Title: Environmental Specialist Date: \_\_\_\_\_

OGCC Approved: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

CONDITIONS OF APPROVAL, IF ANY:

## **ATTACHMENT K**



United States  
Department of  
Agriculture



NRCS

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for Rifle Area, Colorado, Parts of Garfield and Mesa Counties

## P32 Water Impoundment



August 2, 2012



# Preface

---

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://soils.usda.gov/sqi/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://soils.usda.gov/contact/state\\_offices/](http://soils.usda.gov/contact/state_offices/)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the



## Custom Soil Resource Report

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

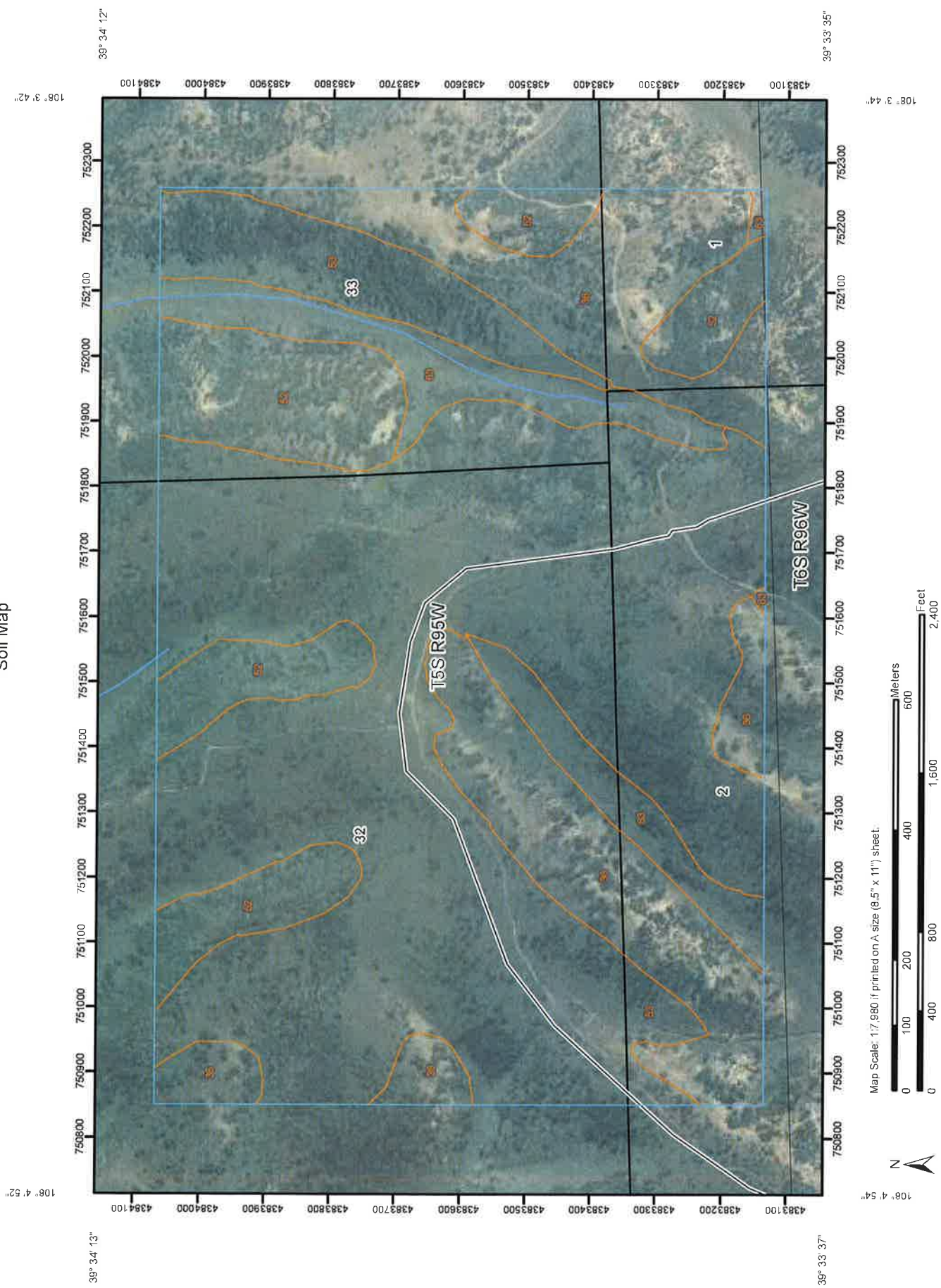
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report Soil Map





## Map Unit Legend

Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
36	Irigul channery loam, 9 to 50 percent slopes	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	24.7	7.6%
<b>Totals for Area of Interest</b>		<b>324.7</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments



## Custom Soil Resource Report

on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Rifle Area, Colorado, Parts of Garfield and Mesa Counties

### 36—Irigul channery loam, 9 to 50 percent slopes

#### Map Unit Setting

*Elevation:* 7,800 to 8,700 feet

#### Map Unit Composition

*Irigul and similar soils:* 85 percent

#### Description of Irigul

##### Setting

*Landform:* Mountainsides, ridges

*Landform position (three-dimensional):* Mountainflank

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Marl and/or residuum weathered from sandstone

##### Properties and qualities

*Slope:* 9 to 50 percent

*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Maximum salinity:* Nonsaline (0.0 to 2.0 mmhos/cm)

*Available water capacity:* Very low (about 1.2 inches)

##### Interpretive groups

*Land capability (nonirrigated):* 7e

*Ecological site:* Loamy Slopes (R048AY303CO)

##### Typical profile

*0 to 6 inches:* Channery loam

*6 to 17 inches:* Extremely channery sandy clay loam

*17 to 21 inches:* Unweathered bedrock

### 52—Parachute loam, 25 to 65 percent slopes

#### Map Unit Setting

*Elevation:* 7,500 to 8,700 feet

#### Map Unit Composition

*Parachute and similar soils:* 85 percent

#### Description of Parachute

##### Setting

*Landform:* Mountainsides

## Custom Soil Resource Report

*Landform position (three-dimensional):* Mountainflank

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Residuum weathered from sandstone

### Properties and qualities

*Slope:* 25 to 65 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Low (about 3.3 inches)

### Interpretive groups

*Land capability (nonirrigated):* 7e

*Ecological site:* Brushy Loam (R048AY238CO)

### Typical profile

*0 to 5 inches:* Loam

*5 to 18 inches:* Loam

*18 to 29 inches:* Extremely channery loam

*29 to 33 inches:* Unweathered bedrock

## 53—Parachute-Rhone loams, 5 to 30 percent slopes

### Map Unit Setting

*Elevation:* 7,600 to 8,600 feet

### Map Unit Composition

*Parachute and similar soils:* 55 percent

*Rhone and similar soils:* 30 percent

### Description of Parachute

#### Setting

*Landform:* Mountainsides, ridges

*Landform position (three-dimensional):* Mountainflank, mountaintop

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Marl and/or residuum weathered from sandstone

#### Properties and qualities

*Slope:* 5 to 30 percent

*Depth to restrictive feature:* 20 to 40 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

## Custom Soil Resource Report

*Available water capacity:* Low (about 3.3 inches)

### **Interpretive groups**

*Land capability (nonirrigated):* 6e

*Ecological site:* Mountain Loam (R048AY228CO)

### **Typical profile**

*0 to 5 inches:* Loam

*5 to 18 inches:* Loam

*18 to 29 inches:* Extremely channery loam

*29 to 33 inches:* Unweathered bedrock

## **Description of Rhone**

### **Setting**

*Landform:* Mountainsides, ridges

*Landform position (three-dimensional):* Mountainflank, mountaintop

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Marl and/or residuum weathered from sandstone

### **Properties and qualities**

*Slope:* 5 to 20 percent

*Depth to restrictive feature:* 40 to 60 inches to paralithic bedrock

*Drainage class:* Well drained

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Moderate (about 6.2 inches)

### **Interpretive groups**

*Land capability (nonirrigated):* 6e

*Ecological site:* Mountain Loam (R048AY228CO)

### **Typical profile**

*0 to 8 inches:* Loam

*8 to 28 inches:* Sandy clay loam

*28 to 52 inches:* Very channery sandy clay loam

*52 to 56 inches:* Unweathered bedrock

## **63—Silas loam, 3 to 12 percent slopes**

### **Map Unit Setting**

*Elevation:* 7,600 to 8,300 feet

### **Map Unit Composition**

*Silas and similar soils:* 90 percent

## Custom Soil Resource Report

### Description of Silas

#### Setting

*Landform:* Valley floors

*Landform position (three-dimensional):* Lower third of mountain flank

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Marl and/or alluvium derived from sandstone

#### Properties and qualities

*Slope:* 3 to 12 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Moderately well drained

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.60 to 6.00 in/hr)

*Depth to water table:* About 48 to 72 inches

*Frequency of flooding:* Occasional

*Frequency of ponding:* None

*Maximum salinity:* Nonsaline (0.0 to 2.0 mmhos/cm)

*Available water capacity:* High (about 9.6 inches)

#### Interpretive groups

*Land capability (nonirrigated):* 6e

*Ecological site:* Mountain Swale (R048AY245CO)

#### Typical profile

*0 to 14 inches:* Loam

*14 to 60 inches:* Loam



# **Soil Information for All Uses**

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## **Suitabilities and Limitations for Use**

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

## **Building Site Development**

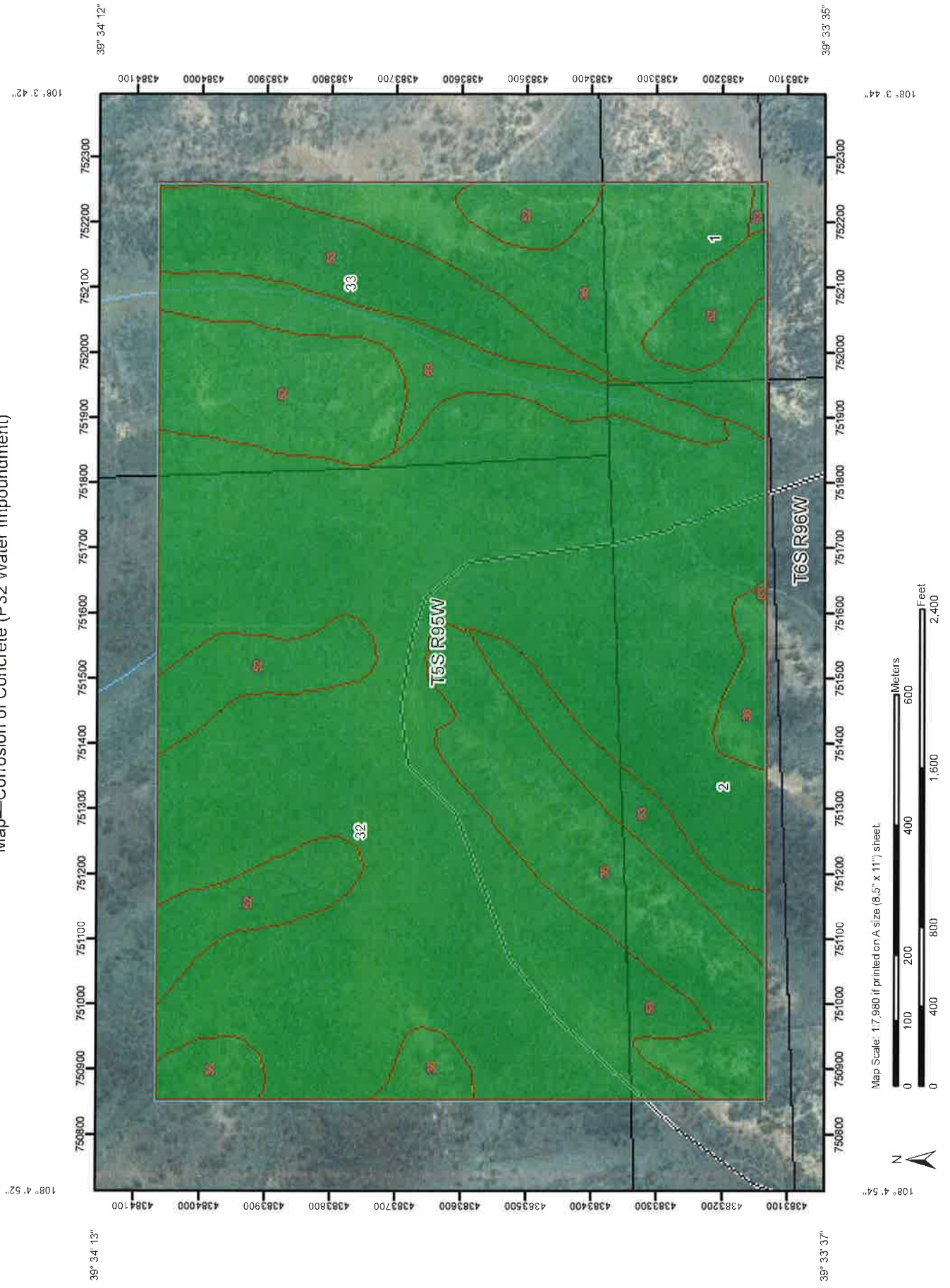
Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

### **Corrosion of Concrete (P32 Water Impoundment)**

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.


The risk of corrosion is expressed as "low," "moderate," or "high."


Custom Soil Resource Report  
Map—Corrosion of Concrete (P32 Water Impoundment)





MAP LEGEND


- Area of Interest (AOI)


 Area of Interest (AOI)
- Soils


 Soil Map Units
- Soil Ratings


 High


 Moderate


 Low


 Not rated or not available
- Political Features


 Cities


 PLSS Township and Range


 PLSS Section
- Water Features


 Streams and Canals
- Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Corrosion of Concrete (P32 Water Impoundment)**

<b>Corrosion of Concrete— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	Low	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	Low	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	Low	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	Low	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Corrosion of Concrete (P32 Water Impoundment)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

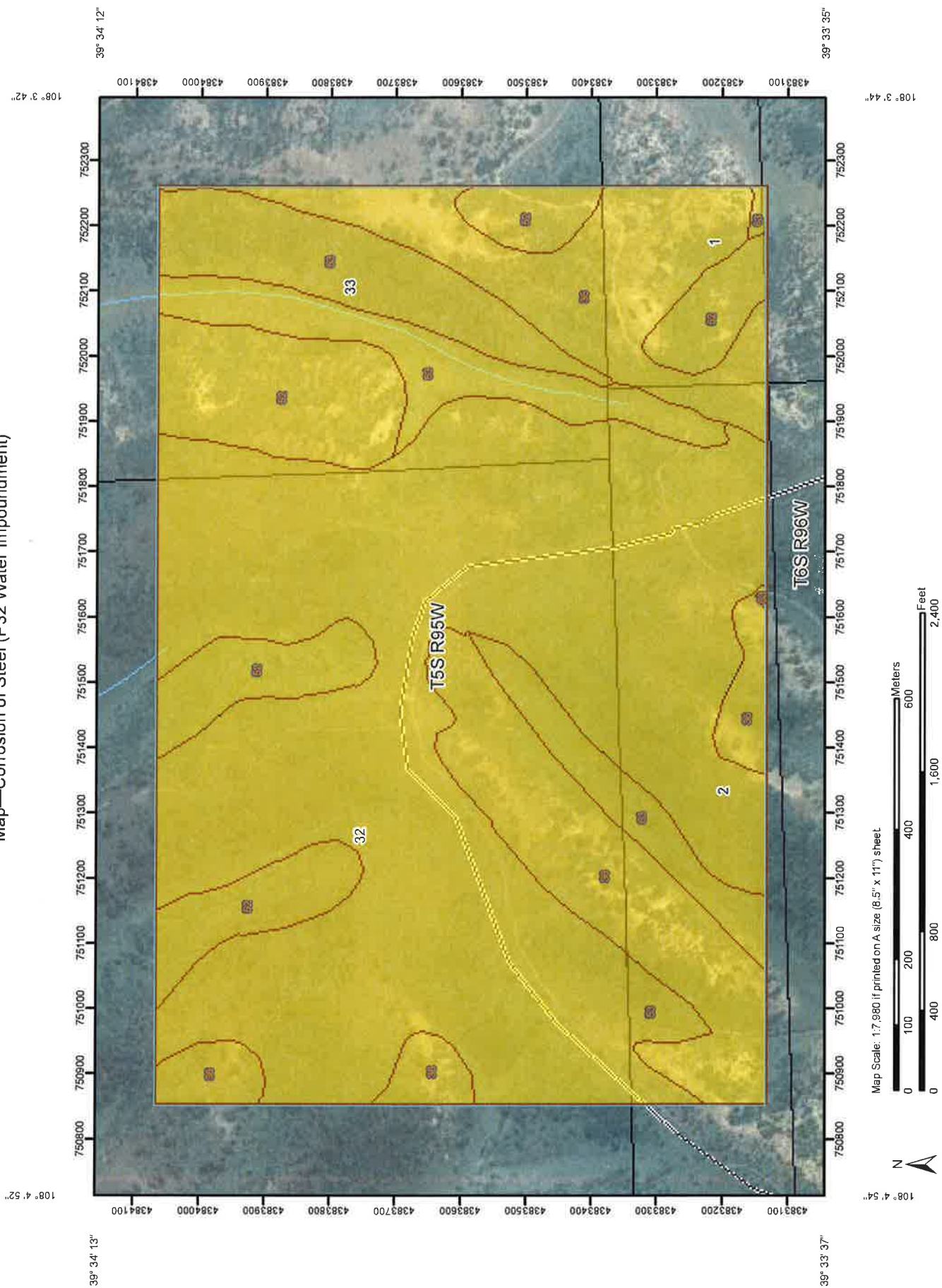
*Tie-break Rule:* Higher

**Corrosion of Steel (P32 Water Impoundment)**

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."


Custom Soil Resource Report  
Map—Corrosion of Steel (P32 Water Impoundment)








MAP LEGEND


- Area of Interest (AOI)


 Area of Interest (AOI)
- Soils


 Soil Map Units
- Soil Ratings


 High


 Moderate


 Low


 Not rated or not available
- Political Features


 Cities


 PLSS Township and Range


 PLSS Section
- Water Features


 Streams and Canals
- Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Corrosion of Steel (P32 Water Impoundment)**

<b>Corrosion of Steel— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	Moderate	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	Moderate	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	Moderate	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	Moderate	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Corrosion of Steel (P32 Water Impoundment)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

**Water Management**

Water Management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

**Excavated Ponds (Aquifer-Fed) (P32 Water Impoundment)**

Excavated ponds (aquifer-fed) are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, saturated hydraulic conductivity (Ksat) of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for

## Custom Soil Resource Report

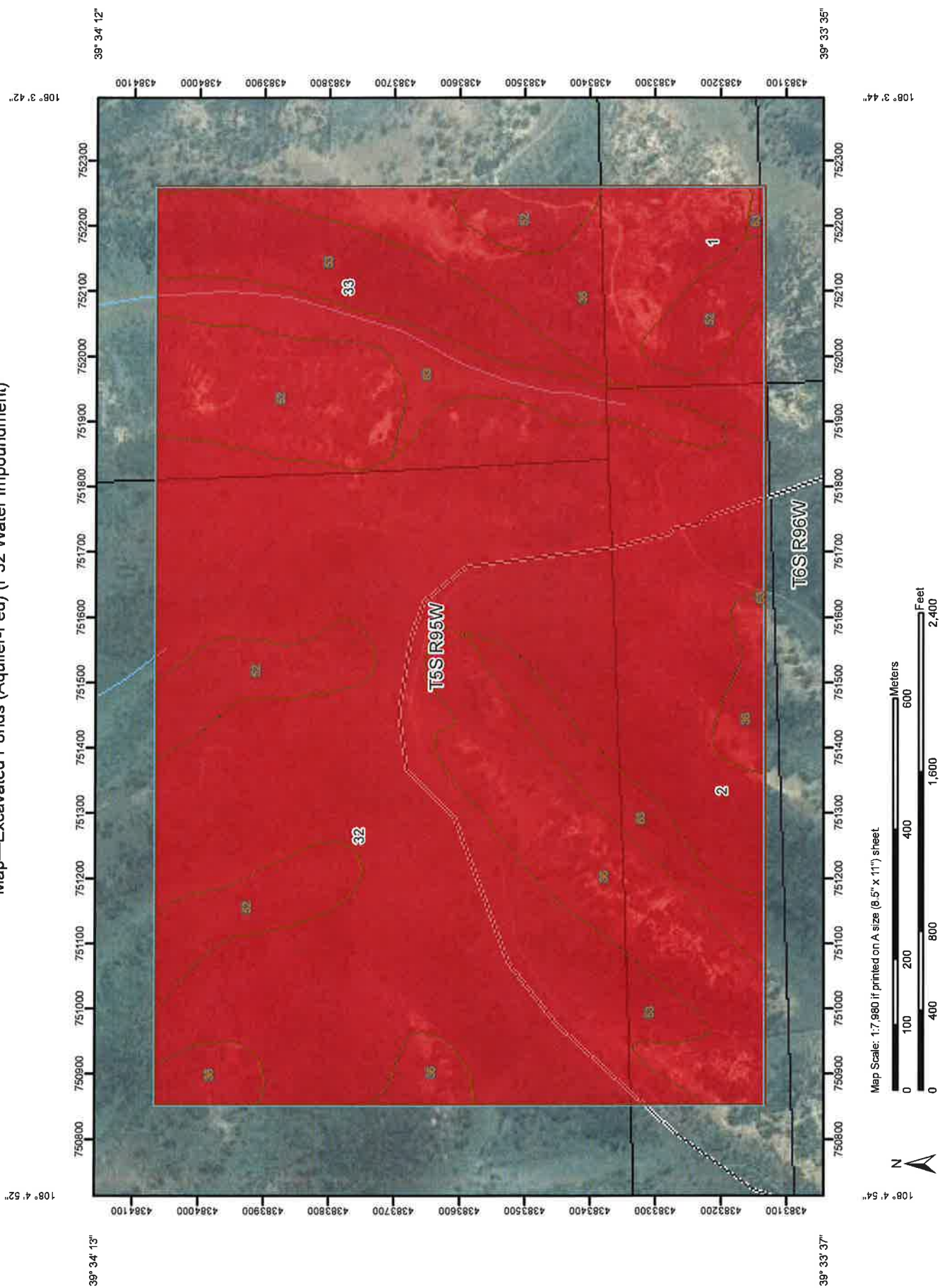
the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.


Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report  
Map—Excavated Ponds (Aquifer-Fed) (P32 Water Impoundment)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 Very limited


 Somewhat limited


 Not limited

 Not rated or not available

Political Features

 Cities

 PLSS Township and Range


 PLSS Section


Water Features


 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.  
The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



### Tables—Excavated Ponds (Aquifer-Fed) (P32 Water Impoundment)

Excavated Ponds (Aquifer-Fed)— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
36	Irigul channery loam, 9 to 50 percent slopes	Very limited	Irigul (85%)	Depth to water (1.00)	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	Very limited	Parachute (85%)	Depth to water (1.00)	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	Very limited	Parachute (55%)	Depth to water (1.00)	190.7	58.7%
			Rhone (30%)	Depth to water (1.00)		
63	Silas loam, 3 to 12 percent slopes	Very limited	Silas (90%)	Depth to water (1.00)	24.7	7.6%
Totals for Area of Interest					324.7	100.0%

Excavated Ponds (Aquifer-Fed)— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Very limited	324.7	100.0%
Totals for Area of Interest	324.7	100.0%

### Rating Options—Excavated Ponds (Aquifer-Fed) (P32 Water Impoundment)

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

### Pond Reservoir Areas (P32 Water Impoundment)

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.

