U.S. Department of the Interior
Bureau of Land Management
Glenwood Springs Field Office
50629 Highway 6 & 24
P.O. Box 1009
Glenwood Springs, CO 81602

ENVIRONMENTAL ASSESSMENT

NUMBER: CO-2006-084 EA

CASEFILE NUMBER: Lease COC-64181

PROJECT NAME**:** Helmer Gulch Fed 31-41 Drill Pad

LEGAL DESCRIPTION**:** Well pad and wells located in T6S R93W Section 31 NE ¼ NE ¼ of the 6th P.M. Garfield County, Colorado

Federal 31-41-1
- Surface Location: 4' FNL, 1123' FEL (39.48967, 107.81