## Custom Soil Resource Report

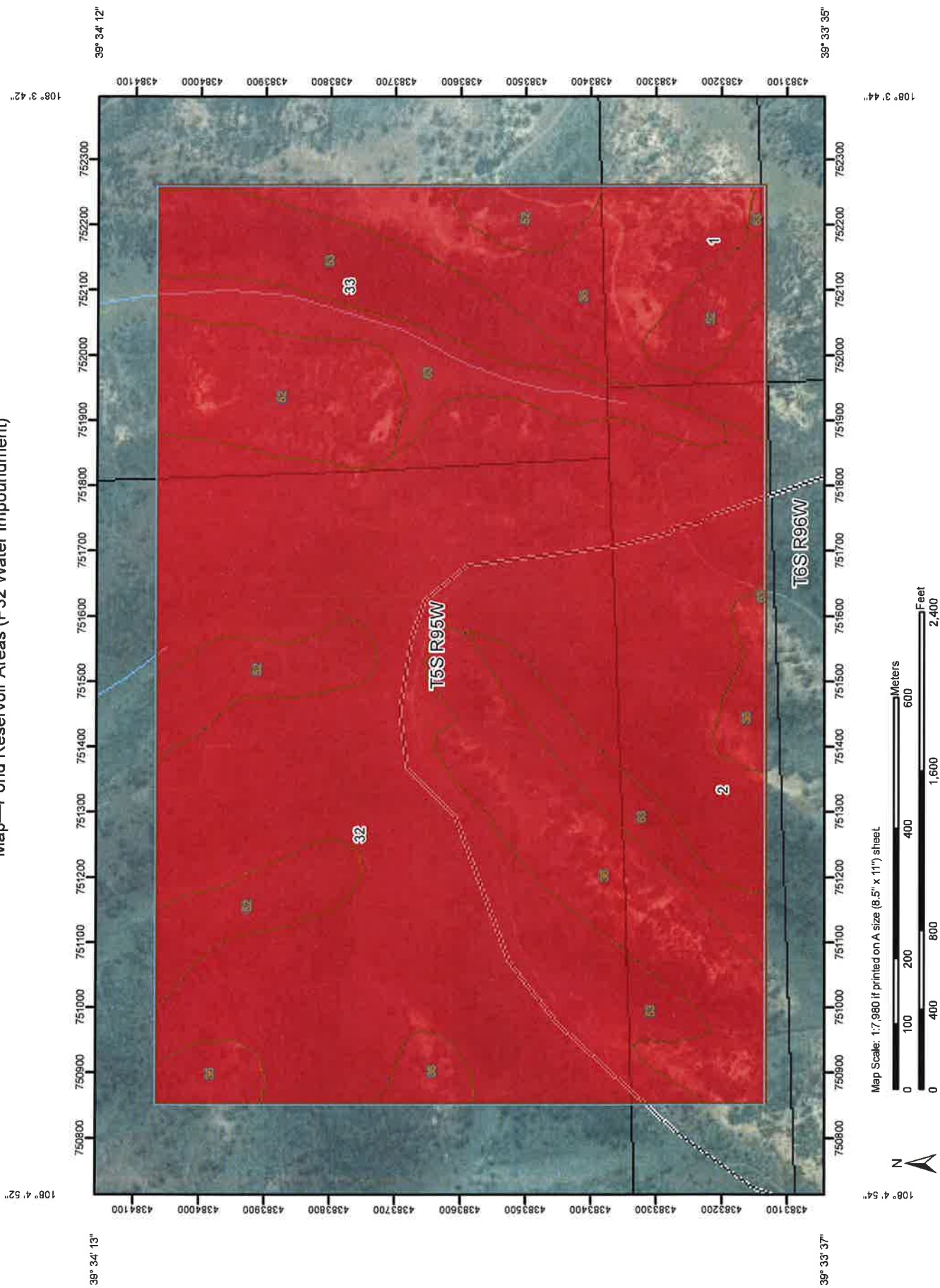
"Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.


Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.


Custom Soil Resource Report  
Map—Pond Reservoir Areas (P32 Water Impoundment)





MAP LEGEND


- Area of Interest (AOI)**


 Area of Interest (AOI)
- Soils**


 Soil Map Units
- Soil Ratings**


 Very limited


 Somewhat limited


 Not limited


 Not rated or not available
- Political Features**


 Cities


 PLSS Township and Range


 PLSS Section
- Water Features**


 Streams and Canals
- Transportation**

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

MAP INFORMATION

- Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.
- The soil surveys that comprise your AOI were mapped at 1:24,000.
- Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.
- Please rely on the bar scale on each map sheet for accurate map measurements.
- Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83
- This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.
- Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008
- Date(s) aerial images were photographed: 8/8/2005
- The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Custom Soil Resource Report

## Tables—Pond Reservoir Areas (P32 Water Impoundment)

Pond Reservoir Areas— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)						
Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
36	Irigul channery loam, 9 to 50 percent slopes	Very limited	Irigul (85%)	Slope (1.00)	66.5	20.5%
				Depth to bedrock (1.00)		
52	Parachute loam, 25 to 65 percent slopes	Very limited	Parachute (85%)	Slope (1.00)	42.9	13.2%
				Seepage (0.72)		
				Depth to bedrock (0.11)		
53	Parachute-Rhone loams, 5 to 30 percent slopes	Very limited	Parachute (55%)	Slope (1.00)	190.7	58.7%
				Seepage (0.72)		
				Depth to bedrock (0.11)		
			Rhone (30%)	Slope (1.00)		
				Seepage (0.54)		
				Depth to bedrock (0.00)		
63	Silas loam, 3 to 12 percent slopes	Very limited	Silas (90%)	Seepage (1.00)	24.7	7.6%
				Slope (1.00)		
Totals for Area of Interest					324.7	100.0%

Pond Reservoir Areas— Summary by Rating Value		
Rating	Acres in AOI	Percent of AOI
Very limited	324.7	100.0%
Totals for Area of Interest	324.7	100.0%

## Rating Options—Pond Reservoir Areas (P32 Water Impoundment)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



## Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

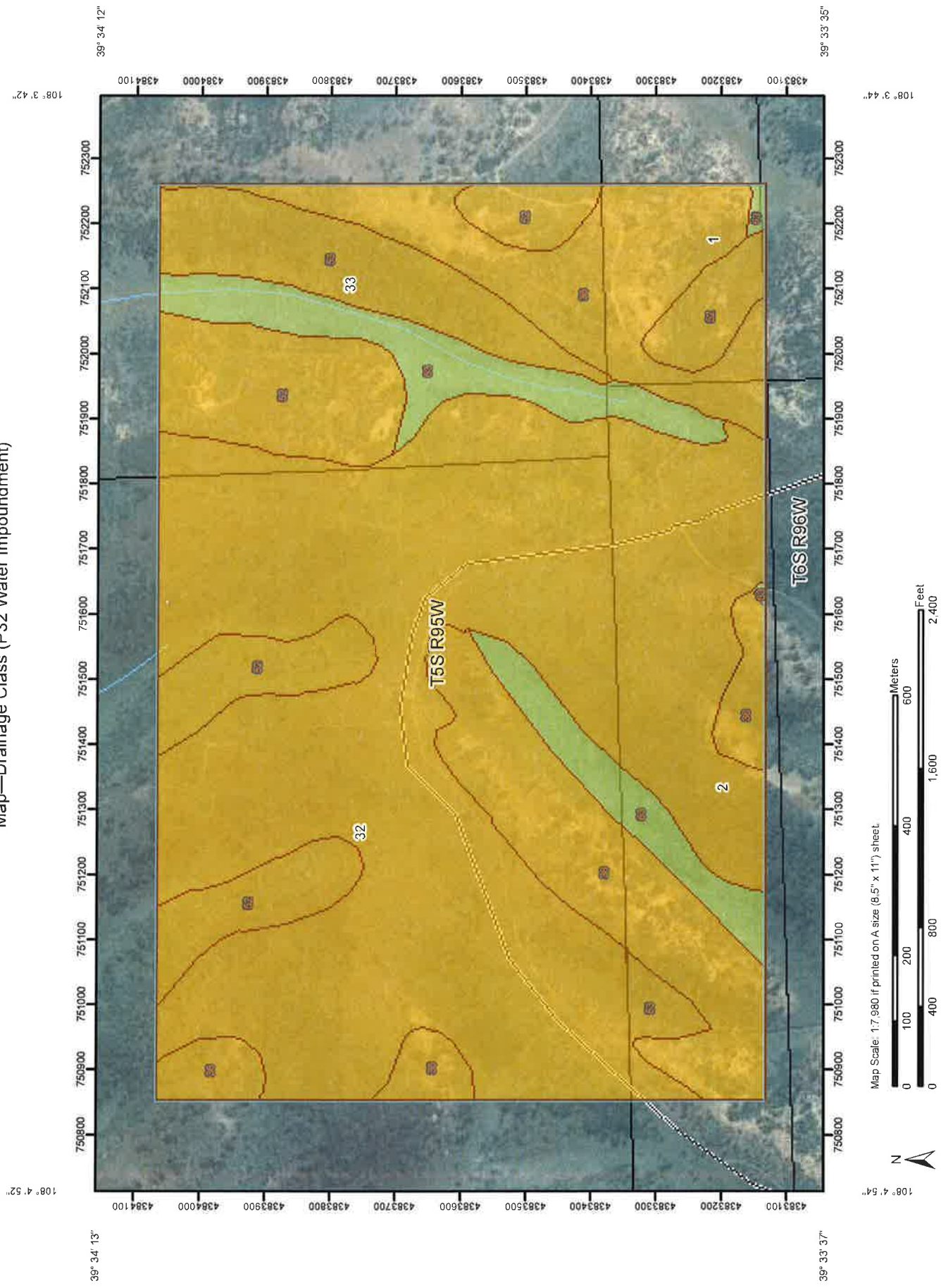
## Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

## Drainage Class (P32 Water Impoundment)


"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Custom Soil Resource Report  
Map—Drainage Class (P32 Water Impoundment)




MAP LEGEND










**Area of Interest (AOI)**

 Area of Interest (AOI)




**Soils**

 Soil Map Units


**Soil Ratings**

	Excessively drained
	Somewhat excessively drained
	Well drained
	Moderately well drained
	Somewhat poorly drained
	Poorly drained
	Very poorly drained
	Subaqueous
	Not rated or not available





**Political Features**

	Cities
	PLSS Township and Range
	PLSS Section


**Water Features**

 Streams and Canals

**Transportation**

	Rails
	Interstate Highways
	US Routes
	Major Roads

Local Roads



MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Drainage Class (P32 Water Impoundment)**

<b>Drainage Class— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	Well drained	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	Well drained	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	Well drained	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	Moderately well drained	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Drainage Class (P32 Water Impoundment)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

**Hydrologic Soil Group (P32 Water Impoundment)**

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

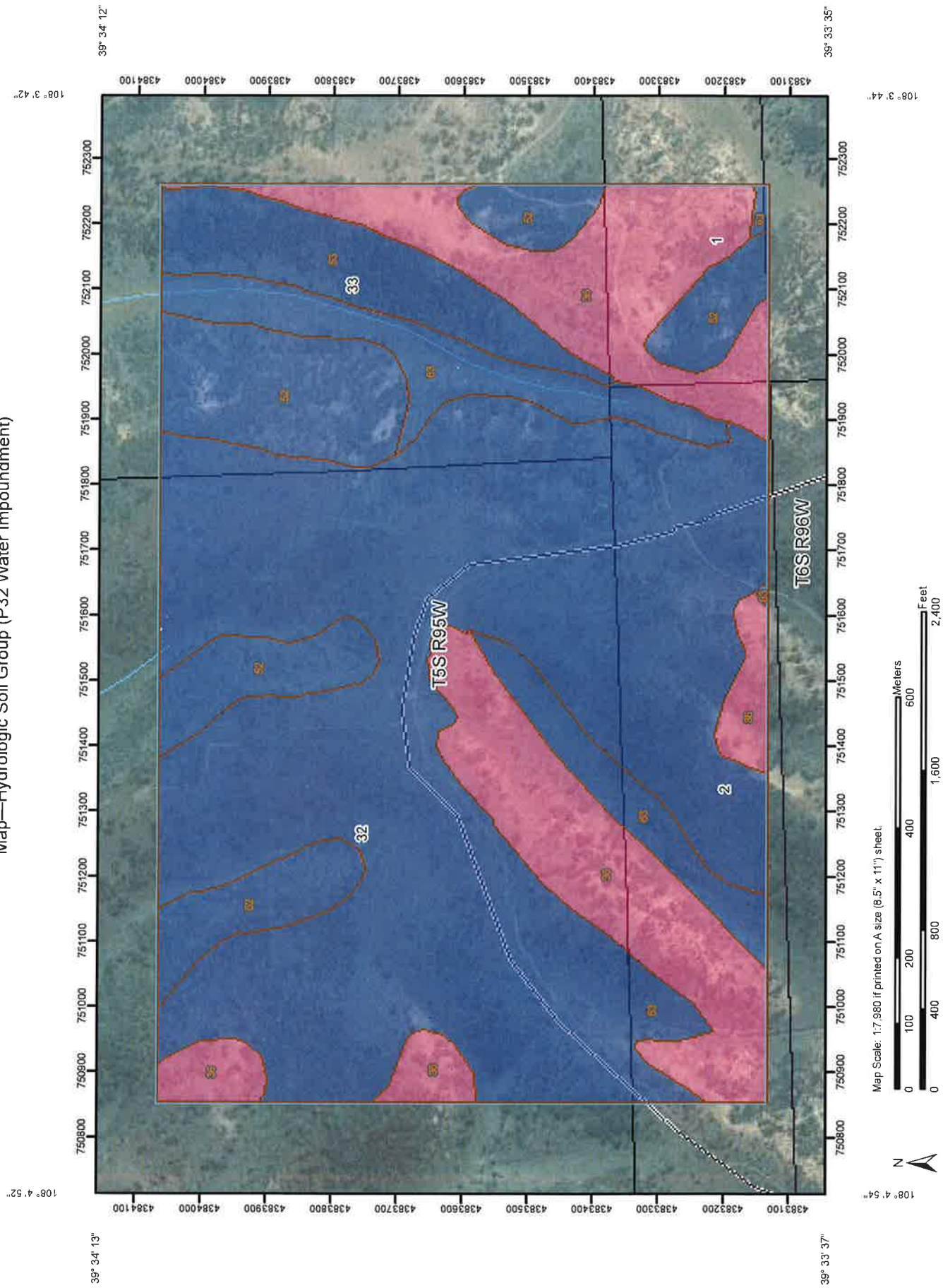
## Custom Soil Resource Report

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.




Custom Soil Resource Report  
Map—Hydrologic Soil Group (P32 Water Impoundment)




MAP LEGEND









**Area of Interest (AOI)**

 Area of Interest (AOI)




**Soils**

 Soil Map Units


**Soil Ratings**

	A
	A/D
	B
	B/D
	C
	C/D
	D
	Not rated or not available






**Political Features**

	Cities
	PLSS Township and Range
	PLSS Section

**Water Features**

 Streams and Canals

**Transportation**

	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads

MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

**Table—Hydrologic Soil Group (P32 Water Impoundment)**

<b>Hydrologic Soil Group— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	D	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	B	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	B	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	B	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Hydrologic Soil Group (P32 Water Impoundment)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

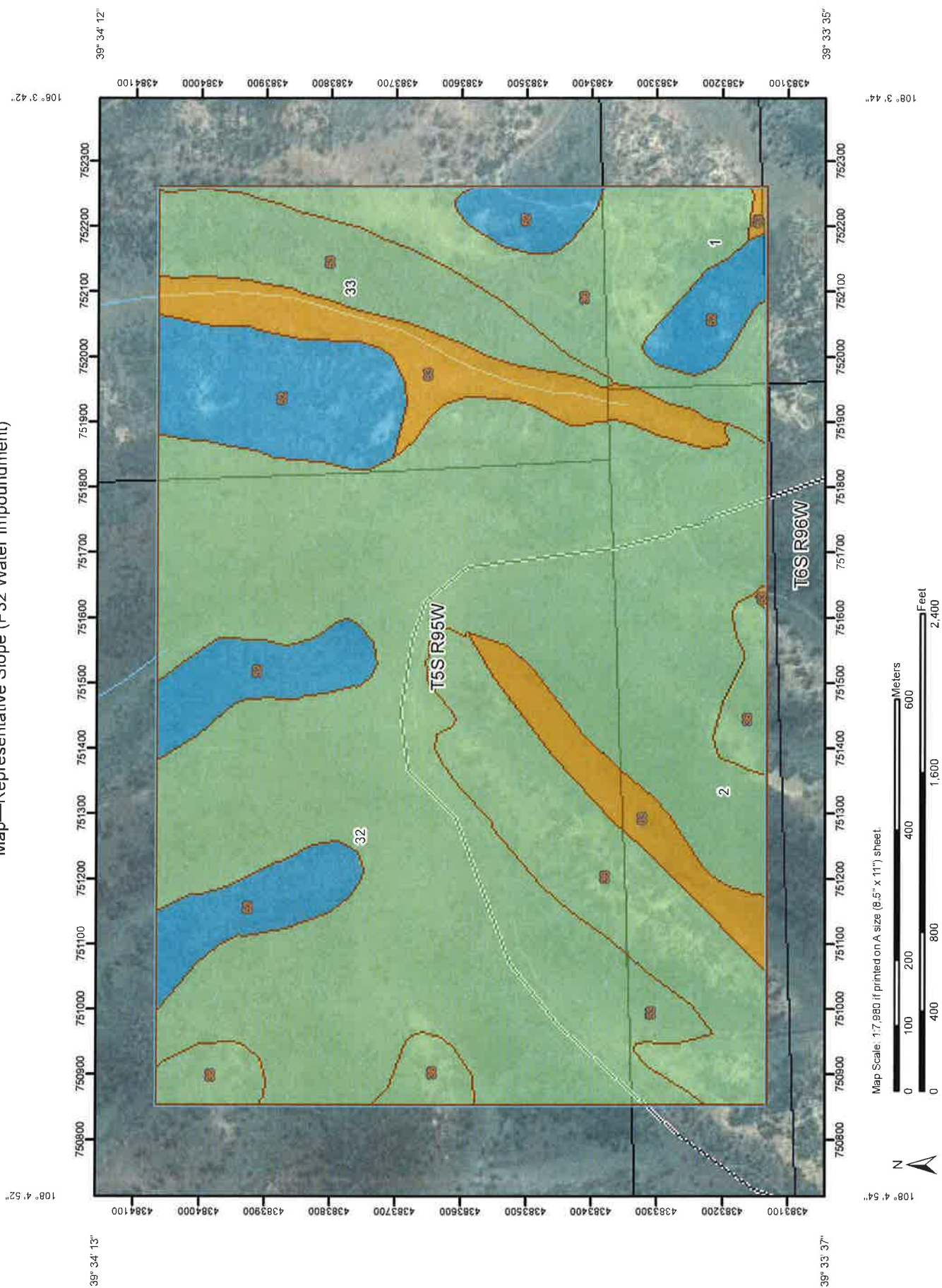
*Tie-break Rule:* Higher

**Representative Slope (P32 Water Impoundment)**

Slope gradient is the difference in elevation between two points, expressed as a percentage of the distance between those points.

The slope gradient is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report  
Map—Representative Slope (P32 Water Impoundment)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

0 - 5

5 - 15

15 - 30

30 - 45

45 - 60

Not rated or not available

Political Features

Cities

PLSS Township and Range

PLSS Section

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

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**Table—Representative Slope (P32 Water Impoundment)**

<b>Representative Slope— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating (percent)</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	30.0	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	45.0	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	18.0	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	8.0	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Representative Slope (P32 Water Impoundment)***Units of Measure:* percent*Aggregation Method:* Dominant Component*Component Percent Cutoff:* None Specified*Tie-break Rule:* Higher*Interpret Nulls as Zero:* No**Unified Soil Classification (Surface) (P32 Water Impoundment)**

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

## Custom Soil Resource Report

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Custom Soil Resource Report  
Map—Unified Soil Classification (Surface) (P32 Water Impoundment)



MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.  
The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

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MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Units

**Soil Ratings**

CH

CL

CL-A (proposed)

CL-K (proposed)

CL-ML

CL-O (proposed)

CL-T (proposed)

GC

GC-GM

GM

GP

GP-GC

GP-GM

GW

GW-GC

GW-GM

MH

MH-A (proposed)

MH-K (proposed)

MH-O (proposed)

MH-T (proposed)

**ML**

ML-A (proposed)

ML-K (proposed)

ML-O (proposed)

ML-T (proposed)

OH

OH-T (proposed)

OL

PT

SC

SC-SM

SM

SP

SP-SC

SP-SM

SW

SW-SC

SW-SM

Not rated or not available

**Rails**

Interstate Highways

US Routes

Major Roads

Local Roads

**Political Features**

Cities

PLSS Township and Range

PLSS Section

**Water Features**

Streams and Canals

**Transportation**

**Table—Unified Soil Classification (Surface) (P32 Water Impoundment)**

Unified Soil Classification (Surface)— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
36	Irigul channery loam, 9 to 50 percent slopes	CL-ML	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	CL	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	CL	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	CL	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Unified Soil Classification (Surface) (P32 Water Impoundment)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Lower

*Layer Options:* Surface Layer

**Water Features**

Water Features include ponding frequency, flooding frequency, and depth to water table.

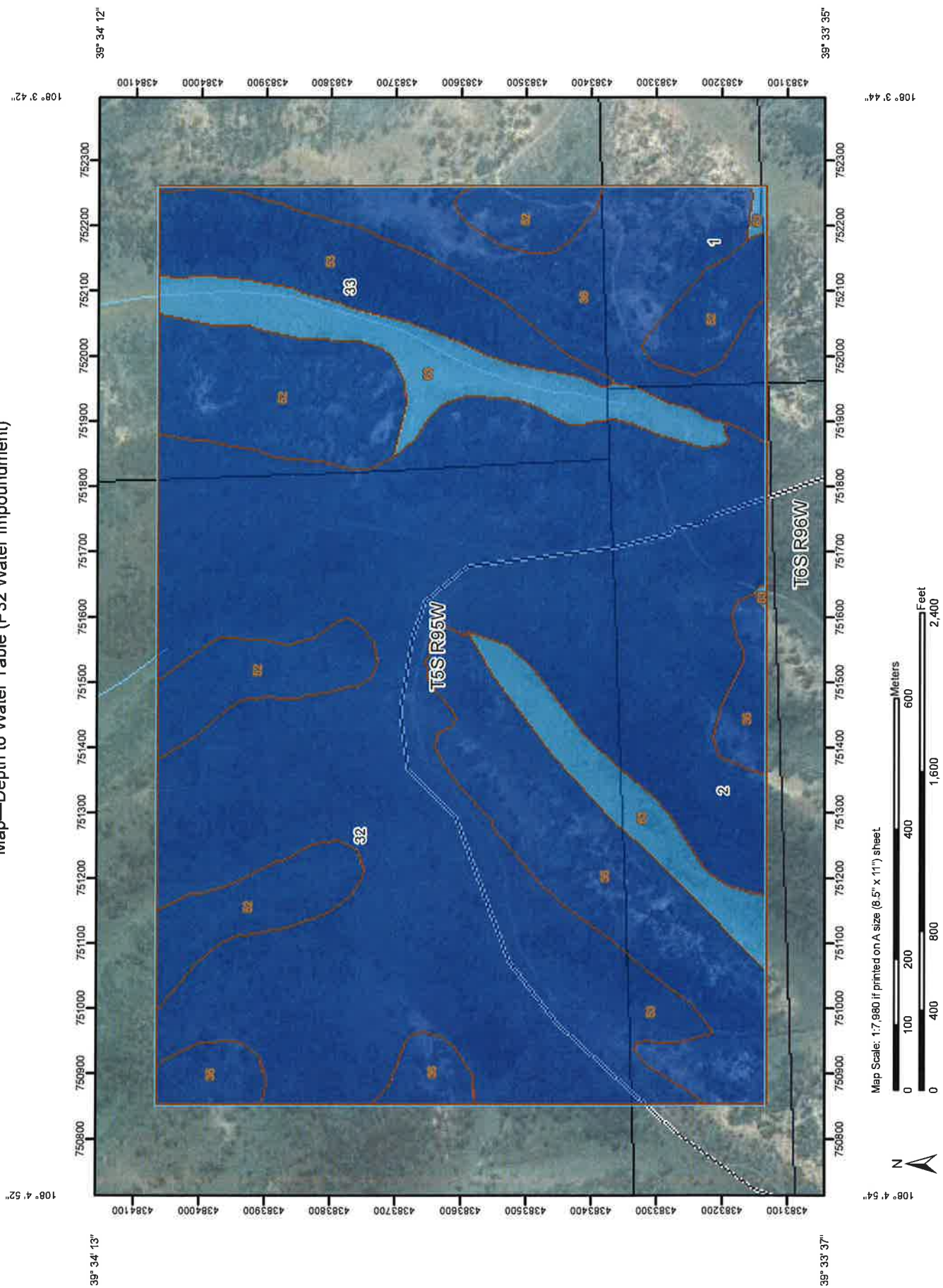
**Depth to Water Table (P32 Water Impoundment)**

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

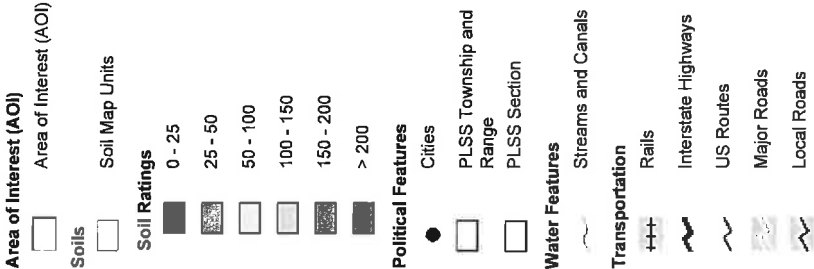
This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.



Custom Soil Resource Report  
Map—Depth to Water Table (P32 Water Impoundment)



MAP LEGEND



MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties  
Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

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# Custom Soil Resource Report

**Table—Depth to Water Table (P32 Water Impoundment)**

<b>Depth to Water Table— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating (centimeters)</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	>200	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	>200	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	>200	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	153	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

### **Rating Options—Depth to Water Table (P32 Water Impoundment)**

*Units of Measure:* centimeters

*Aggregation Method:* Dominant Component

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Lower

*Interpret Nulls as Zero:* No

*Beginning Month:* January

*Ending Month:* December

### **Flooding Frequency Class (P32 Water Impoundment)**

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.

"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.

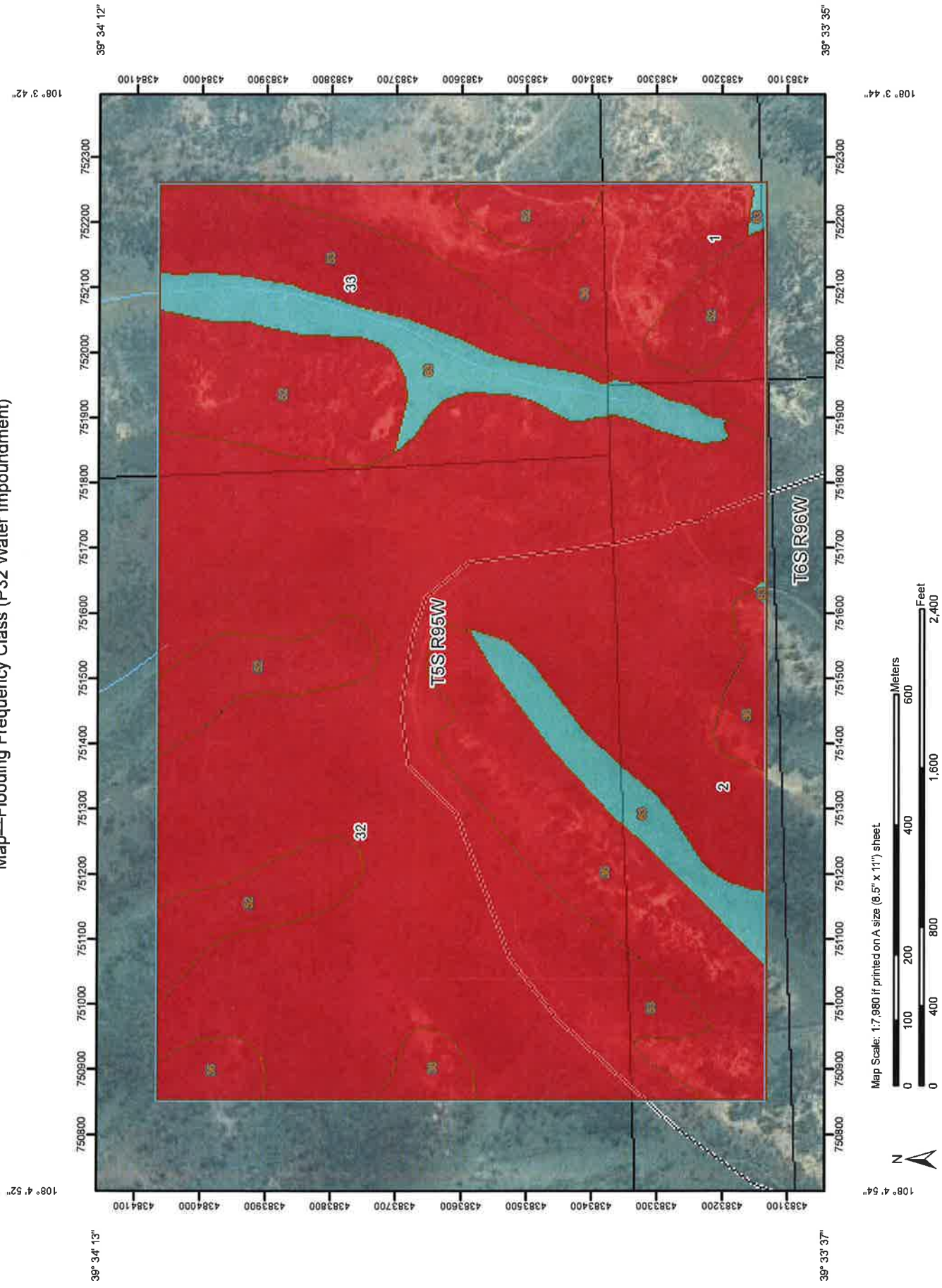
"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.

"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.

"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.

"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

Custom Soil Resource Report  
Map—Flooding Frequency Class (P32 Water Impoundment)





MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

None

Very Rare

Rare

Occasional

Frequent

Very Frequent

Political Features

Cities

PLSS Township and Range

PLSS Section

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:7,980 if printed on A size (8.5" x 11") sheet.

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Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>

Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rifle Area, Colorado, Parts of Garfield and Mesa Counties

Survey Area Data: Version 6, Mar 25, 2008

Date(s) aerial images were photographed: 8/8/2005

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**Table—Flooding Frequency Class (P32 Water Impoundment)**

<b>Flooding Frequency Class— Summary by Map Unit — Rifle Area, Colorado, Parts of Garfield and Mesa Counties (CO683)</b>				
<b>Map unit symbol</b>	<b>Map unit name</b>	<b>Rating</b>	<b>Acres in AOI</b>	<b>Percent of AOI</b>
36	Irigul channery loam, 9 to 50 percent slopes	None	66.5	20.5%
52	Parachute loam, 25 to 65 percent slopes	None	42.9	13.2%
53	Parachute-Rhone loams, 5 to 30 percent slopes	None	190.7	58.7%
63	Silas loam, 3 to 12 percent slopes	Occasional	24.7	7.6%
<b>Totals for Area of Interest</b>			<b>324.7</b>	<b>100.0%</b>

**Rating Options—Flooding Frequency Class (P32 Water Impoundment)**

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* More Frequent

*Beginning Month:* January

*Ending Month:* December

## Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

## Building Site Development

This folder contains a collection of tabular reports that present soil interpretations related to building site development. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

## Roads and Streets, Shallow Excavations, and Lawns and Landscaping (P32 Water Impoundment)

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel,

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crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

### **Report—Roads and Streets, Shallow Excavations, and Lawns and Landscaping (P32 Water Impoundment)**

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

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Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Rifle Area, Colorado, Parts of Garfield and Mesa Counties							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
36—Irigul channery loam, 9 to 50 percent slopes							
Irigul	85	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Droughty	1.00
		Slope	1.00	Slope	1.00	Depth to bedrock	1.00
		Large stones content	0.03	Cutbanks cave	0.10	Slope	1.00
				Large stones content	0.03	Large stones content	0.54
						Gravel content	0.04
52—Parachute loam, 25 to 65 percent slopes							
Parachute	85	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	0.50	Depth to soft bedrock	0.42	Depth to bedrock	0.42
				Cutbanks cave	0.10	Droughty	0.21
53—Parachute-Rhone loams, 5 to 30 percent slopes							
Parachute	55	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	0.50	Depth to soft bedrock	0.42	Depth to bedrock	0.42
				Cutbanks cave	0.10	Droughty	0.21
Rhone	30	Somewhat limited		Somewhat limited		Somewhat limited	
		Slope	0.84	Slope	0.84	Slope	0.84
		Frost action	0.50	Cutbanks cave	0.10		
63—Silas loam, 3 to 12 percent slopes							
Silas	90	Very limited		Somewhat limited		Somewhat limited	
		Flooding	1.00	Flooding	0.60	Flooding	0.60
		Frost action	0.50	Depth to saturated zone	0.15	Slope	0.01
		Slope	0.01	Cutbanks cave	0.10		
				Slope	0.01		

## Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for



each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

## **Taxonomic Classification of the Soils (P32 Water Impoundment)**

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. This table shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

**ORDER.** Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisols.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalfs (*Ud*, meaning humid, plus *alfs*, from Alfisols).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that has a udic moisture regime).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic Hapludalfs.

**SERIES.** The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

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### References:

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. (The soils in a given survey area may have been classified according to earlier editions of this publication.)

### Report—Taxonomic Classification of the Soils (P32 Water Impoundment)

[An asterisk by the soil name indicates a taxadjunct to the series]

Taxonomic Classification of the Soils— Rifle Area, Colorado, Parts of Garfield and Mesa Counties	
Soil name	Family or higher taxonomic classification
Irigul	Loamy-skeletal, mixed Lithic Cryoborolls
Parachute	Loamy-skeletal, mixed Typic Cryoborolls
Rhone	Fine-loamy, mixed Pachic Cryoborolls
Silas	Fine-loamy, mixed Cumulic Cryoborolls

## Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

### Chemical Soil Properties (P32 Water Impoundment)

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated.

*Cation-exchange capacity* is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

*Effective cation-exchange capacity* refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

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*Soil reaction* is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Calcium carbonate* equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

*Gypsum* is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

*Salinity* is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

*Sodium adsorption ratio (SAR)* is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

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Chemical Soil Properties-- Rifle Area, Colorado, Parts of Garfield and Mesa Counties								
Map symbol and soil name	Depth	Cation-exchange capacity	Effective cation-exchange capacity	Soil reaction	Calcium carbonate	Gypsum	Salinity	Sodium adsorption ratio
	In	meq/100g	meq/100g	pH	Pct	Pct	mmhos/cm	
36—Irigul channery loam, 9 to 50 percent slopes								
Irigul	0-6	10-20	—	6.1-7.3	0	0	0.0-2.0	0
	6-17	10-20	—	7.4-7.8	0	0	0.0-2.0	0
	17-21	—	—	—	—	—	—	—
52—Parachute loam, 25 to 65 percent slopes								
Parachute	0-5	10-25	—	6.6-7.8	0	0	0	0
	5-18	10-20	—	6.6-7.8	0	0	0	0
	18-29	10-15	—	6.6-7.8	0	0	0	0
	29-33	—	—	—	—	—	—	—
53—Parachute-Rhone loams, 5 to 30 percent slopes								
Parachute	0-5	10-25	—	6.6-7.8	0	0	0	0
	5-18	10-20	—	6.6-7.8	0	0	0	0
	18-29	10-15	—	6.6-7.8	0	0	0	0
	29-33	—	—	—	—	—	—	—
Rhone	0-8	15-30	—	6.1-7.8	0	0	0	0
	8-28	10-25	—	6.1-7.8	0	0	0	0
	28-52	10-20	—	6.1-7.8	0	0	0	0
	52-56	—	—	—	—	—	—	—
63—Silas loam, 3 to 12 percent slopes								
Silas	0-14	10-25	—	6.6-7.8	0	0	0.0-2.0	0
	14-60	10-20	—	6.6-7.8	0	0	0.0-2.0	0

## Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

### Physical Soil Properties (P32 Water Impoundment)

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

*Sand* as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

*Silt* as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity ( $K_{sat}$ ), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

*Moist bulk density* is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots.

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Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Saturated hydraulic conductivity (Ksat)* refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Linear extensibility* refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

*Erosion factors* are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor Kw* indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

*Erosion factor Kf* indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.



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*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

*Wind erodibility index* is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

### Reference:

United States Department of Agriculture, Natural Resources Conservation Service.  
National soil survey handbook, title 430-VI. (<http://soils.usda.gov>)

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Physical Soil Properties— Rifle Area, Colorado, Parts of Garfield and Mesa Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
36—Irigul channery loam, 9 to 50 percent slopes	In	Pct	Pct	Pct	g/cc	micro m/sec	In/in	Pct	Pct					
	0-6	-42-	-37-		15-21- 27	1.25-1.40	4.23-42.34	0.10-0.13	0.0-2.9	1.0-3.0	.15	.28	1	6
	6-17	-55-	-18-		20-27- 34	1.25-1.40	1.41-14.11	0.04-0.05	0.0-2.9	0.5-1.0	.02	.20		
52—Parachute loam, 25 to 65 percent slopes	17-21	—	—	—	—	0.42-1.41	—	—	—	—				
	0-5	-42-	-38-		15-20- 25	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	3.0-6.0	.20	.20	3	5
	5-18	-41-	-37-		18-22- 25	1.25-1.40	4.23-14.11	0.13-0.16	0.0-2.9	1.0-2.0	.28	.28		
53—Parachute-Rhone loams, 5 to 30 percent slopes	18-29	-41-	-37-		18-22- 25	1.25-1.40	4.23-14.11	0.04-0.05	0.0-2.9	0.5-1.0	.05	.37		
	29-33	—	—	—	—	0.42-1.41	—	—	—	—				
Rhone	0-5	-42-	-38-		15-20- 25	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	3.0-6.0	.20	.20	3	5
	5-18	-41-	-37-		18-22- 25	1.25-1.40	4.23-14.11	0.13-0.16	0.0-2.9	1.0-2.0	.28	.28		
	18-29	-41-	-37-		18-22- 25	1.25-1.40	4.23-14.11	0.04-0.05	0.0-2.9	0.5-1.0	.05	.37		
	29-33	—	—	—	—	0.42-1.41	—	—	—	—				
Rhone	0-8	-39-	-37-		20-24- 27	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	3.0-6.0	.20	.20	4	6
	8-28	-55-	-17-		20-28- 35	1.25-1.40	1.41-14.11	0.14-0.17	0.0-2.9	1.0-3.0	.17	.17		
	28-52	-57-	-18-		20-25- 30	1.25-1.40	1.41-14.11	0.07-0.09	0.0-2.9	0.0-1.0	.05	.20		
	52-56	—	—	—	—	0.42-1.41	—	—	—	—				

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Physical Soil Properties-- Rifle Area, Colorado, Parts of Garfield and Mesa Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility Index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
63—Silas loam, 3 to 12 percent slopes														
Silas	0-14	-42-	-37-	15-21- 27	1.25-1.40	4.23-42.34	0.14-0.17	0.0-2.9	3.0-5.0	.20	.20	5	6	48
	14-60	-42-	-37-	15-21- 27	1.25-1.40	4.23-42.34	0.14-0.17	0.0-2.9	1.0-3.0	.28	.28			

## Soil Qualities and Features

This folder contains tabular reports that present various soil qualities and features. The reports (tables) include all selected map units and components for each map unit. Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

### Soil Features (P32 Water Impoundment)

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

*A restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

*Subsidence* is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

*Potential for frost action* is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity ( $K_{sat}$ ), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel

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or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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Soil Features— Rifle Area, Colorado, Parts of Garfield and Mesa Counties									
Map symbol and soil name	Kind	Restrictive Layer			Subsidence		Potential for frost action	Risk of corrosion	
		Depth to top	Thickness	Hardness	Initial	Total		Uncoated steel	Concrete
		<i>In</i>	<i>In</i>		<i>In</i>	<i>In</i>			
36—Irigul channery loam, 9 to 50 percent slopes									
Irigul	Lithic bedrock	10-20	—	Indurated	0	—	Low	Moderate	Low
52—Parachute loam, 25 to 65 percent slopes									
Parachute	Paralithic bedrock	20-40	—	Moderately cemented	0	—	Moderate	Moderate	Low
53—Parachute-Rhone loams, 5 to 30 percent slopes									
Parachute	Paralithic bedrock	20-40	—	Moderately cemented	0	—	Moderate	Moderate	Low
Rhone	Paralithic bedrock	40-60	—	Moderately cemented	0	—	Moderate	Moderate	Low
63—Silas loam, 3 to 12 percent slopes									
Silas		—	—		0	—	Moderate	Moderate	Low



## Vegetative Productivity

This folder contains a collection of tabular reports that present vegetative productivity data. The reports (tables) include all selected map units and components for each map unit. Vegetative productivity includes estimates of potential vegetative production for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture and rangeland. In the underlying database, some states maintain crop yield data by individual map unit component. Other states maintain the data at the map unit level. Attributes are included for both, although only one or the other is likely to contain data for any given geographic area. For other land uses, productivity data is shown only at the map unit component level. Examples include potential crop yields under irrigated and nonirrigated conditions, forest productivity, forest site index, and total rangeland production under of normal, favorable and unfavorable conditions.

## Rangeland Productivity (P32 Water Impoundment)

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

This table shows, for each soil that supports rangeland vegetation, the ecological site and the potential annual production of vegetation in favorable, normal, and unfavorable years. An explanation of the column headings in the table follows.

An *ecological site* is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The hydrology of a site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service (NRCS).

*Total dry-weight production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Range management requires knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range similarity index and rangeland trend. Range similarity index is determined by comparing the present

## Custom Soil Resource Report

plant community with the potential natural plant community on a particular rangeland ecological site. The more closely the existing community resembles the potential community, the higher the range similarity index. Rangeland trend is defined as the direction of change in an existing plant community relative to the potential natural plant community. Further information about the range similarity index and rangeland trend is available in the "National Range and Pasture Handbook," which is available in local offices of NRCS or on the Internet.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

### Reference:

United States Department of Agriculture, Natural Resources Conservation Service,  
National range and pasture handbook.

## Report—Rangeland Productivity (P32 Water Impoundment)

Rangeland Productivity— Rifle Area, Colorado, Parts of Garfield and Mesa Counties				
Map unit symbol and soil name	Ecological site	Total dry-weight production		
		Favorable year	Normal year	Unfavorable year
		<i>Lb/ac</i>	<i>Lb/ac</i>	<i>Lb/ac</i>
36—Irigul channery loam, 9 to 50 percent slopes				
Irigul	Loamy Slopes	1,200	900	500
52—Parachute loam, 25 to 65 percent slopes				
Parachute	Brushy Loam	3,000	2,000	1,500
53—Parachute-Rhone loams, 5 to 30 percent slopes				
Parachute	Mountain Loam	1,800	1,500	1,200
Rhone	Mountain Loam	1,800	1,500	1,200
63—Silas loam, 3 to 12 percent slopes				
Silas	Mountain Swale	3,000	2,500	2,000

## Water Management

This folder contains a collection of tabular reports that present soil interpretations related to water management. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Water management interpretations are tools for evaluating the potential of the soil in the

application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

## Ponds and Embankments (P32 Water Impoundment)

This table gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Aquifer-fed excavated ponds* are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, Ksat of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

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Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

### Report—Ponds and Embankments (P32 Water Impoundment)

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Ponds and Embankments— Rifle Area, Colorado, Parts of Garfield and Mesa Counties							
Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
36—Irigul channery loam, 9 to 50 percent slopes							
Irigul	85	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	1.00	Seepage	0.75		
				Large stones content	0.03		
52—Parachute loam, 25 to 65 percent slopes							
Parachute	85	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Thin layer	0.85	Depth to water	1.00
		Seepage	0.72	Seepage	0.75		
		Depth to bedrock	0.11				

# Custom Soil Resource Report

Ponds and Embankments– Rifle Area, Colorado, Parts of Garfield and Mesa Counties							
Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
53—Parachute-Rhone loams, 5 to 30 percent slopes							
Parachute	55	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Thin layer	0.85	Depth to water	1.00
		Seepage	0.72	Seepage	0.75		
		Depth to bedrock	0.11				
Rhone	30	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Seepage	0.19	Depth to water	1.00
		Seepage	0.54	Thin layer	0.11		
		Depth to bedrock	0.01				
63—Silas loam, 3 to 12 percent slopes							
Silas	90	Very limited		Very limited		Very limited	
		Seepage	1.00	Piping	1.00	Depth to water	1.00
		Slope	1.00				

# References

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American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. <http://soils.usda.gov/>

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. <http://soils.usda.gov/>

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. <http://soils.usda.gov/>

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. <http://soils.usda.gov/>

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.glti.nrcs.usda.gov/>

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. <http://soils.usda.gov/>

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. <http://soils.usda.gov/>



## Custom Soil Resource Report

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210.

## **ATTACHMENT L**



**Nicholson GeoSolutions, LLC**

3433 East Lake Drive  
Centennial, CO 80121

**Geologic Hazard Report for the Proposed Berry Petroleum Company  
P-32 Produced Water Facility**

Potential geologic hazards in the area of the proposed P-32 produced water facility include slumping of excavation walls, erosive soils, landslides, and earthquakes. Consideration will need to be given to the design and construction of this facility to ensure that slopes are graded to minimize the potential for slumping and caving. The suitability of the soils in the area is identified as being very limited in regard to the construction of shallow excavations. As long as consideration is given to design and construction issues related to the thinness of the soil layer and depth to bedrock, those limitations can be mitigated.

**Surficial Geology and Soils**

The proposed location of the produced water facility is underlain by the Uinta Formation and the Parachute Creek member of the Green River Formation. Beds of the Uinta Formation cap Old Mountain and alternate with tongues of with the underlying Green River Formation in this area. The Uinta Formation consists of marlstone (oil shale), sandstone, siltstone, and mudstone and the Parachute Creek Member consists of claystone, marlstone, and shale (Hail et al, 1989; Hail 1992; Tweto 1979). The proposed facility location is underlain by soils of the Parachute-Rhone loams, 5 to 30% slopes (NRCS 2012). This soil is described as well drained loam, sandy loam, and channery loam that extends to depths of about 30-53 inches beneath the proposed location. The soil has an erosion factor Kw of 0.20, which generally means that the water erosion potential is low to moderate. Limitations of this soil in relation to the proposed project are discussed below.

**Limitations of Soils for Intended Uses**

The Natural Resources Conservation Service (NRCS) provides information regarding the suitability or limitations of soils for the proposed use – shallow excavations. The Parachute-Rhone loams are rated as very limited. The primary limitations identified by the NRCS for shallow excavations are based on the shallow depth to soft bedrock and the potential for cutbanks to cave. Consideration will need to be given to the design and construction of this facility to ensure that slopes are graded appropriately to minimize the potential for cutbank caving.

## **Landslides**

The primary geologic hazard in the Parachute Creek area is landslides. The Garden Gulch Member of the Green River Formation has been eroded into steep slopes and cliffs along Parachute Creek and the loose materials that form the slopes facing the creek are largely at the angle of repose. The access road to the facility (the Wheeler Gulch Road) crosses areas where landslides have occurred and could potentially be affected by future landslides. However, the proposed facility would be built on the Uinta Formation on a previously constructed well pad that is in an area with nearly flat to low slopes. No slope instability occurred during the construction of this well pad. Therefore, landslides are not a threat to the proposed water storage facility itself.

## **Siesmicity and Earthquakes**

Approximately 400 earthquakes of magnitude 2.5 or greater have occurred in Colorado since 1867 (CGS 2012). However, most of these earthquakes have been below magnitude 3.0 and have not caused significant damage. Most of the largest earthquakes in Colorado history were associated with the injection of waste liquids at the Rocky Mountain Arsenal during the 1960s. In addition, the Colorado Earthquake and Fault Map shows that no faults considered to be potentially active occur on the Roan Plateau (CEHMC 2008), although at least two earthquakes with a magnitude of 5.0 have occurred within the Piceance Basin. Given the lack of potentially active faults on the Plateau, the potential for a damaging earthquake to occur near the proposed facility is considered to be very low.

## **Summary and Conclusions**

Potential geologic hazards in the area of the proposed P-32 produced water facility and access road include slumping of excavation walls, erosive soils, landslides, and earthquakes. The suitability of the soils at the site for shallow excavations is very limited. However, as long as consideration is given to design and construction issues related to the thinness of the soil layer and depth to soft bedrock, those limitations can be mitigated. The soil at the proposed location has a low to moderate water erosion potential; therefore, excessive soil erosion should not occur. Landslides could potentially occur along the access road to the facility, but not at the proposed facility itself. The potential for a damaging earthquake to strike the facility is considered to be very low. Based on the available geologic information, there would be little or no expected impact to the proposed facility resulting from geologic hazards.

## **References**

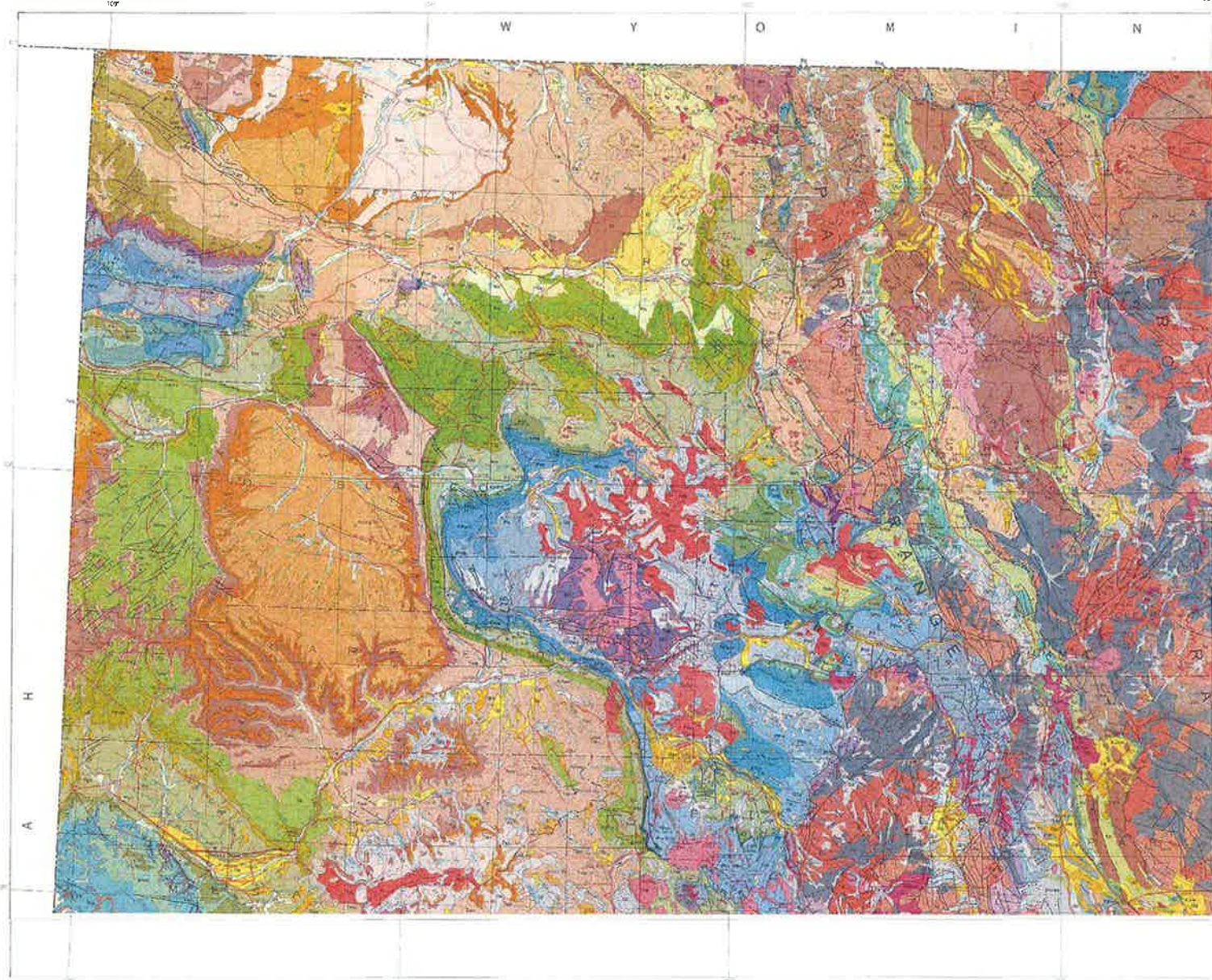
- Colorado Geological Survey, Earthquakes in Colorado, accessed at <http://geosurvey.state.co.us/hazards/Earthquakes/Pages/Earthquakes.aspx>; July 30, 2012
- Colorado Earthquake Hazard Mitigation Council, 2008, Colorado Earthquake Hazards, accessed at [http://geosurvey.state.co.us/hazards/Earthquakes/Documents/Earthquake\\_Map\\_2008.pdf](http://geosurvey.state.co.us/hazards/Earthquakes/Documents/Earthquake_Map_2008.pdf); July 31, 2012
- Hail, W.J., O'Sullivan, R.B., and Smith, M.C., 1989, Geologic map of the Roan Plateau area,

northwestern Colorado: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1797-C, scale 1:50000.

Hail, W.J., 1992, Geology of the central Roan Plateau area, northwestern Colorado: U.S. Geological Survey, Bulletin 1787-R, scale 1:164000.

Tweto, Ogden, 1979, Geologic map of Colorado: U.S. Geological Survey, scale 1:500000.

U. S. Department of Agriculture, Natural Resources Conservation Service, 2012, Custom Soil Resource Report for Rifle Area, Colorado, Parts of Garfield and Mesa Counties, Web Soil Survey; generated on August 2, 2012.



From U.S. Geological Survey, 1968  
Further revised data collection based  
on current reports 1970 and 1971



Geological Survey, Denver, Colorado, 1970  
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# GEOLOGIC MAP OF COLORADO

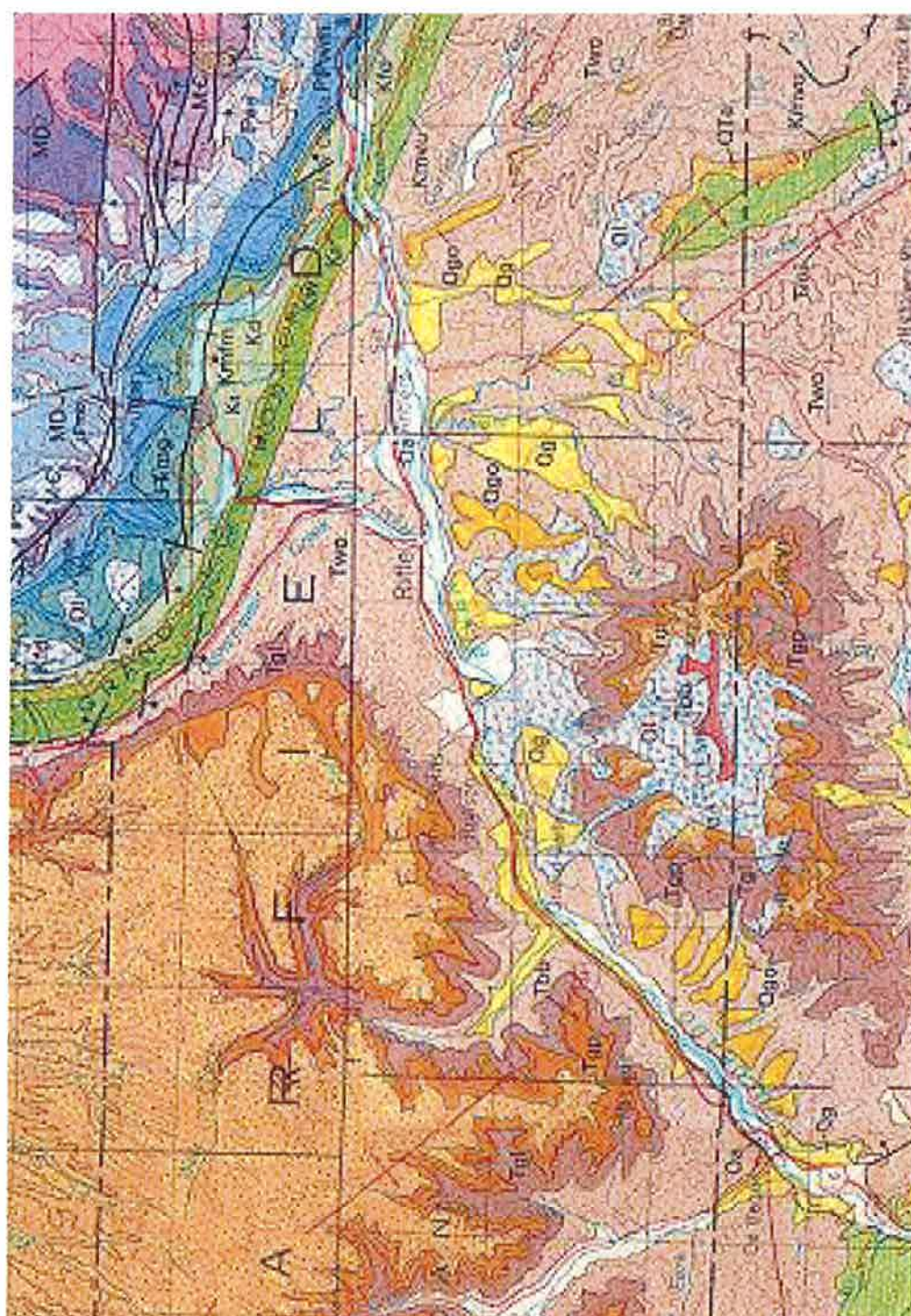
Compiled by Ogden Tweto

1979



For sale by Bureau of Land Management, 1015 Jackson Street  
Box 7240, Denver, Colorado 80202





Value	Definition
Qa	Modern alluvium
Qg	Gravels and alluviums (Pinedale and Bull Lake age)
Qgo	Older gravels and alluviums (Pre-Bull Lake age)
Qe	Eolian deposits (Quaternary)
Qeo	Older eolian deposits (Quaternary)
Qd	Glacial drift of Pinedale and Bull Lake glaciations
Qdo	Older glacial drift (Pre-Bull Lake age)
Qb	Basalt Flows (Age <1.8 M.Y.)
QTsa	Unclassified surficial deposits and underlying Alamosa Formation
QTa	Ancient Alluvium
To	Ogallala Formation
Tgv	Bouldery gravel on old erosion surfaces in front range and never summer mountains
Ta	Arikaree formation
Twr	White river formation or group
Th	Huerfano formation
Tcu	Cuchara formation
Tpc	Poison canyon formation
Tdu	Upper part of Dawson arkose
Tbp	Browns park formation
Tt	Troublesome formation
Tnp	North park formation
Tos	Oligocene sedimentary rocks
Tu	Uinta formation
Tb	Bridger formation
Tg	Green river formation
Tfp	Parachute creek memeber - Green river formation
Tgl	Lower part - Green river formation
Tglm	Laney member - Green river formation
Tgt	Tipton tongue - Green river formation
Tglu	Luman tongue - Green River formation
Tglw	Lower part of Green river formation
Tw	Wasatch formation
Twc	Cathedral bluffs tongue - Wasatch formation
Twn	Niland tongue - Wasatch formation
Two	Wasatch formation and Ohio creek formation
Tf	Fort union formation
Tc	Coalmont formation
Tm	Middle park formation exclusive of windy gap member
Td	Dry union formation
Ts	Santa Fe formation
Tos	Oligocene sedimentary rocks
Te	Eocene prevolcanic sedimentary rocks
Tsp	South park formation
Tlp	Los Pinos formation
Tsj	San Jose formation
Tn	Nacimiento formation
Tbb	Basalt flows and associated tuff, breccia, and conglomerate of late-volcanic bimodal suite
Tbbi	Basaltic intrusive rocks related to basalt flows
Tbr	Rhyolitic intrusive rocks and flows of late-volcanic bimodal suite
Tbrt	Ash-flow tuff of late-volcanic bimodal suite
Taf	Ash-flow tuff of main volcanic sequence
Tial	Intra-ash flow andesitic lavas
Tiql	Intra-ash-flow quartz latitic lavas
Tpl	Pre-ash-flow andesitic lavas, breccians, tuffs, and conglomerates

Twm	Wall mountain tuff
Tv	Volcanic rocks in northwestern Colorado
Tui	Upper Tertiary intrusive rocks
Tmi	Middle tertiary intrusive rocks
TKda	Denver and Arapahoe formations
Tdv	Basaltic flows in Denver formation near Golden
TKdl	Denver formation or lower part of Dawson arkose
TKr	Raton formation
TKa	Animas formation
TKec	Telluride conglomerate of Eocene prevolcanic sedimentary rocks and Cimarron ridge formation
TKi	Laramide intrusive rocks
Kl	Laramie formation
Kf	Fox hills sandstone
Klf	Laramie formation and fox hills sandstone
Kvt	Vermejo formation and Trinidad sandstone
Kp	Perre shale, undivided
Kpu	Upper unit - Pierre shale
Kpl	Lower unit - Pierre shale
Kn	Niobrara formation
Kcg	Carlile shale, greenhorn limestone, and graneros shale
Kc	Colorado group
Kpg	Pierre shale, Niobrara, and Carlile, Greenhorn, and Graneros formations, undivided
Kdp	Dakota sandstone and Purgatoire formation
Kd	Dakota sandstone or group
Kl	Lance formation
Kmv	Windy gap memeber
Kls	Lewis shale
Kmv	Mesaverde formation, undivided
Kmvu	Upper part - Mesaverde group
Kmvl	Lower part - Mesaverde group
Kw	Williams fork formation
Ki	Iles formation
Ksc	Sego sandstone, Buck tongue of Mancos shale, and Castlegate sandstone
Kh	Hunter canyon formation
Kmgs	Mount Garfield formation and Sego sandstone
Km	Mancos shale
Kmfm	Frontier sandstone and Mowry shale members and intervening shale zone
Kfd	Frontier sandstone and Mowry shale members of Mancos shale and Dakota sandstone
Kdb	Dakota sandstone and Burro canyon formation
Kkf	Kirtland shale and Fruitland formation
Kpcl	Pictured cliffs sandstone and Lewis shale
Kch	Cliff house sandstone
Kmp	Menefee formation and Point lookout sandstone
KJdm	Dakota and Morrison formations
KJdj	Dakota, Burro canyon, Morrison, and Junction creek formations
KJdw	Dakota, Burro Canyon, Morrison, and Wanakah formations
KJdr	Dakota group and Morrison and Ralston creek formations at mountain front between Boulder and C
KJde	Dakota and other formations depending on location
KJds	Dakota, Morrison, and Sundance formations
Jm	Morrison formation
Jmj	Morrison formation and Junction creek sandstone
Jmc	Morrison formation and curtis formation
Jmw	Morrison formation and Wanakah formation
Jmr	Morrison formation and Ralston creek formation
Jme	Morrison formation and Entrada sandstone



Jms	Morrison formation and Sundance formation
Jmse	Morrison formation, Summerville formation, and Entrada sandstone
Jmce	Morrison, Curtis, and Entrada formations
Jmre	Morrison, Ralston creek, and Entrada formations
Jmwe	Morrison, Wanakah, and Entrada formations
J@g	Glen canyon sandstone
J@gc	Glen canyon group and Chinle formation
J@mg	Morrison, Curtis, Entrada, and Glen canyon formations
J@mc	Morrison, Entrada, and Chinle formations
@kc	Kayenta formation, Wingate sandstone, and Chinle formation
@wc	Wingate sandstone and Chinle formation
@m	Moenkopi formation
@ch	Chugwater formation
@cc	Chinle and Chugwater formations
@c	Chinle formation
@d	Dolores formation
@dg	Dockum group
@Pl	Lykins formation
@Ps	State bridge formation
@Pl	Lykins formation and Lyons sandstone
@Pjs	Jelm, Lykins, Lyons, and Satanka formations
@Pcs	Chinle and State bridge formations
@Pcp	Chinle, Moenkopi, and Park City formations
@Pr	Triassic and Permian rocks
@Pdc	Dolores formation and Cutler formation
@Pmc	Moenkopi formation and Cutler formation
@&lf	Lykins, Lyons, and Fountain formations
Pp	Park city formation
Pu	Upper Permian rocks, undivided
Pc	Cutler formation
Mz	Mesozoic rocks
MzPz	Mesozoic and Paleozoic rocks
P&f	Fountain formation
P&cf	Casper formation and Lower part of Fountain formation
P&if	Ingleside formation and Fountain formation
P&s	Sangre de Cristo formation
P&m	Maroon formation
P&w	Weber sandstone
P&wm	Weber sandstone and Maroon formation
&m	Minturn formation in west-central and south-central and other units of middle Pennsylvanian age
&b	Belden formation
&mb	Minturn and Belden formations
&ee	Evaporitic facies
&mbe	Evaporitic facies of Minturn and Belden formations in South Park and southward
&h	Hermosa formation
&rh	Rico and Hermosa formations
&mr	Morgan formation and Round Valley limestone
M_	Leadville limestone, Williams canyon limestone, Manitou limestone, and Sawatch quartzite
MDO	Leadville limestone, Williams canyon limestone, and one or more Ordovician formations
DO_	Williams canyon limestone, Manitou Limestone, and Sawatch quartzite
O_	Manitou limestone and Sawatch quartzite
Or	One or more Ordovician formations
MD	Leadville limestone, Gilman sandstone, Dyer dolomite, and parting formation
MD_	Leadville, Gilman, Dyer, Parting, and Sawatch formations
DO	Parting, Fremont, and Harding formations

s	Sawatch quartzite
Mm	Madison limestone
l	Lodore formation
M ml	Madison limestone and Lodore formation
Md	Leadville Limestone, Ouray Limestone, Elbert formation, and Ignacio quartzite
am	Alkaline and mafic intrusive rocks in small plutons, and diabase dikes
Yu	Uinta mountain group
YXu	Uncompahgre formation
Xb	Biotitic gneiss, schist, and migmatite
Xfh	Felsic and hornblende gneiss
Xq	Quartzite, conglomerate, and interlayered mica schist
Wr	Red creek quartzite
Yp	Rocks of Pikes peak batholith
Yg	Granitic rocks of 1,400-M.Y. age group
Yam	Alkaline and mafic rocks in small plutons, and diabase and gabbro dikes
Xg	Granitic rocks of 1,700-M.Y. age group
Xm	Mafic rocks of 1,700-M.Y. age group
YXg	Granitic rocks of 1,400- and 1,700-M.Y. age groups



## **Nicholson GeoSolutions, LLC**

3433 East Lake Drive  
Centennial, CO 80121

### **Background Radiation Survey of the P-32 Well Pad**

#### **Introduction**

Background radiation is the natural radioactivity of an area. Background radiation varies due to the influence of natural mineral deposits, building materials, elevation, and topography. In Western Colorado, the typical background levels range from 8 to 30 microrentgens per hour ( $\mu\text{R/h}$ ). The most common outside background levels in Mesa County are 10 to 15  $\mu\text{R/h}$  (CDPHE 2012). A meter reading 30 percent higher than the local background level could be considered significant and require investigation.

The proposed location of the P-32 produced water facility is an undrilled well pad on Old Mountain that is underlain by the Uinta Formation and the Parachute Creek member of the Green River Formation, and soils of the Parachute-Rhone loams, 5 to 30% slopes (Hail et al, 1989; NRCS 2012). The pad has been cleared and leveled but no facilities were constructed, wells drilled, or materials stored at the site.

#### **Survey Objectives and Design**

The objective of a gamma survey is to evaluate natural radiation levels, to determine if radioactive materials including uranium mill tailings are present on individual properties, to acquire sufficient data to evaluate the gamma levels and health risks, and to document the location and conditions of radioactive materials, if present. The gamma surveys may also locate natural soils, rocks, or ores that have elevated gamma radiation and have the potential to increase indoor radon levels.

The survey was conducted using a Ludlum Model 3 radiation meter. Transects were walked on the surface of the well pad, surrounding berms, access road, and soil stockpile on the south side of the well pad. The meter probe was kept about 4 inches above the ground while slowly walking along the transects to detect any large changes in radiation. At approximately 75-foot intervals, the meter probe was placed on the ground surface and the maximum meter reading recorded after about 10 seconds. A second reading was also recorded at one meter above the ground surface. Each location was recorded using a hand-held GPS receiver. Background readings collected from nearby locations on Old Mountain ranged from 15 to 19  $\mu\text{R/h}$ .

At three survey locations, a sample of soil and rock was collected from a depth of 0-4 inches and sent to Pace Analytical Services, Inc. of Greensburg, PA for analysis of gamma-emitting radionuclides, including forms of uranium, thorium, Ra228, Ra226, and Pb210. The soil sample



locations were chosen to be representative of a range of meter results at the site based on the ground level readings. The results of the soil analyses are pending and will be used to establish a relationship between the meter readings and the activities of the gamma-emitting radionuclides in the soil and rock of the area.

## **Results**

Figure 1 provides the meter readings at ground level across the site. The background radiation at ground level ranges from 14 to 19  $\mu\text{R/h}$ . Figure 2 provides the meter readings at one meter height. The readings taken at one meter height ranged from 13 to 17  $\mu\text{R/h}$ , but were not significantly different from those collected at ground level and showed no direct correlation to those readings. No readings were more than 30% of the maximum background radiation measured nearby.

## **Conclusions**

The survey shows that natural background radiation at the P-32 site is typical for Western Colorado. The radiation levels range from 13 to 19  $\mu\text{R/h}$ , with no areas of greater radiation detected. The readings taken at one meter height were not significantly different from those at ground level.

## REFERENCES

Hail, W.J., O'Sullivan, R.B., and Smith, M.C., 1989, Geologic map of the Roan Plateau area, northwestern Colorado: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1797-C, scale 1:50000.

U. S. Department of Agriculture, Natural Resources Conservation Service, 2012, Custom Soil Resource Report for Rifle Area, Colorado, Parts of Garfield and Mesa Counties, Web Soil Survey; generated on August 2, 2012.

Colorado Department of Health and Environment, Hazardous Materials and Waste Management Division' UMTRA (Uranium Mill Tailings Remedial Action) Program Issues Gamma Radiation Survey Procedures, accessed at <http://www.cdph.state.co.us/hm/umtra/gammaradiation>



**Nicholson  
GeoSolutions,  
LLC**



PROJECT NO.	119808
DRAWN:	8/14/12
DRAWN BY:	L.Hockert
CHECKED BY:	D.Nicholson
FILE NAME:	P-32.mxd

**Berry Petroleum Company**

Radiological Survey  
P-32 Well Pad  
Garfield Co., Colorado

FIGURE

**1**





**Nicholson  
GeoSolutions,  
LLC**



PROJECT NO. 119808  
 DRAWN: 8/14/12  
 DRAWN BY: L.Hockert  
 CHECKED BY: D.Nicholson  
 FILE NAME: P-32.mxd

**Berry Petroleum Company**

Radiological Survey  
 P-32 Well Pad  
 Garfield Co., Colorado

FIGURE

**2**

## **ATTACHMENT M**

## Operating Plan for Old Mountain P32 impoundment

The P32 impoundment on OM will serve as our primary produced water storage facility on OM.

- Gonzo will be pumping produced water from all locations on OM to the P32 impoundment 3 days/week.
- Water is pumped from each location via pipeline to the P32 impoundment.
- Operation time for Gonzo to complete pump operations on these days is typically 7am-2pm.
- Inflow volume to the P32 pit on these days will be on avg. 400bbls.
- When impoundment reaches a level of 25-30K water will be pumped via pipeline from P32 down to a central impoundment, that is easily accessible for transport to disposal.
- If completion needs arise, water will be stored and treated at P32 then sent to location via transport or pipeline for completion.
- Impoundment may also serve as a fresh water source to meet drilling needs if necessary. This would change the route of any produced water.
- Impoundment will be monitored with a sonar fluid level monitor, and/or leak detection device, tracking all fluctuation of the fluid level.
- On a daily basis impoundment will be visually inspected by Berry employee. Data gathered will be logged weekly.
- On an annual basis, or when deemed necessary by Berry P32 will be drained and given full inspection. All data will be logged.



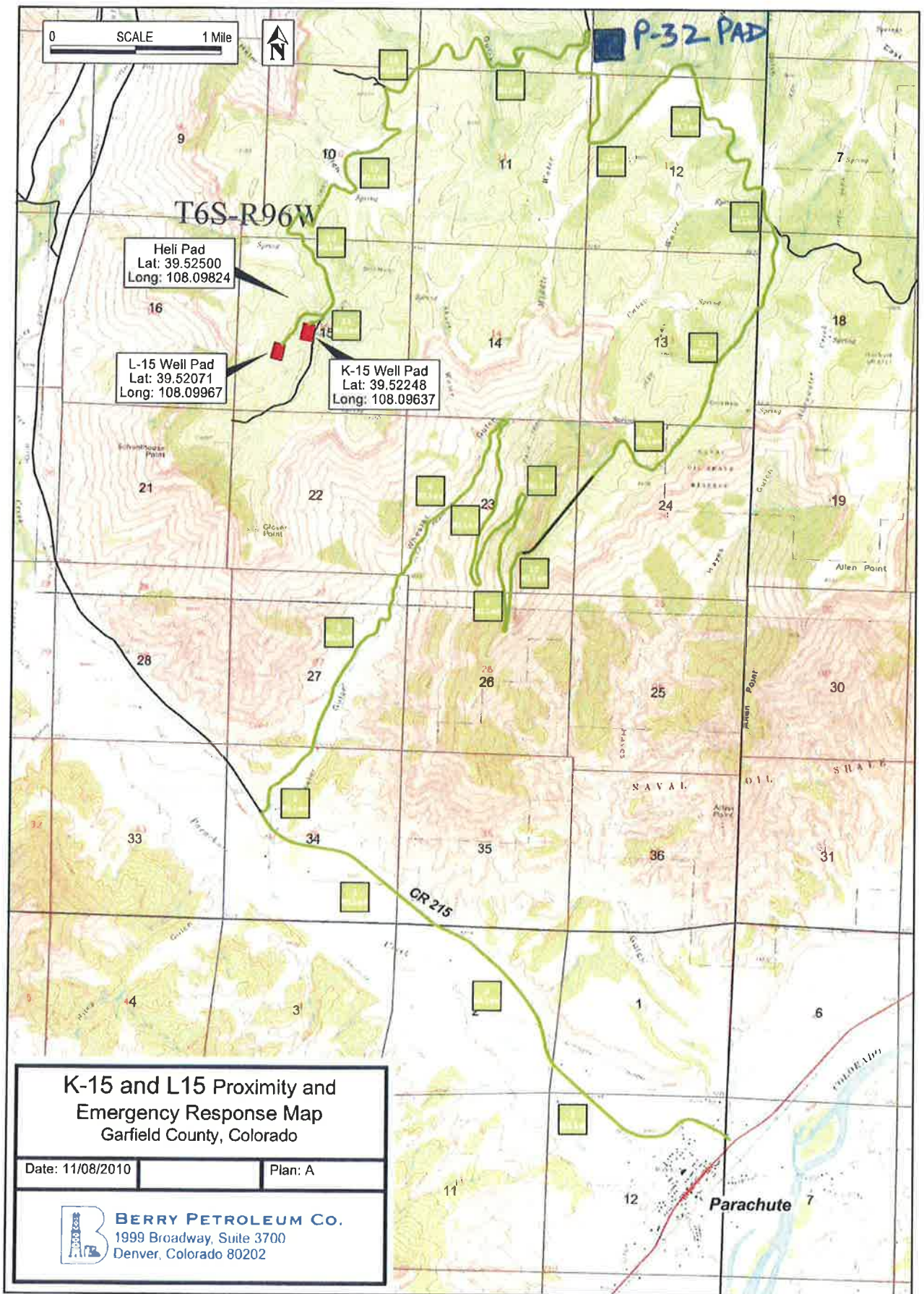
## **ATTACHMENT N**

## **Emergency Response Plan**

In order to ensure a safe and timely response to emergency situations, Berry will provide office personnel with contact information for the Garfield County Sheriff's Department, the local fire department, and emergency medical service providers with a detailed map showing the location of the proposed E&P Waste Management Impoundment, detailed directions to it, and GPS coordinates to facilitate timely response. Since the impoundment would be unmanned and located within an active field, roads will be well-maintained and snow plowed in the winter to facilitate vehicle access. Berry will also make best efforts to adequately sign the entrance to the location.

In the case of medical emergencies, the type of action taken will depend on the severity of the medical emergency. Should a life threatening medical emergency arise, Berry or its contractors would summon St. Mary's Care Flight for helicopter response. Helicopter landing sites have been established in close proximity to the P-32 proposed water impoundment, on the access road adjacent to the pad. The GPS locations of the landing sites will be provided to office personnel for communication to first responders in the event of an incident. Emergency contact numbers are located in the next tab of this document. In the case of injuries or medical problems that are not life threatening, the injured worker would either be transported down the mountain in a company/contractor vehicle to the nearest medical center for treatment or transported by ambulance summoned to the site, depending on the circumstances.

Since the proposed water impoundment would be placed on COGCC-permitted well pad that is clear of vegetation, the risk of wildfires would be minimal. Smoking on-site and open fires would not be permitted.



## **CONTACT INFORMATION**

### **BERRY PETROLEUM COMPANY**

Attn: Bryan Burns  
1999 Broadway, Ste. 3700  
Denver, CO 80202

#### Berry Petroleum Company 24-Hour Emergency Response Contacts:

### **DEREK JOHNSON**

Production Superintendent  
Office: (970) 285-5202  
Cell: (970) 274-3335

### **BERRY PETROLEUM FIELD OFFICE**

235 Callahan Ave  
Parachute, CO 81635  
(970) 285-2200

### **STANLEY BENCH**

Safety Specialist  
Office: (435) 722-1061  
Cell: (435) 823-1820

---

### **St. Mary's Hospital & Life/Care Flight**

2635 North 7th Street  
Grand Junction, Colorado 81502  
970-244-CARE (2273)  
1-800-458-3888

### **Battlement Mesa Medical Center**

P.O. Box 912  
Rifle, CO 81650  
970.285.7046

### **Grand Valley Fire Protection District**

1777 S. Battlement Pkwy  
Parachute, CO 81635  
(970) 285-9119

### **Grand River Medical Center**

P.O. Box 912  
Rifle, CO 81650  
970.625.1510

### **Garfield County Building and Planning Dept.**

108 8th St.  
Glenwood Springs, CO 81601  
(970) 945-0453

### **Garfield County Sheriff's Office**

107 8th St  
Glenwood Springs, CO 81601  
(970) 945-8212

# Oil & Produced Water Release Report

☐ Initial Report (Subject to change as information is gathered) ☐ Supplemental Report #  ☐ Final Report

Date of Spill	<input type="text"/>
Time of Spill	<input type="text"/>
Field	<input type="text"/>
Lease	<input type="text"/>
County	<input type="text"/>
State	<input type="text"/>

Reason for Supplement	<input type="text"/>				
Section	<input type="text"/>	Township	<input type="text"/>	Range	<input type="text"/>
Landowner	<input type="text"/>				
Landowner Notified	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required				

Spilled		Recovered	
Volume of Oil	<input type="text"/> Bbls.	<input type="text"/> Bbls.	
Volume of Water	<input type="text"/> Bbls.	<input type="text"/> Bbls.	
Size of Spill	Length (ft) <input type="text"/>	Width (ft) <input type="text"/>	Depth (ft) <input type="text"/>

## Type of Surface Affected

(Check all that apply)

- ☐ Land/ Habitat  
☐ Inside Dike/ Berm  
☐ Water  
☐ Dry Drainage

If Release is 1 bbl or more (regardless of containment), Notify:	Person Contacted	Time	Date
OGCC (888) 235-1101 or (303) 894-2100	<input type="text"/>	<input type="text"/>	<input type="text"/>
OGCC Tracking No.	<input type="text"/>		
CO Dept. of Public Health & Env. (877) 518-5608	<input type="text"/>	<input type="text"/>	<input type="text"/>
BLM if federal lease (970) 244-3000	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>If Oil Enters Any Surface Water, in addition to the above, Notify:</b> NRC w/in 2 hrs 1-800-424-8802	<input type="text"/>	<input type="text"/>	<input type="text"/>

## When reporting to agencies include:

- A. Date and time of spill  
 B. Identity of material spilled  
 C. Quantity spilled  
 D. Location/ source  
 E. Cause of spill  
 F. Hazards/ injuries  
 G. Correction action  
 H. Berry name and number

## Description of Spill

### General Spill Location

- ☐ Production Well #
- ☐ Injection Well #
- ☐ Tank Battery
- ☐ Treatment Facility
- ☐ Water Treatment Plant
- ☐ Drilling/Workover Rig
- ☐ Other

### Specific Spill Location

- ☐ Tubing/Casing
- ☐ Wellhead
- ☐ Stuffing Box
- ☐ Flowline
- ☐ Truck Line/ Gathering Line
- ☐ Facility Piping/ Connections
- ☐ Facility Valve/ Meter
- ☐ Vessel #
- ☐ Tank #
- ☐ Pump
- ☐ Injection/ Disposal Line
- ☐ Other

### Root Cause of Spill

(Check all that apply)

- ☐ Freezing
- ☐ Lightning
- ☐ Earthquake
- ☐ Fire
- ☐ Other Natural Forces
- ☐ Power Failure
- ☐ External Damage
- ☐ Livestock
- ☐ Vandalism
- ☐ Contractor Error
- ☐ Worn Equipment
- ☐ Internal Corrosion
- ☐ External Corrosion
- ☐ Plugging
- ☐ Malfunction
- ☐ Defective Material
- ☐ Alarm Failure
- ☐ Procedure-Related
- ☐ Operations-Related
- ☐ Design
- ☐ Training

### Type of Material

(Check all that apply)

- ☐ Aluminum, Bronze/Brass
- ☐ Fiberglass
- ☐ Steel
- ☐ Plastic/PVC
- ☐ Stainless Steel
- ☐ Other
- ☐ Internally Coated
- ☐ Externally Coated

Estimated Age

Size

### Weather Conditions

- ☐ Dry ☐ Windy
- ☐ Rain ☐ Snow

Has it rained in the last 48 hours?

☐ Yes ☐ No

Is precipitation Expected before clean up can occur?

☐ Yes ☐ No

**Write in costs if know, otherwise check best estimate**

### Repairs

\$

- ☐ \$0-\$99
- ☐ \$100-\$499
- ☐ \$500-\$999
- ☐ \$1000-2999
- ☐ \$3000-\$4999
- ☐ \$5000-\$9999
- ☐ more than \$10,000

### Clean Up

\$

- ☐ \$0-\$99
- ☐ \$100-\$499
- ☐ \$500-\$999
- ☐ \$1000-2999
- ☐ \$3000-\$4999
- ☐ \$5000-\$9999
- ☐ more than \$10,000

### Oil Loss

\$

- ☐ \$0-\$99
- ☐ \$100-\$499
- ☐ \$500-\$999
- ☐ \$1000-2999
- ☐ \$3000-\$4999
- ☐ \$5000-\$9999
- ☐ more than \$10,000

General Comments



What was the cause of the spill?	
What corrective measures have been taken to prevent future spills?	
What has been done, or will be done to remediate the spill area	
Where is recovered material being stored?	
How and where is recovered material being disposed?	
Estimated size and depth of spill area.	
Other Comments	

Reported By		Title		Date	
Supervisor		Title		Phone	

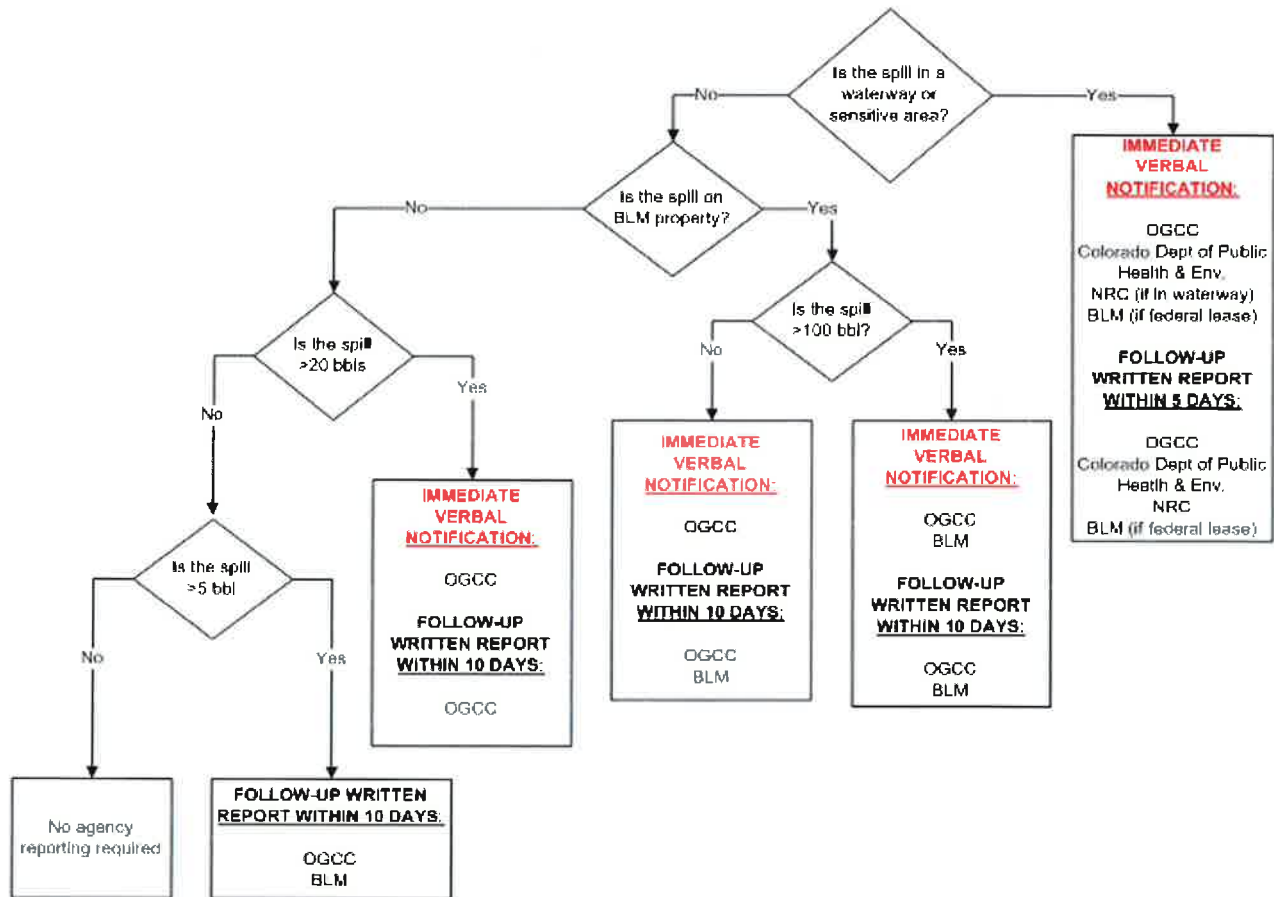
Call EHS Manager as soon as practicable after discovery of spill at (661)-616-3808  
 Complete form and Fax or Email completed spill report to EHS Manager within 24 hours  
 of the incident (661) 616-3886 or at reb@bry.com

Print Form

Submit by Email

# Berry Petroleum Company

## Oil and Produced Water Release Reporting Flowchart Parachute and Wray, Colorado



### Reporting Requirements:

Spills greater than 20 bbl, any spill to a sensitive area or waterway must be reported immediately, but no later than 24 hours after discovery.

Follow-up reports must be filed with OGCC, Colorado Dept. of Public Health and Environment and NRC (if spill was to a waterway) and BLM (if federal lease). Follow-up reports to OGCC must be filed on OGCC Form 19.

### Agency Contact Phone Numbers:

Oil and Gas Conservation Commission (OGCC)  
Colorado Dept. of Public Health and Environment  
National Response Center (NRC)  
Bureau of Land Management (BLM)

(303) 894-2100 or (888) 235-1101  
(877) 518-5608  
(800) 424-8802  
(970) 244-3000



## CONTRACTOR GENERAL LIABILITY INCIDENT REPORT

### Berry Petroleum Company

Use this form to report all Contractor incidents. Non-injury motor vehicle incidents should be reported on Motor Vehicle Report Form.

Reporting Person	<input type="text"/>	Phone	<input type="text"/>
Employer	<input type="text"/>	Asset/Field	<input type="text"/>
Nearest Town/City	<input type="text"/>	Lease/Facility	<input type="text"/>
State	<input type="text"/>	Zip Code	<input type="text"/>

#### Injured Person's Employer Information

Employer	<input type="text"/>	Phone	<input type="text"/>
Address	<input type="text"/>	City	<input type="text"/>
State	<input type="text"/>	Zip	<input type="text"/>

#### Incident Information

Injured Person	<input type="text"/>	Date of Incident	<input type="text"/>
Address	<input type="text"/>	Time of Incident	<input type="text"/>
City/State	<input type="text"/>	Location of Incident	<input type="text"/>
Zip Code	<input type="text"/>	Work Activity	<input type="text"/>
Phone	661-623-6829	Berry Supervisor	<input type="text"/>

Incident Type (Check all that apply)	Contractor Type
<input type="checkbox"/> Property Damage	<input type="checkbox"/> Drilling/Well Servicing
<input type="checkbox"/> First Aid	<input type="checkbox"/> Transportation
<input type="checkbox"/> Medical Treatment	<input type="checkbox"/> Construction/Maint.
<input type="checkbox"/> Lost Time	<input type="checkbox"/> Electrical
<input type="checkbox"/> Fire	<input type="checkbox"/> Other
<input type="checkbox"/> Motor Vehicle	
<input type="checkbox"/> Serious Potential (Near Miss)	
<input type="checkbox"/> Earthquake/Landslide	
<input type="checkbox"/> Occupational Illness	

#### Medical Information

Seen by Physician?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Ambulance/EMT?	<input checked="" type="radio"/> Yes	<input checked="" type="radio"/> No
Physician/Hospital	<input type="text"/>				
Physician Phone No.	<input type="text"/>				
Comments	<input type="text"/>				



## CONTRACTOR GENERAL LIABILITY INCIDENT REPORT

Berry Petroleum Company

Page 2

Witnesses			
	Witness	Address	Phone #
1			
2			
3			

Responding Agencies			
	Agency	Name of Agency Official	Phone #
1			
2			
3			

### Injury Description

Describe in detail the incident.  
Attach additional pages and/or  
documentation as necessary.

Basic cause of the incident.  
Attach additional information if  
necessary

Describe corrective action(s) taken  
to prevent recurrence. Attach  
additional information if necessary.

Form Prepared by		Supervisor	
Title			
Signature		Date	

Within 24 hours, submit completed form to the EHS Manager. "Submit by Email" button or fax written report to the EHS Manager at (661) 616-3891.

## **ATTACHMENT O**

# **SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN**

**January 2009**

**Prepared for:**



**Berry Petroleum Company**  
Piceance Basin Field, Colorado

**Prepared by:**

**Buys & Associates, Inc.**  
300 E. Mineral Ave., Suite 10  
Littleton, Colorado 80122  
(303) 781-8211  
[www.Buysandassociates.com](http://www.Buysandassociates.com)





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## **LIST OF APPENDICES**

---

- Appendix A Contact Lists and Phone Numbers, Release Notification Form, and Qualified Discharge Report Form
- Appendix B Central Facility Examination Form and Inspection Forms
- Appendix C Stormwater Inspection Procedure and Drainage Record
- Appendix D Training Record Form
- Appendix E Certification of Substantial Harm Determination
- Appendix F Facility List and Site Specific Information

## REGULATORY CROSS-REFERENCE

Regulatory Citation	Description of Regulatory Requirement	Section Number
§112.3 (d)(3)	Professional Engineer Certification	1.5
§112.3	Applicable Industry Standards	2.4
§112.5 (a),(c)	Plan Amendments and Certification	1.7, 1.7.2, 1.7.3
§112.5(b)	Plan Review	1.7, 1.7.1
§112.7	General Requirements - Management Approval	1.3
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§112.7(a)(3)	Physical Layout and Facility Diagram	2.2, Appendix F
§112.7(a)(3)(i)	Container Capacity and Type of Oil	Appendix F
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## 1.0 GENERAL INFORMATION

---

### 1.1 Facility and Operator General Information

1. Name of Facility: Piceance Basin Field
2. Type of Facility: **Onshore Production Facility**
3. Facility Location: **A list of the individual facilities subject to this plan is located in Appendix F.**
4. Name and Address of Owner or Operator

Name: **Berry Petroleum Company**

Address: **950 17<sup>th</sup> Street, Suite 2400  
Denver, CO 80202**

### 1.2 Designated Person Accountable for Oil Spill Prevention (40 CFR 112.7 (f) (2))

The following person reports to management and is accountable for discharge prevention at the subject facilities.

Name: Kenneth Kuhn  
Title: Production Superintendent

### 1.3 Management Approval (40 CFR 112.7)

Berry Petroleum Company is committed to the prevention of discharges of oil to the environment, including navigable waters, and maintains the highest standards for spill prevention control through regular review, updating and implementation of this SPCC plan. With the signature below, I certify that this Spill Prevention, Control and Countermeasures plan will be implemented as herein described.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Name: James T. Albi

Title: Asset Manager, Piceance Basin



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#### 1.4 Plan Implementation (40 CFR 112.7)

Any additional facilities, procedures, methods, or equipment not yet fully operational are discussed below with the details of installation and start-up.

Inspection and testing procedures specified in Section 3.0 are to be implemented as soon as practical, but no later than six months following the date of this plan.

Secondary containment structures for containers and process equipment are to be constructed and maintained as indicated on the facility diagram in accordance with API Standard 2610 - *Design, Construction, Operation, Maintenance, and Inspection of Terminal and Tank Facilities*. The containment structures are to be constructed or improved as soon as practical, but no later than six months following the date of this plan.

#### 1.5 Professional Engineer Certification (40 CFR 112.3 (d))

By means of this Professional Engineer Certification, I hereby attest that:

- 1) I am familiar with the provisions of 40 CFR Part 112;
- 2) I, or my agent, have visited and examined the facilities;
- 3) This SPCC Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of 40 CFR 112;
- 4) Procedures for required inspections and testing have been established, and
- 5) This plan is adequate for the subject facilities.

**Douglas N. Henderer**

Printed Name of Registered Professional Engineer

Date: 4/30/07

  
Signature of Registered Professional Engineer  
Registration No.: 35230 State: Colorado

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1.7.3 Amendment Certification (40 CFR 112.5 (c))

**First Technical Amendment**

I hereby attest that:

- 6) I am familiar with the provisions of 40 CFR Part 112;
- 7) I, or my agent, have visited and examined the facilities;
- 8) This SPCC Plan has been amended in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of 40 CFR 112;
- 9) Procedures for required inspections and testing have been established, and
- 10) This plan is adequate for the subject facilities.

Date: March 10, 2008

Douglas A. Henderson  
Printed Name of Registered Professional Engineer  
[Signature] 03/10/08  
Signature of Registered Professional Engineer  
Registration No. 35230 State: CO

**Second Technical Amendment**

I hereby attest that:

- 1) I am familiar with the provisions of 40 CFR Part 112;
- 2) I, or my agent, have visited and examined the facilities;
- 3) This SPCC Plan has been amended in accordance with good engineering practice, including consideration of applicable industry standards, and with the requirements of 40 CFR 112;
- 4) Procedures for required inspections and testing have been established, and
- 5) This plan is adequate for the subject facilities.

Date: JAN. 15, 2009

Douglas A. Henderson  
Printed Name of Registered Professional Engineer  
[Signature]  
Signature of Registered Professional Engineer  
Registration No. 35230 State: CO

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## 1.6 Plan History

This plan supersedes all plans listed in the following table:

Plan Name	Date Created
1. None	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

## 1.7 Plan Review and Amendments (40 CFR 112.5)

In accordance with 40 CFR 112.5(b), a review and evaluation of this SPCC plan is conducted at least once every five years. As a result of this review and evaluation, Berry Petroleum Company will amend the plan to include more effective spill prevention and control technology if:

- 1) Such technology will significantly reduce the likelihood of a spill event from the facilities, and
- 2) If such technology has been field-proven at the time of the review.

Technical amendments to this SPCC plan shall be certified by a Registered Professional Engineer within six months if modifications to the facility materially affect the potential for discharges of oil into or upon navigable waters. Modifications which may require plan amendments and certification include:

- 1) Commissioning or decommissioning of containers;
- 2) Replacement, reconstruction, or movement of containers;
- 3) Reconstruction, replacement or installation of piping systems;
- 4) Construction or demolition actions that may alter secondary containment structures;
- 5) Changes in products or type of equipment service; or
- 6) Changes in operating and maintenance procedures.

Administrative or non-technical amendments do not require the certification of a Registered Professional Engineer. Examples of administrative changes include, but are not limited to, phone numbers, name changes, or any non-technical text revisions.



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### 1.7.1 Review Summary

Original Date of Plan: April 23, 2007

By my signature below, I attest that I have completed a review and evaluation of this SPCC plan for the Piceance Basin Field.

Review Date	Signature	Printed Name	Title	Plan Amended (Yes/No)
1.				
2.				
3.				
4.				
5.				

### 1.7.2 Amendment Summary

Amendments to this plan are required whenever there is a change in facility design, construction, operation or maintenance which materially affects the facility's potential for the discharge of oil into or upon navigable waters of the United States. Such amendments shall be implemented as soon as possible, but no later than six months after such changes occur.

This SPCC plan for the Piceance Basin Field has been amended as follows.

Amendment Date	Purpose and Description of Amendment	Amendment Type (Administrative or Technical)	Amendment Certified by P.E. (Yes/No)
1. 3/10/2008	Inclusion of new facilities and contact list update	Technical and Administrative	Yes
2. 1/9/09	Inclusion of new facilities and contact list update	Technical and Administrative	Yes
3.			
4.			

**Note: P. E. certification is not required for administrative amendments.**

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## 2.0 SPILL PREVENTION AND CONTROL

### 2.1 Facility Conformance (40 CFR 112.7(a)(1) and (2))

The subject facilities are in conformance with 40 CFR 112 as amended on July 17, 2002 with the following exceptions noted below. The reason for any nonconformance and the provided equivalent environmental protection measures are also noted.

Conformance Deviation	Reason for Nonconformance	Equivalent Environmental Protection Measures
Piping is not provided with a means of secondary containment as specified by 112.9	Construction techniques utilized for these facilities make secondary containment for piping impracticable.	The operator has implemented an oil spill contingency plan and a written commitment of manpower. The facility is visited on a frequent basis and any spills or accidental releases of oil are promptly cleaned up by the operator.
Separation equipment are not provided with a means of secondary containment as specified by 112.9.	Secondary containment for separation equipment is not practicable as dikes or trenches can trap explosive and toxic gases creating a safety hazard and would also interfere with access required for normal operations.	The operator has implemented an oil spill contingency plan and a written commitment of manpower. The facility is visited on a frequent basis and any spills or accidental releases of oil are promptly cleaned up by the operator.
Drainage from undiked areas is not confined in a catchment basin or holding pond as specified by 112.9.	Secondary containment for undiked areas is not practicable. The collection of stormwater would create unsafe conditions.	The operator has implemented an oil spill contingency plan and a written commitment of manpower. The facility is visited on a frequent basis and any spills or accidental releases of oil are promptly cleaned up by the operator.
Truck loading and unloading areas are not provided with a catchment basin or other means of secondary containment as specified by 112.7(h)	Secondary containment for loading and unloading areas is not practicable. Containment structures would interfere with normal operations and the collection of stormwater would create unsafe conditions	All loading and unloading operations are attended by the driver and conducted in accordance with DOT regulations. In addition, the operator has implemented an oil spill contingency plan and a written commitment of manpower. In addition, for truck loading where the loading occurs outside of containment, absorbents are readily available for use in the case of a release.

## **2.2 Facility Physical Layout (40 CFR 112.7 (a)(3))**

The subject properties are typical onshore crude oil and/or natural gas production facilities consisting of wellheads, separation equipment and bulk storage containers.

A diagram of each subject facility is located in Appendix F. The following details and location information, as applicable, is included on the diagram:

- 1) Containers and their contents;
- 2) Completely buried and/or bunkered tanks including underground storage tanks subject to 40 CFR Part 280 or 281; and
- 3) Drum and portable container storage areas.

## **2.3 Drainage Pathways and Distances to Navigable Waters**

Drainage pathways proximate to the subject facilities and USGS topographic maps for the area are contained in Appendix F.

Facility Component	Applicable Industry Standards
Inspection and Testing of Piping and Valves	<b>API Standard 570</b> - Piping Inspection Code. <b>API Recommended Practice 574</b> - Inspection Practices for Piping System Components. <b>ASME B31.3</b> - Process Piping <b>ASME 31.4</b> - Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols.
Secondary Containment for Drilling and Workover Operations	<b>API Recommended Practice 52</b> - Land Drilling Practices for Protection of the Environment. <b>NFPA 30</b> - Flammable and Combustible Liquids Code <b>BOCA</b> - National Fire Prevention Code
Integrity Testing	<b>API Standard 653</b> - Tank Inspection, Repair, Alteration, and Reconstruction. <b>API Recommended Practice 575</b> - Inspection of Atmospheric and Low-Pressure Tanks. <b>API Standard 570</b> - Piping Inspection Code <b>ASME B31.3</b> - Process Piping <b>ASME 31.4</b> - Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols. <b>STI Standard SP001-00</b> - Standard for Inspection of In-Service Shop Fabricated Aboveground Tanks for Storage of Combustible and Flammable Liquids <b>UL Standard 142</b> - Steel Aboveground Tanks for Flammable and Combustible Liquids.
Brittle Fracture Evaluation	<b>API Standard 653</b> - Tank Inspection, Repair , Alteration, and Reconstruction. <b>API Recommended Practice 920</b> - Prevention of Brittle Fracture of Pressure Vessels.

Note:

- API - American Petroleum Institute
- ASME - American Society of Mechanical Engineers
- BOCA - Building Officials and Code Administrators International
- NACE - National Association of Corrosion Engineers
- NFPA - National Fire Protection Association
- PEI - Petroleum Equipment Institute
- STI - Steel Tank Institute
- UL - Underwriters Laboratories



## **2.5 Contact List and Phone Numbers (112.7 (a)(3-5))**

Lists of contact names and phone numbers for Berry Petroleum Company personnel, company approved cleanup contractors, and federal and state agencies are contained in Appendix A. Also included in Appendix A are forms to be used for organizing release notification information and the submission of required information to the EPA Regional Administrator for qualified discharges.

A qualified discharge is any oil spill that contacts surface water, whether flowing or not, or an intermittent drainage and results in a “visible sheen” on the water.

## **2.6 Spill Prediction and Control (40 CFR 112.7 (a) and (b))**

Equipment located at the subject facilities with the potential to accidentally release oil are specifically addressed by location in Appendix F.

The reasonably expected modes of major failure or accident for which oil could be released from the facilities are as follows:

### **A. Bulk Storage Tank Leak or Failure**

- I. Failure Modes: Corrosion, vandalism, lightening strikes, valve or piping failure, overfilling.
- II. Rate of Flow: Variable, depending upon the type, size and location of the tank failure. The ambient temperature at the time of the release may affect the viscosity of the oil and thereby impact the rate of flow. Flow rates for corrosion failure are typically low, ranging from less than a gallon per day to a gallon per hour. Flows resulting from valve and piping failures or vandalism typically range from a gallon per hour to 400 bbls per hour. Lightning strikes may result in a release that is essentially instantaneous.
- III. Discharge Quantity: Variable depending upon the type and location of the failure. The total quantity discharged would not exceed the working capacity of the largest tank.
- IV. Preventative Measures: Personnel routinely perform visual inspections of storage tanks. Storage tanks are constructed in accordance with API industry standards. Materials used in constructing the tanks are compatible with the substances stored. Where practicable, earthen berms or other diversionary structures are utilized to control any released fluids. Tanks are appropriately sized to minimize the risk of overfilling.

### **B. Tanker Truck Loading and Unloading Operations**

- I. Failure Modes: Piping or valve failure, tank failure, overflow, and human error.
- II. Rate of Flow: Variable depending upon the type, size and exact location of the failure, and the amount of oil in the tanker truck and storage tank. The ambient temperature at the time of the release may affect the viscosity of the oil and thereby impact the rate of flow. Flow rates resulting from piping and valve failures can range from 1 gallon per hour up to 400 bbls per hour. The flow rate for tank truck overflows typically will not exceed 5 to 10 bbls per minute. Tank failures may result in releases that are essentially instantaneous.

- III. Discharge Quantity: Variable depending upon the type and location of the failure. The total quantity discharged would not exceed the working capacity of the largest tank.
- IV. Preventative Measures: Tanker truck loading and unloading operations are conducted in accordance with United States Department of Transportation regulations (49 CFR 177). All loading operations are attended by the truck driver. No smoking or open flames are allowed in the vicinity of the storage tanks and loading area. Wheel chocks are placed at the wheel nearest the truck loading connection to reduce the risk of the truck movement during loading operations. Following the completion of loading operations, the transfer line is disconnected and all valves and outlets on the tanker truck and the storage tank are visually inspected for leakage prior to vehicle departure.

C. Process Unit Failure (Separator/Heater Treater/Gun Barrel)

- I. Failure Modes: Process vessels may potentially rupture, or associated lines, valves and gauges may fail or leak.
- II. Rate of Flow: Variable, depending upon the mode and extent of the failure. The maximum expected rate of flow from a process unit failure is the oil process rate of the equipment plus any additional fluid volume contained in the vessel above the elevation of the rupture. The oil process rates for the subject equipment are contained in Appendix F.
- III. Discharge Quantity: Variable, depending on the type of failure and the length of time that the failure went undetected.
- VI. Preventative Measures: Personnel routinely perform visual inspections of process units. Process units are constructed in accordance with API and ASME industry standards. Where practicable, earthen berms or other diversionary structures are utilized to control any released fluids.

D. Piping Failure

- I. Failure Modes: Both aboveground and buried pipelines may rupture or corrode and leak. Associated flanges, screwed connections, valves and gauges are also subject to corrosion and may fail or leak.
- II. Rate of Flow: Variable, depending on the size and location of the piping related failure. The maximum potential rate of flow is not expected to exceed the oil process rates as listed in Appendix F.
- III. Discharge Quantity: Variable depending upon the type and extent of the failure and the length of time that the failure went undetected.

- IV. Prevention Measures: Personnel routinely perform visual inspections of aboveground piping and buried flowline right-of-ways to detect failures. As warranted by soil conditions, corrosion protection is provided for buried pipelines.

## **2.7 Impracticable Containment or Diversion Measures (40 CFR 112.7 (d))**

In some instances, containment, diversionary structures, or equipment to prevent oil from reaching navigable waters may not be practicable. Secondary containment is provided for equipment located at the subject facilities as indicated in Appendix F.

Secondary containment or diversionary structures may be impracticable for some equipment at these facilities for the following reasons:

Extensive diking and/or drainage trenches would interfere with site access for normal operations and also with current surface land use.

An effective dike system would be difficult to design and to construct. Damage to vegetation and potential erosion due to construction of dikes would probably be worse than the risk adjusted environmental impact of a spill. It would also be difficult to maintain dike integrity and to drain off rain water.

Flowlines operate at pressures far below the rated working pressure and therefore have a minimal risk of rupture.

Berms, trenches and other means of containment can trap explosive gases such as methane and hazardous vapors such as hydrogen sulfide leading to potential safety and exposure problems.

The berms or diversions would trap stormwater and cause muddy conditions which in turn can create slippery unsafe working conditions. Trapped water may also increase the rate of corrosion.

Other: \_\_\_\_\_  
\_\_\_\_\_

## **2.8 Oil Spill Contingency Plan and Commitment of Manpower (40CFR112.7 (d)(1) & (2))**

Berry Petroleum Company maintains a strong contingency plan for oil spills and a written commitment of manpower follows.

Berry Petroleum Company is committed to a strong antipollution and spill prevention program. We are committed to designing and operating our facilities in a manner that will minimize the size and occurrence of spills. We are committed to a strong, pro-active training and inspection program that will insure that our facilities are operated and maintained in a manner that will prevent or minimize the occurrence of spills.

In the event of a spill, Berry Petroleum Company will commit the manpower, equipment and materials necessary to ensure that the clean up occurs in the shortest practical time while minimizing environmental damage and maximizing product recovery.

## **2.9 Discharge Countermeasures and Methods of Disposal (40 CFR 112.7 (a)(3)(iv)&(v))**

In the event of an accidental release, Berry Petroleum Company personnel will promptly initiate recovery actions as appropriate.

### **Levels of Response**

Major Releases: Major releases are defined as:

1) Spills of crude oil, condensate, or saltwater greater than 10 bbls, or 2) Spills of refined crude oil products, including but not limited to, gasoline, diesel fuel, aviation fuel, asphalt, road oil, kerosene, fuel oil, and derivative of mineral, animal or vegetable oils, or 3) Any volume of oil which results in a fire, will reach a water course, or may with reasonable probability endanger public health or result in substantial damage to property or the environment.

Major releases will be handled under the direction of Berry Petroleum Company personnel. Response contractors listed in Appendix A will be utilized as necessary to complete the clean up. If oil should threaten surface waters, the company contingency plan will be implemented. Containment structures would be constructed and booms would be deployed as needed to protect waterways.

Minor Releases: Releases not classified as major shall be reported internally to the appropriate supervisor on an incident report.

## **Product Recovery and Handling**

### **Spills onto Soil**

Mobile oil spills should be contained as soon as possible by the construction of earthen dams or by the placement of mechanical barriers. Free oil may be removed from the ground by the use of a vacuum truck. Sumps or trenches may be dug to intercept or drain free oil. Remaining free oil may be removed from the ground by the use of oil-absorbent materials.

When all free oil has been removed, the affected soil containing over 1.0% total petroleum hydrocarbon (TPH) by weight should be delineated, both vertically and horizontally. All soil containing over 1.0% TPH should then be excavated by backhoe or similar appropriate equipment for remediation or disposal.

To prevent stormwater contamination, all impacted soils containing in excess of 1.0% TPH should be placed in an approved disposal site or in a secure interim storage location for future remediation or disposal, unless more immediate on-site techniques can be implemented. Placing the impacted soil on a sheet of visquene and providing appropriate cover, diking, or stormwater diversions, is acceptable.

A final cleanup level of 1.0% TPH should be achieved as soon as practicable. Several methods are acceptable for the cleanup of oil contaminated soil; regulatory agencies may specify which methods are appropriate.

### **Spills onto Water**

Oil spills onto surface waters must be cleaned up to the satisfaction of the landowners and regulatory agencies. The spill should be contained as soon as possible by the use of floating booms or other mechanical barriers. Free oil may be removed from the water by the use of a vacuum truck or by oil-skimming equipment. Remaining free oil may be removed from the water by the use of oil-absorbent materials such as spray-sorb. Oil-absorbent materials may also be used to remove oil that has accumulated on shoreline soils, rocks and vegetation. Oil contaminated shoreline materials may require removal to a suitable treatment site for cleanup as described above.



## **2.10 Regulatory Conformance**

The subject properties are not subject to any state regulated discharge prevention and containment requirements beyond those specified by federal regulation.

## **2.11 Regulatory Exclusions**

The subject properties are classified as onshore non-production facilities which store only petroleum based oils. Furthermore, the properties are not expected to cause substantial harm to the environment as demonstrated by the completed Certification of Substantial Harm Determination form contained in Appendix E. As such, the subject properties are excluded from the following regulations:

### **Subpart A – General Requirements**

40 CFR 112.7(g) Security

### **Subpart B - Requirements for Petroleum Oils and Non-Petroleum Oils except Animal Fats**

40 CFR 112.8 SPCC plan requirements for onshore facilities (excluding production)

40 CFR 112.11 SPCC plan requirements for offshore oil facilities

### **Subpart C - Requirements for Animal Fats and Oils, Greases, Fish and Marine Oils**

40 CFR 112.12 SPCC plan requirements for onshore facilities (excluding production)

40 CFR 112.13 SPCC plan requirements for onshore oil production facilities

40 CFR 112.14 SPCC plan requirements for onshore oil drilling facilities

40 CFR 112.15 SPCC plan requirements for offshore oil drilling facilities

### **Subpart D - Response Requirements**

40 CFR 112.20 Facility response plans

40 CFR 112.21 Facility response training and drills/exercises

### **3.0 INSPECTIONS, TESTING AND TRAINING**

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#### **3.1 Inspections and Testing (40 CFR 112.7 (e))**

Written procedures are outlined in Section 3.1.1 and utilized when performing prescribed inspection and testing of equipment. Records of inspections and tests are to be signed by the appropriate supervisor/inspector and maintained at the local office.

The following items are inspected to minimize oil discharges from occurring; tanks for leaks and corrosion, process units for leaks and corrosion, sight glasses for leaks, pumps for leakage around packing glands, lines for leaks around fittings, flowlines for leaks, wellheads and metering stations for leakage. If problems are identified, prompt action is taken for repairs. A record of inspection is to be kept with the SPCC Plan for at least 3 years. A copy of the inspection form is included in Appendix B.

##### **3.1.1 Scheduled Examinations**

The lease operator, in the course of their normal routine, is responsible for examining the facilities covered by this SPCC Plan. This periodical review is to insure that the facilities are operating properly and that no problems exist. In addition to periodical observations made by lease personnel in their routine activities, a formal documented inspection of the facilities will be conducted on an annual basis to insure that the facilities are in compliance with the SPCC Plan. Following are general procedures for conducting the formal examinations. There may be specific items covered in the SPCC Plan that are specific to a facility and may not be covered by these general guidelines. Conversely, certain items covered by these procedures may not apply to every facility.

The Facility Examination Form contained in Appendix B is to be used to document the periodic examinations. The examinations are to be conducted and documented on an annual basis at a minimum.

THE FOLLOWING ITEMS (if present) MUST BE INSPECTED:

##### **Ditches and Waterways**

Drainage ditches in and around the facility and within the field, roadside ditches, water courses, ponds, etc. will be inspected for oil accumulations and/or evidence of saltwater spills.

##### **Above Ground Piping**

Flowlines, injection lines, gathering lines, gas lift lines, and other piping in and around batteries, separation facilities, saltwater handling facilities, etc. will be inspected for leaks, evidence of leaks, and evidence of potential leaks. Lines along roads will be inspected while driving through the field. Other above ground lines will be walked periodically.

**Tanks**

All liquid storage tanks, except fresh water tanks, (including crude oil, saltwater, fuel, treatment chemicals containing oils, lube oil, etc.) and associated piping will be visually inspected for leaks, overflows, and signs of potential problems. Special emphasis will be placed on the inspection of foundations, bottom seams, patches, flanges, piping connections, sight-glasses, and other openings. Valves should be in their proper position and locked or sealed, if required.

**Berms**

Earthen berms will be inspected for adequate capacity, erosion and leaks. Cement firewalls will be inspected for leaks, cracks, or other signs of failure. Accumulations of liquid will be removed from the firewall. If the liquid is from one of the tanks, the source will be found and repaired. Rainwater will be removed as soon as feasible after rain.

If a firewall is equipped with a drain, the drain **MUST** be closed, sealed and locked when not in use. The drain must be manned whenever it is in use. Each drainage event must be recorded. The Drainage Log contained in Appendix C will be used for this record.

**Line Heaters, Separators, Heater Treaters and Glycol Units**

These pieces of equipment should be visually inspected for leaks, especially around valves, fittings, inspection plates and sight glasses. Vents on glycol units should be inspected for excessive liquid carryover. Glycol still vents must discharge into an appropriate container if liquids are generated.

**Chemical Storage Tanks, Pumps and Piping**

Chemical injection systems should be inspected for leaks, especially around storage tanks, pumps and fittings on tubing or piping.

**Lube Oil Systems**

Lube oil storage tanks and the piping systems should be inspected, especially around tanks, pumps and fittings on the piping or tubing.

**Flare System**

Any liquid handling system associated with a flare system, liquid knock-outs, etc., should be inspected.

The flare ignition system should be checked periodically. Any evidence of liquid carryover should be reported and corrective action to prevent reoccurrence implemented. If liquid carryovers are frequent, containment should be constructed to contain the carryover.

**Drain Pans or Drip Pans**

The liquid level in drip or drain pans should be checked and emptied as necessary.

**Pressure Relief Valves**

Pressure relief valves should be checked for leaks, evidence of leaks and signs of failure.

**Plant Process Heaters**

Plant process heaters should be checked for leaks, evidence of leaks and signs of failure. The stack should be checked for visible smoke emissions.

**Alarm Systems**

All alarm and shut down systems should be tested periodically for proper function.

**Rainwater Removed from Berms**

All discharges of rainwater from berms to drainage **MUST BE RECORDED**. The date of discharge must be noted on the Drainage Log contained in Appendix C.

Prior to discharge, the water must be visually inspected for the presence of oil and tested for the presence of saltwater. If either is present, the water cannot be discharged and must be disposed of in a permitted disposal system or other acceptable manner.

### 3.1.2 Inspections

Comprehensive inspections of oil containing equipment may be performed as opportunities allow or when indicated during the completion of a scheduled examination. These inspections should be conducted by a competent person or a qualified inspector in accordance with the standards listed below. The inspections are to be documented using the checklists contained in Appendix B and the records maintained at the appropriate field office. If problems are identified, appropriate corrective actions are to be implemented and noted on the inspection form.

Equipment	Inspection Standard
Bulk Storage Tanks	API RP 12R1 - Recommended Practice for Setting, Maintenance, Inspection, Operation, and Repair of Tanks In Production Service
Pressure/Process Vessels	API RP 510 - Alternative Rules for Exploration and Production Pressure Vessels
Piping	API 574 - Inspection Practices for Piping System Components

### 3.1.3 Integrity Testing Procedures (40 CFR 112.7 (d))

When conditions make it impracticable to provide secondary containment, periodic integrity testing will be conducted for affected storage containers and separation equipment. The following industrial standards for conducting integrity tests will be utilized as appropriate.

Industrial Testing Standard	Title
API Standard 653	Tank Inspection, Repair, Alteration, and Reconstruction
API Recommended Practice 575	Inspection of Atmospheric and Low-Pressure Tanks
API RP 510	Production Pressure Vessels
ASME 31.4	Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols
Steel Tank Institute Standard SP001-00	Standard for Inspection of In-Service Shop Fabricated Aboveground Tanks for Storage of Combustible and Flammable Liquids
UL Standard 142	Steel Aboveground Tanks for Flammable and Combustible Liquids

### **3.1.4 Brittle Fracture Evaluation (40 CFR 112.7(i))**

All field constructed aboveground tanks and process equipment are to be evaluated for the risk of failure due to brittle fracture whenever:

- 1) The equipment undergoes repair, alteration, reconstruction, or a change in service that may affect the risk of a discharge or failure due to brittle fracture, or
- 2) The equipment has discharged oil or failed due to brittle fracture failure or other catastrophe.

The brittle fracture risk evaluation is to be conducted in accordance with the following industrial standards as appropriate.

- 1) **API Standard 653** - Tank Inspection, Repair, Alteration, and Reconstruction.
- 2) **API Recommended Practice 920** - Prevention of Brittle Fracture of Pressure Vessels.

### **3.2 Personnel Training and Discharge Prevention Procedures (40 CFR 112.7 (f))**

- 1) Personnel are properly instructed in the following:
  - a. Proper operation and maintenance of equipment to prevent oil discharges,
  - b. Discharge procedure protocols,
  - c. Applicable oil spill prevention laws, rules and regulations,
  - d. General facility operations, and
  - e. The contents of facility SPCC plans and applicable pollution control laws, rules, and regulations.

Company and contract personnel attend in-house compliance awareness programs on a periodic basis. Compliance awareness briefings are conducted at least once per year to assure continued understanding of the applicable SPCC plans. In addition, spill related topics are discussed at safety meetings. Safety meeting topics include: spill control equipment; equipment operation and maintenance; inspection of containment structures, vessels, tanks and piping; spill response, containment and clean up; company policies on reporting and responding to spills; and specific SPCC Plans.

- 2) For the subject facilities, the designated person accountable for oil discharge prevention is:

Name: Kenneth Kuhn  
Title: Production Superintendent



- 3) Scheduled prevention briefings for the operating personnel are conducted on a periodic basis to assure adequate understanding of the SPCC Plan. The briefing program is as follows:

A SPCC compliance awareness program is presented on an annual basis. The program includes a review of specific SPCC Plans, updates on state and federal regulations, company policy and procedures, and spill reporting.

Additional short briefing sessions are held as needed before and during certain jobs to review spill potential, necessary precautions and appropriate responses. Also, included in the briefing is a review of known spill events or failures, malfunctioning components and recently developed precautionary measures. A copy of the Training Record Form is attached in Appendix D.

- 4) Contractors working at the facilities are instructed as follows:

- 1) Pollution control will be maintained at all times in connection with all operations by the contractor. Berry Petroleum Company personnel will be notified immediately of any emitting, spilling, venting, discharging, disposal or loss of any hazardous or harmful substances, air contaminants and/or pollutants of any nature (referred to as discharges).
- 2) If any discharges occur as a result of the performance of work by the contractor, its agents, employees and subcontractors, or other persons for whom the contractor is responsible, the contractor will immediately proceed to stop or abate such discharges.
- 3) The contractor will comply with any and all local, state and federal laws, regulations, standards and orders applicable to the controlling and prevention of discharges.
- 4) Contractors will install and maintain adequate discharge control equipment on or about their plant, rig or other equipment to prevent discharges, in violation of any local, state and federal laws, regulations, standards and orders.

#### **4.0 DRILLING AND WORKOVER OPERATIONS (40 CFR 112.10)**

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Berry Petroleum Company is committed to the preventing releases during drilling and workover operations. All drilling and workover contractors operating on company leases must have a written SPCC plan for their operations as required by 40 CFR 112.3(c). The contractor's plans must be implemented before operations are initiated. At a minimum the SPCC plans must comply with the general requirements of 40 CFR 112.7 and specifically address the following:

- 1) Drilling and workover equipment is to be positioned or located so as to prevent spilled oil, fuel, or oily drilling fluids from reaching navigable waters whenever possible. If necessary the use of catchment basins or diversion structures will be implemented
- 2) A blowout preventer (BOP) assembly and well control system is to be installed before drilling below any casing string and as required during workover operations.
- 3) The BOP assembly will be capable of controlling any expected wellhead pressure.
- 4) Casing and BOP installations will conform to industry standards and state regulations.

## **APPENDIX A**

**CONTACT LISTS AND PHONE NUMBERS**

**RELEASE NOTIFICATION FORM**

**QUALIFIED DISCHARGE REPORT FORM**



## **SPCC NOTIFICATION LIST**

### **Berry Petroleum Company Call List**

Derek Johnson – Project Superintendent

Office: (970) 285-5202

Cell: (970) 274-3335

Brent White – Production Foreman

Office: (970) 285-5204

Cell: (970) 948-2177

Vinny Taylor – Field Operator

Office: (970) 285-5209

Cell: (970) 987-9812

### **Emergency Response Contractors**

Doug Teter & Sons – 970-986-1860

Roustabout Services

Roustabout Specialties, Inc. – 970-241-9696

Roustabout Services

Stateline Trucking – 970-270-5388

Water Hauling





## SPCC NOTIFICATION LIST FEDERAL, STATE AND LOCAL AGENCY CALL LIST

If any oil contacts surface water, whether flowing or not, or an intermittent drainage, and results in a "visible sheen" on the water, the following phone contacts must be made as soon as possible following the discovery of the spill. The contacts must be made regardless of the quantity discharged.

- 1) National Response Center (The NRC should automatically contact the EPA)
- 2) The Regional office of the EPA
- 3) State Water Quality Control Division
- 4) State Oil and Gas Regulatory Agency
- 5) Any other state agencies with responsibility for oil pollution control
- 6) Affected land owners

**FOLLOW COMPANY REPORTING PROCEDURES SHOULD IT BECOME NECESSARY TO CONTACT ANY OF THE ABOVE AGENCIES. USE THE RELEASE NOTIFICATION FORM ON THE FOLLOWING PAGE TO ORGANIZE AND COMMUNICATE INFORMATION CONCERNING THE SPILL.**

### FEDERAL AGENCIES

National Response Center: 1-800-424-8802 (24 Hour)  
<http://www.nrc.uscg.mil/index.html>

**Always call the NRC first.** The NRC will contact the Coast Guard and other appropriate federal agencies.

EPA Region VIII: 303-312-6312  
<http://www.epa.gov/region8/> 303-293-1788 (Spill Line)  
1-800-227-8914 (24 Hour)

**NOTE:** It is only necessary to contact the EPA if you cannot contact the NRC.

BLM White River Office (Meeker, CO) (970) 878-3800  
<http://www.blm.gov/co/st/en.html>

BLM Grand Junction Field Office (970)-244-3000  
<http://www.blm.gov/co/st/en/fo/gjfo.html>

BLM Glenwood Springs Field Office (970)-947-2800  
<http://www.blm.gov/co/st/en/fo/gsfo.html>

### STATE AGENCIES

Oil and Gas Conservation Commission: 303-894-2100  
<http://oil-gas.state.co.us/> 1-888-235-1101 (Spill Line)

Colorado Department of Public Health and Environment (CDPHE): 1-877-518-5608 (24 Hour)  
<http://www.cdphe.state.co.us/>

Division of Oil & Public Safety:  
<http://oil.cdle.state.co.us/>

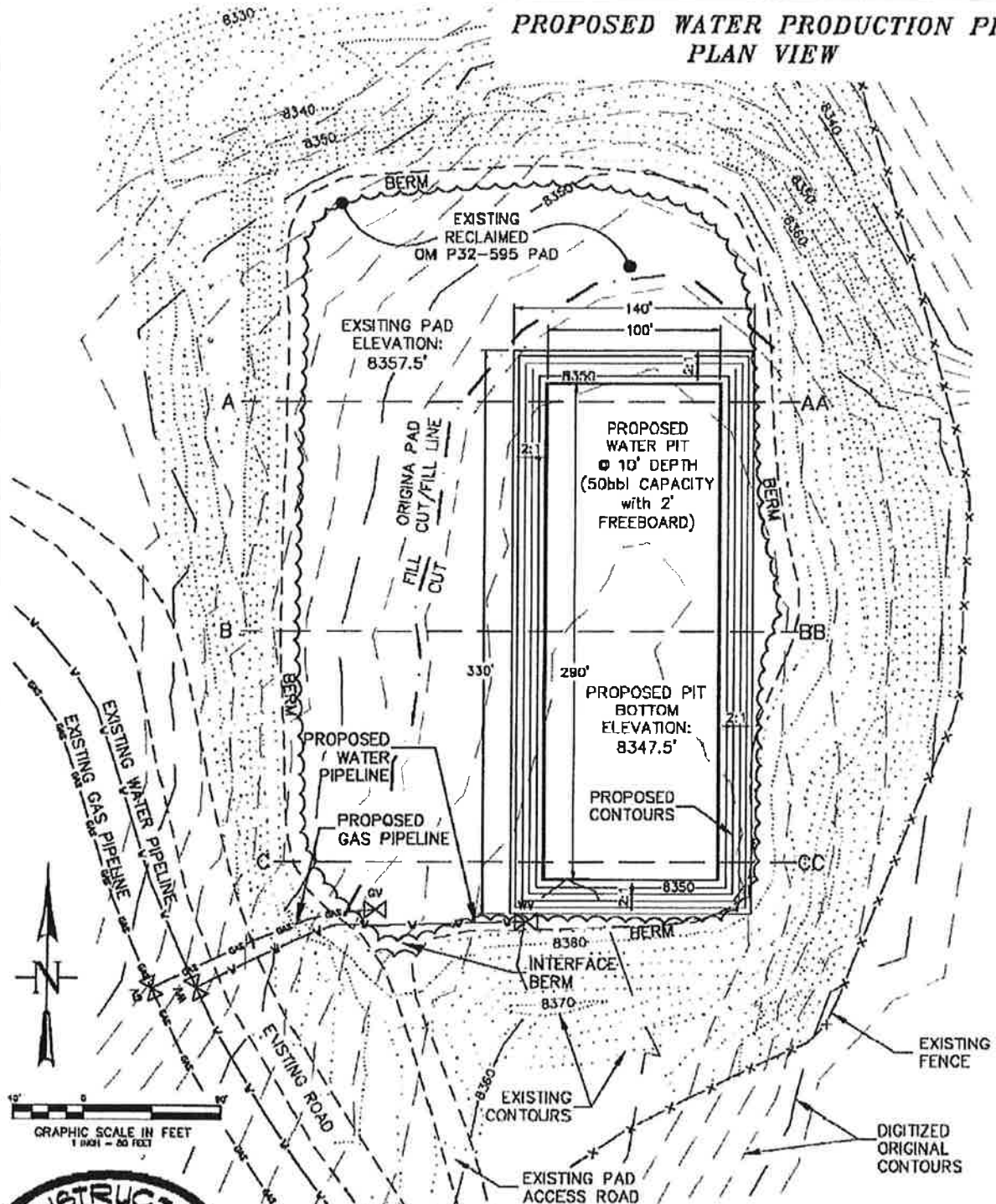
303-318-8547

**LOCAL AGENCIES**

Garfield County Sheriff's Office (Local Emergency Planning Commission)  
Jim Sears, Emergency Ops Commander  
107 8th Street  
Glenwood Springs, CO 81601

970-945-0453

# PROPOSED WATER PRODUCTION PIT PLAN VIEW



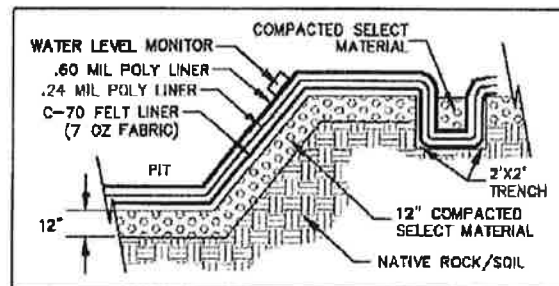
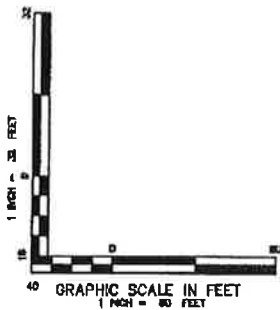
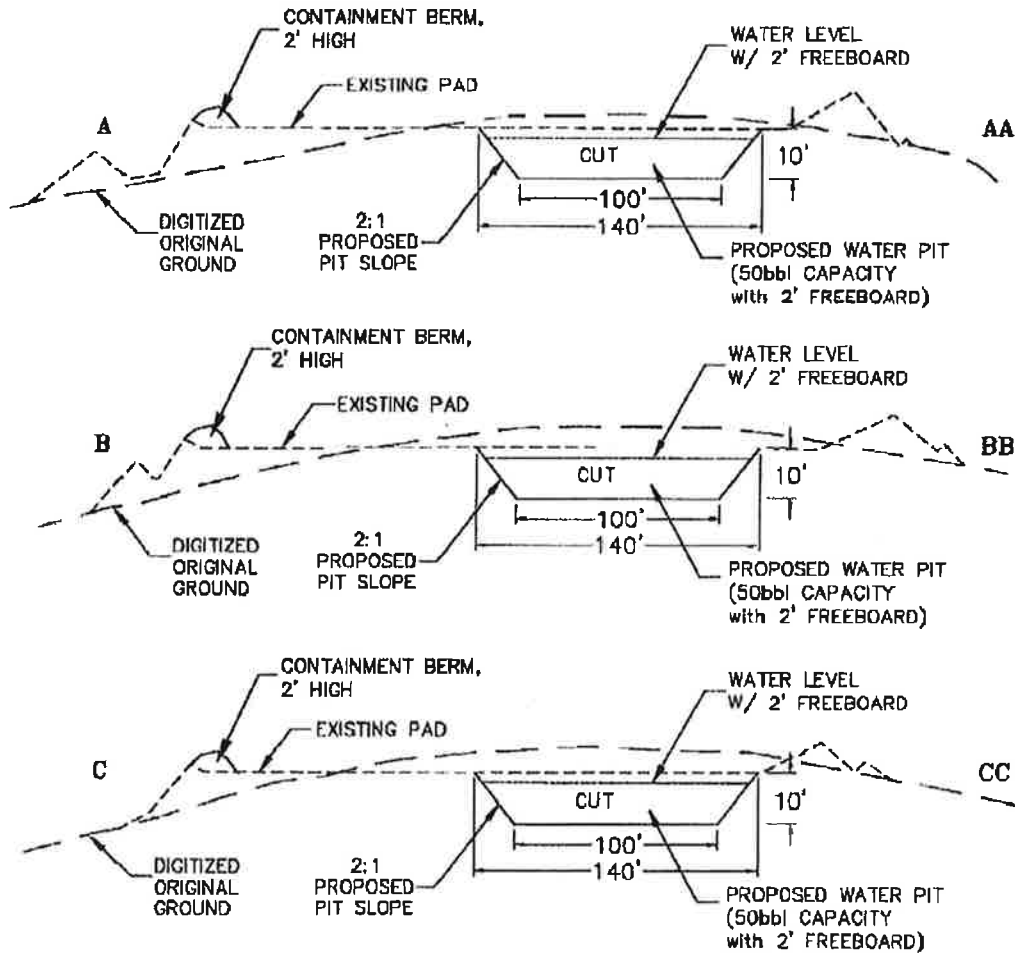
CONSTRUCTION SURVEYS, INC. Old Mountain P32-595  
 0012 SUNRISE BLVD.  
 SILT, CO 81652  
 (970)876-5753

611/4 611/4, SECTION 32, T. 5 S., R. 65 W.  
 BERRY PETROLEUM COMPANY

DATE: 05/03/12

SHEET: 1 OF 2

## PROPOSED WATER PRODUCTION PIT X-SECTIONS



N.T.S.

CLOSE UP X-SECTION VIEW OF BERRY TYPICAL DESIGN



CONSTRUCTION SURVEYS, INC. Old Mountain P32-595  
0012 SUNRISE BLVD. 081/4 081/4, SECTION 32, T. 5 S., R. 95 W.  
BILT, CO 81652 BERRY PETROLEUM COMPANY  
(970)876-5753

DATE: 05/03/12

SHEET: 2 OF 2

**UINTAH ENGINEERING & LAND SURVEYING**  
86 So. 200 East • Vernal, Utah 84078 • (435) 789-1017



# BERRY PETROLEUM COMPANY

## CONSTRUCTION LAYOUT FOR

WELL PAD P32 595  
SECTION 32, T5S, R95W, 6th P.M.  
SE 1/4 SE 1/4

SCALE  
Sheet 2 of 12

SCALE: 1" = 50'  
DATE: 09-12-06  
Drawn By: D.R.B.  
Revised: 09-20-06 D.R.B.  
Revised: 02-10-09 D.R.B.  
Revised: 03-20-09 D.R.B.  
Revised: 04-05-10 D.R.B.

### NOTE:

Flare Pit is to be located a min. of 100' from the Well Head.

### SWMP LEGEND:

LS - LEVEL SPREADER  
ECB - EROSION CONTROL BLANKET  
SCE - STABILIZED CONSTRUCTION ENTRANCE  
SedR - SEDIMENT RESERVOIR  
SL - SLASH  
ST - SEDIMENT TRAP  
TB - TOE BERM  
VB - VEGETATED BUFFER  
W - WATTLE

### NOTE:

Re-Route Existing Fenceline Around Location to the East

### RESERVE PIT

Total Pit Capacity  
W/2' of Freeboard  
= 18,580 Bbls ±  
Total Pit Volume  
= 4,890 Cu. Yds.

0.19 Ac. to Sed. Res. #1  
3,600 cu.ft./Ac. Drainage  
Vol. = 684 cu.ft.  
L = 62', W = 15', D = 4'

### NOTES:

Elev. Ungraded Ground At OM16D Loc. Stake = 8357.7'  
FINISHED GRADE ELEV. AT OM16D LOC. STAKE = 8353.4'

APPROXIMATE ACRES  
APPROX. WELL DISTURBANCE = ±4.767 ACRES  
ACCESS ROAD DISTURBANCE = ±0.207 ACRES  
TOTAL = ±4.974 ACRES

UINTAH ENGINEERING & LAND SURVEYING  
86 So. 200 East • Vernal, Utah 84078 • (435) 789-1017



# BERRY PETROLEUM COMPANY

## LOCATION DRAWING FOR

WELL PAD P32 595

SECTION 32, T5S, R95W, 6th P.M.

SE 1/4 SE 1/4

1/4 Section Line

200' 100' 0' 200'

SCALE

1916 Brass Cap  
1.0' High  
Lat: 39.570320  
Long: 108.060827

Sheet 2a of 12



SCALE: 1" = 200'  
DATE: 04-05-10  
Drawn By: D.R.B.

Section Line

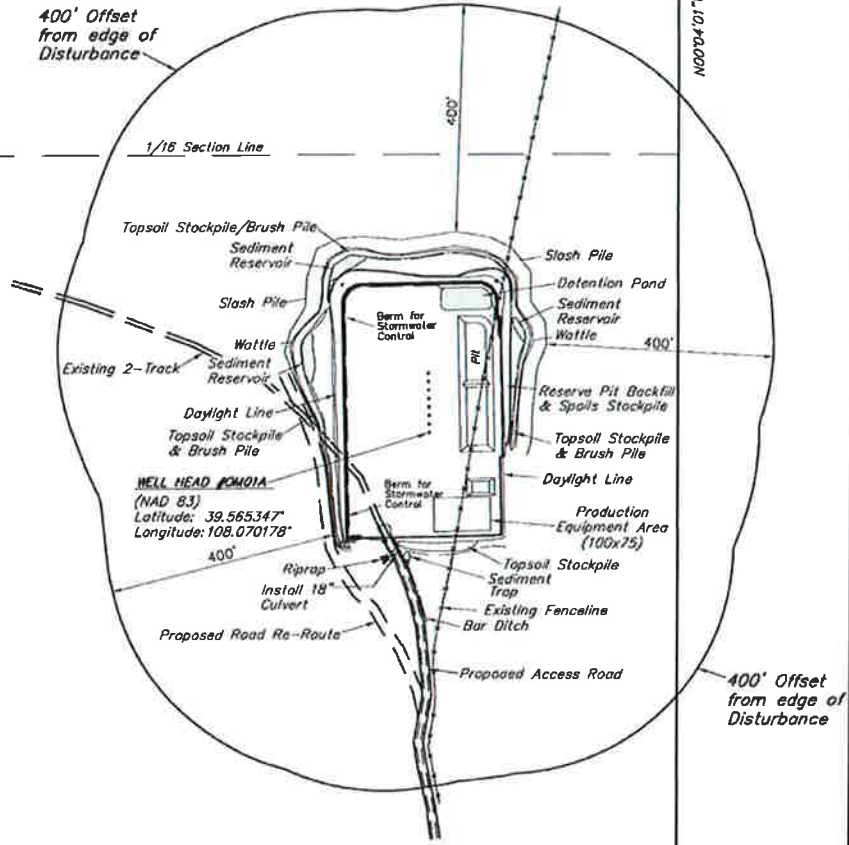
N00°04'01"W - 2642.92' (Meas.)

400' Offset  
from edge of  
Disturbance

SE 1/4

1/16 Section Line

1/16 Section Line



400' Offset  
from edge of  
Disturbance

Section Line

S89°55'34"W - 2637.84' (Meas.)

S 1/4 Sec 32  
1916 Brass Cap  
1.0' High  
Lat: 39.563060  
Long: 108.077974

1912 Brass Cap  
1.0' High  
Lat: 39.563066  
Long: 108.060820

### DISTURBANCE ACREAGE:

2.857 ± DRILLING OPERATIONS  
2.541 ± INTERIM RECLAIM

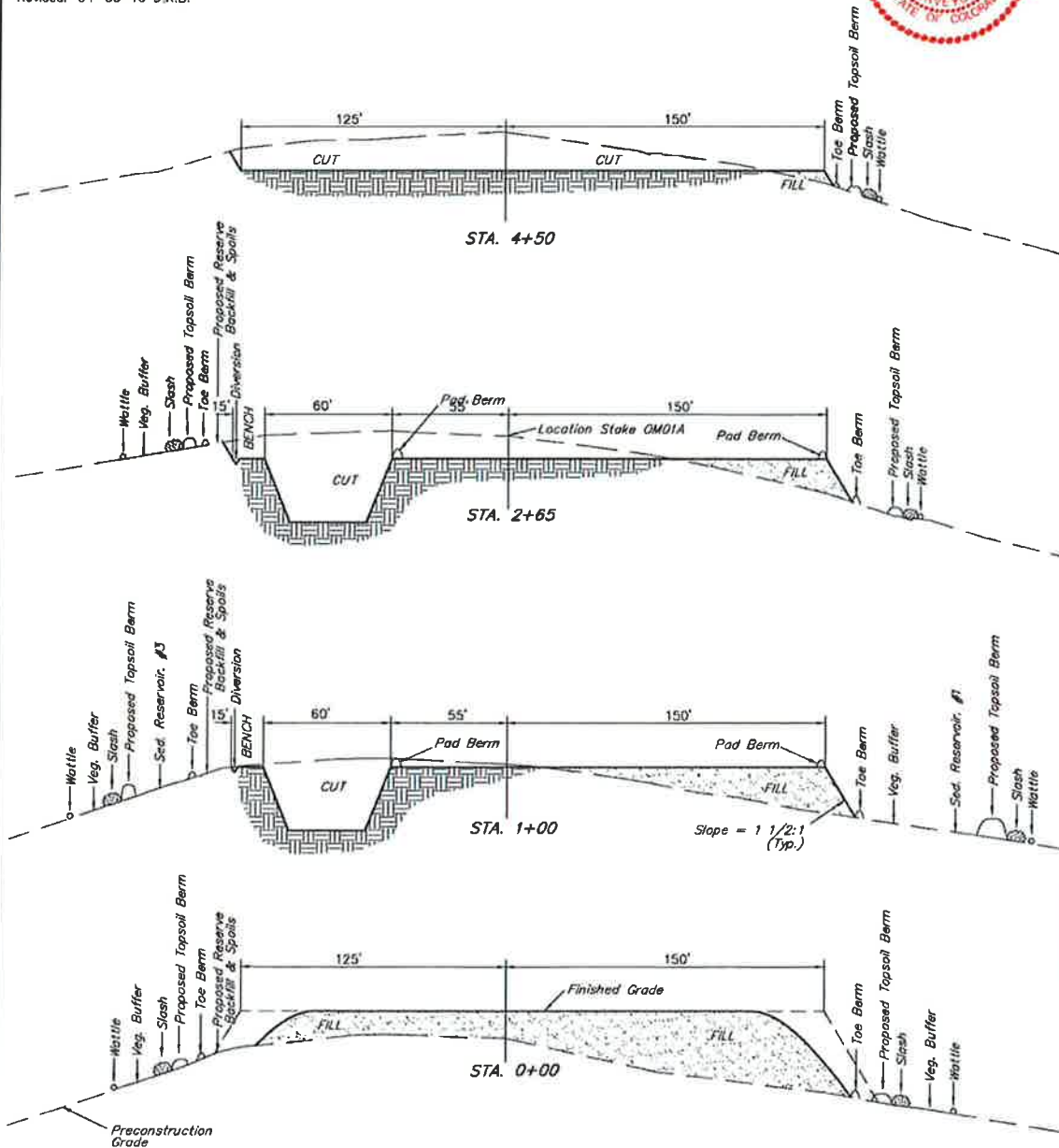
UINTAH ENGINEERING & LAND SURVEYING  
85 So. 200 East • Vernal, Utah 84078 • (435) 788-1017

**BERRY PETROLEUM COMPANY**  
**CONSTRUCTION LAYOUT CROSS SECTIONS FOR**  
**WELL PAD P32 595**  
**SECTION 32, T5S, R95W, 6th P.M.**  
**SE 1/4 SE 1/4**

Sheet 3 of 12

X-Section  
Scale  
1" = 50'

DATE: 09-12-06  
Drawn By: D.R.B.  
Revised: 09-20-06 D.R.B.  
Revised: 02-10-09 D.R.B.  
Revised: 03-20-09 D.R.B.  
Revised: 04-05-10 D.R.B.



NOTE:  
Topsoil should not be  
Stripped Below Finished  
Grade on Substructure Area.

\* NOTE:  
FILL QUANTITY INCLUDES  
5% FOR COMPACTION

**APPROXIMATE YARDAGES**

CUT  
(8") Topsoil Stripping = 2,660 Cu. Yds.  
Remaining Location = 13,330 Cu. Yds.  
TOTAL CUT = 15,990 CU.YDS.  
FILL = 10,880 CU.YDS.

EXCESS MATERIAL = 5,110 Cu. Yds.  
Topsoil & Pit Backfill = 5,110 Cu. Yds.  
(1/2 Pit Vol.)  
EXCESS UNBALANCE = 0 Cu. Yds.  
(After Interim Rehabilitation)

# BERRY PETROLEUM COMPANY

TYPICAL RIG LAYOUT FOR  
WELL PAD P32 595  
SECTION 32, T5S, R95W, 6th P.M.  
SE 1/4 SE 1/4



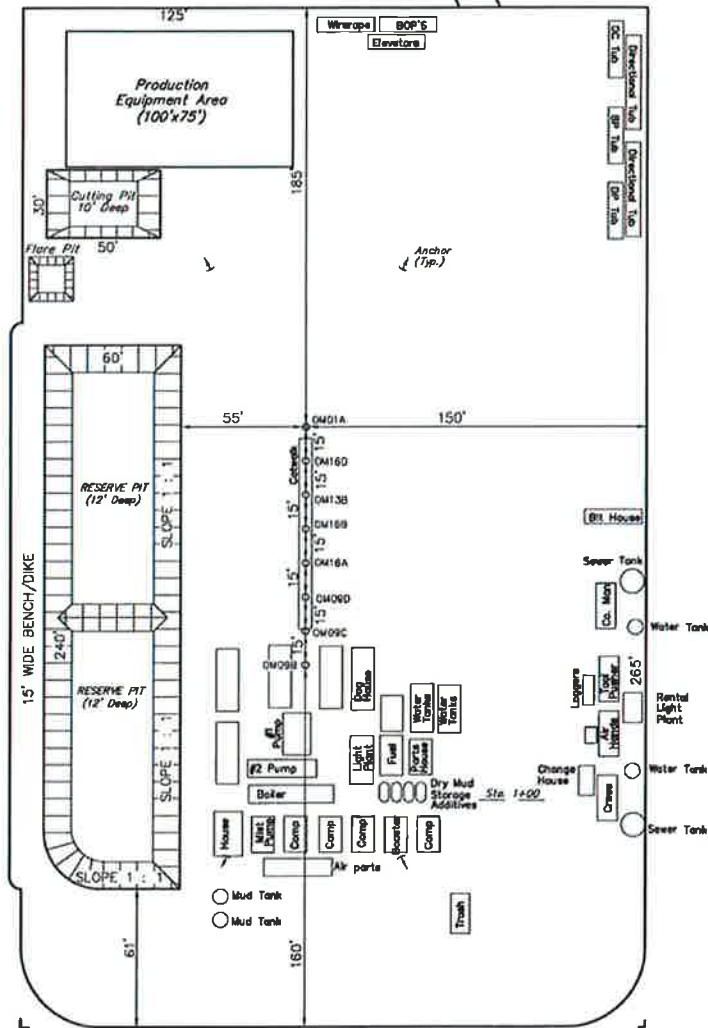
Sheet 4 of 12

SCALE: 1" = 50'  
DATE: 09-12-06  
Drawn By: D.R.B.  
Revised: 09-20-06 D.R.B.  
Revised: 02-10-09 D.R.B.  
Revised: 03-20-09 D.R.B.  
Revised: 04-05-10 D.R.B.



**NOTE:**  
Flare Pit is to be located a min. of 100' from the Well Head.

**RESERVE PIT**  
Total Pit Capacity  
W/2' of Freeboard  
= 18,580 Bbls. ±  
Total Pit Volume  
= 4,890 Cu. Yds.



# Oil & Produced Water Release Report

☐ Initial Report (Subject to change as information is gathered) ☐ Supplemental Report #  ☐ Final Report

Date of Spill	<input type="text"/>
Time of Spill	<input type="text"/>
Field	<input type="text"/>
Lease	<input type="text"/>
County	<input type="text"/>
State	<input type="text"/>

Reason for Supplement	<input type="text"/>				
Section	<input type="text"/>	Township	<input type="text"/>	Range	<input type="text"/>
Landowner	<input type="text"/>				
Landowner Notified	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required				

Spilled		Recovered	
Volume of Oil	<input type="text"/> Bbls.	<input type="text"/> Bbls.	
Volume of Water	<input type="text"/> Bbls.	<input type="text"/> Bbls.	
Size of Spill	Length (ft) <input type="text"/>	Width (ft) <input type="text"/>	Depth (ft) <input type="text"/>

## Type of Surface Affected

(Check all that apply)

- ☐ Land/ Habitat  
☐ Inside Dike/ Berm  
☐ Water  
☐ Dry Drainage

If Release is 1 bbl or more (regardless of containment), Notify:	Person Contacted	Time	Date
OGCC (888) 235-1101 or (303) 894-2100	<input type="text"/>	<input type="text"/>	<input type="text"/>
OGCC Tracking No.	<input type="text"/>	<input type="text"/>	<input type="text"/>
CO Dept. of Public Health & Env. (877) 518-5608	<input type="text"/>	<input type="text"/>	<input type="text"/>
BLM if federal lease (970) 244-3000	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>If Oil Enters <u>Any</u> Surface Water, in addition to the above, Notify:</b> NRC w/in 2 hrs 1-800-424-8802	<input type="text"/>	<input type="text"/>	<input type="text"/>

## When reporting to agencies include:

- A. Date and time of spill
- B. Identity of material spilled
- C. Quantity spilled
- D. Location/ source
- E. Cause of spill
- F. Hazards/ injuries
- G. Correction action
- H. Berry name and number

## Description of Spill

<b>General Spill Location</b> <input type="checkbox"/> Production Well # <input style="width: 50px;" type="text"/> <input type="checkbox"/> Injection Well # <input style="width: 50px;" type="text"/> <input type="checkbox"/> Tank Battery <input type="checkbox"/> Treatment Facility <input type="checkbox"/> Water Treatment Plant <input type="checkbox"/> Drilling/Workover Rig <input type="checkbox"/> Other <input style="width: 100px;" type="text"/>	<b>Specific Spill Location</b> <input type="checkbox"/> Tubing/Casing <input type="checkbox"/> Wellhead <input type="checkbox"/> Stuffing Box <input type="checkbox"/> Flowline <input type="checkbox"/> Truck Line/ Gathering Line <input type="checkbox"/> Facility Piping/ Connections <input type="checkbox"/> Facility Valve/ Meter <input type="checkbox"/> Vessel # <input style="width: 50px;" type="text"/> <input type="checkbox"/> Tank # <input style="width: 50px;" type="text"/> <input type="checkbox"/> Pump <input type="checkbox"/> Injection/ Disposal Line <input type="checkbox"/> Other <input style="width: 100px;" type="text"/>	<b>Root Cause of Spill</b> (Check all that apply) <input type="checkbox"/> Freezing <input type="checkbox"/> Lightning <input type="checkbox"/> Earthquake <input type="checkbox"/> Fire <input type="checkbox"/> Other Natural Forces <input type="checkbox"/> Power Failure <input type="checkbox"/> External Damage <input type="checkbox"/> Livestock <input type="checkbox"/> Vandalism <input type="checkbox"/> Contractor Error <input type="checkbox"/> Worn Equipment <input type="checkbox"/> Internal Corrosion <input type="checkbox"/> External Corrosion <input type="checkbox"/> Plugging <input type="checkbox"/> Malfunction <input type="checkbox"/> Defective Material <input type="checkbox"/> Alarm Failure <input type="checkbox"/> Procedure-Related <input type="checkbox"/> Operations-Related <input type="checkbox"/> Design <input type="checkbox"/> Training
<b>Type of Material</b> (Check all that apply) <input type="checkbox"/> Aluminum, Bronze/Brass <input type="checkbox"/> Fiberglass <input type="checkbox"/> Steel <input type="checkbox"/> Plastic/PVC <input type="checkbox"/> Stainless Steel <input type="checkbox"/> Other <input style="width: 100px;" type="text"/> <input type="checkbox"/> Internally Coated <input type="checkbox"/> Externally Coated Estimated Age <input style="width: 50px;" type="text"/> Size <input style="width: 50px;" type="text"/>	<b>Weather Conditions</b> <input type="checkbox"/> Dry <input type="checkbox"/> Windy <input type="checkbox"/> Rain <input type="checkbox"/> Snow Has it rained in the last 48 hours? <input type="checkbox"/> Yes <input type="checkbox"/> No Is precipitation Expected before clean up can occur? <input type="checkbox"/> Yes <input type="checkbox"/> No	

Write in costs if know, otherwise check best estimate

<b>Repairs</b> \$ <input style="width: 50px;" type="text"/> <input type="checkbox"/> \$0-\$99 <input type="checkbox"/> \$100-\$499 <input type="checkbox"/> \$500-\$999 <input type="checkbox"/> \$1000-2999 <input type="checkbox"/> \$3000-\$4999 <input type="checkbox"/> \$5000-\$9999 <input type="checkbox"/> more than \$10,000	<b>Clean Up</b> \$ <input style="width: 50px;" type="text"/> <input type="checkbox"/> \$0-\$99 <input type="checkbox"/> \$100-\$499 <input type="checkbox"/> \$500-\$999 <input type="checkbox"/> \$1000-2999 <input type="checkbox"/> \$3000-\$4999 <input type="checkbox"/> \$5000-\$9999 <input type="checkbox"/> more than \$10,000	<b>Oil Loss</b> \$ <input style="width: 50px;" type="text"/> <input type="checkbox"/> \$0-\$99 <input type="checkbox"/> \$100-\$499 <input type="checkbox"/> \$500-\$999 <input type="checkbox"/> \$1000-2999 <input type="checkbox"/> \$3000-\$4999 <input type="checkbox"/> \$5000-\$9999 <input type="checkbox"/> more than \$10,000		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; padding: 5px; vertical-align: top;">General Comments</td> <td style="height: 50px;"></td> </tr> </table>			General Comments	
General Comments				

What was the cause of the spill?	
What corrective measures have been taken to prevent future spills?	
What has been done, or will be done to remediate the spill area	
Where is recovered material being stored?	
How and where is recovered material being disposed?	
Estimated size and depth of spill area.	
Other Comments	

Reported By		Title		Date	
Supervisor		Title		Phone	

Call EHS Manager as soon as practicable after discovery of spill at (661)-616-3808  
 Complete form and Fax or Email completed spill report to EHS Manager within 24 hours  
 of the incident (661) 616-3886 or at reb@bry.com

Print Form

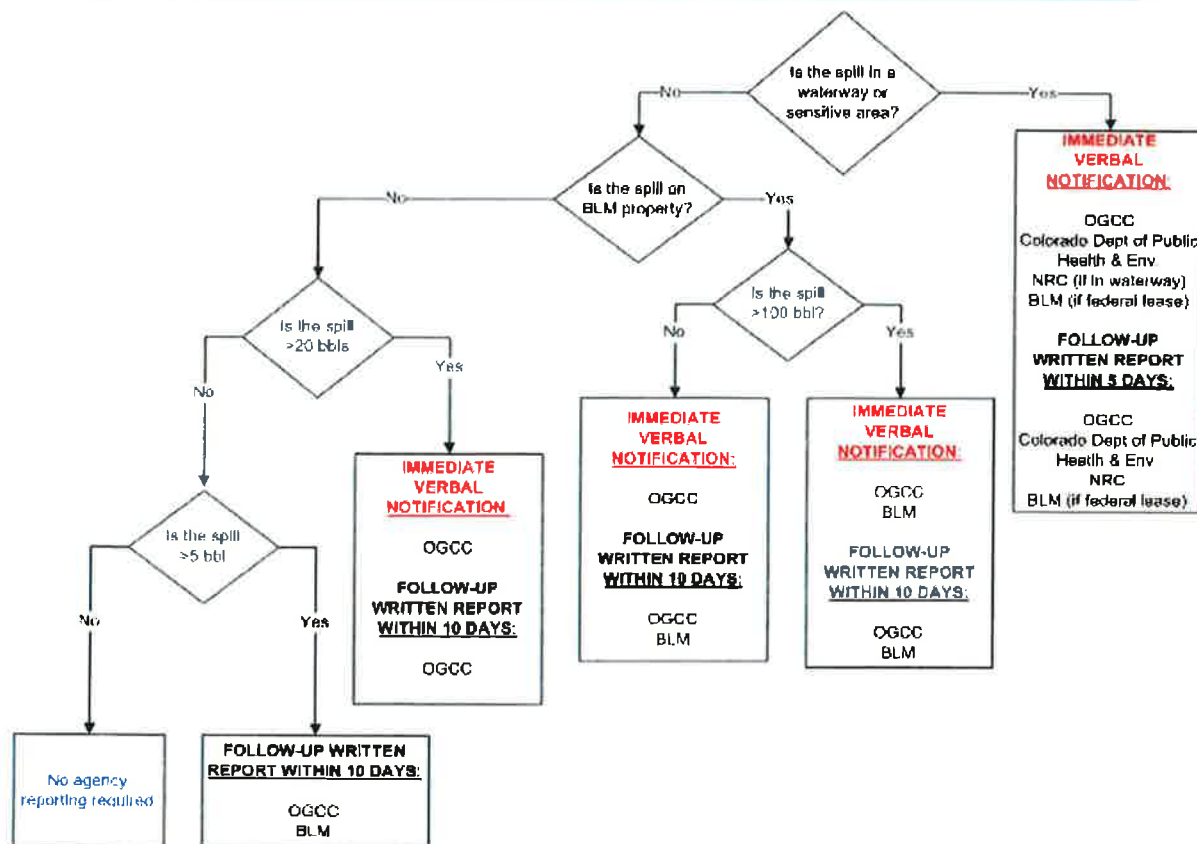
Submit by Email



# Berry Petroleum Company

## Oil and Produced Water Release Reporting Flowchart

### Parachute and Wray, Colorado



### Reporting Requirements:

Spills greater than 20 bbl, any spill to a sensitive area or waterway must be reported immediately, but no later than 24 hours after discovery.

Follow-up reports must be filed with OGCC, Colorado Dept. of Public Health and Environment and NRC (if spill was to a waterway) and BLM (if federal lease). Follow-up reports to OGCC must be filed on OGCC Form 19.

### Agency Contact Phone Numbers:

Oil and Gas Conservation Commission (OGCC)  
Colorado Dept. of Public Health and Environment  
National Response Center (NRC)  
Bureau of Land Management (BLM)

(303) 894-2100 or (888) 235-1101  
(877) 518-5608  
(800) 424-8802  
(970) 244-3000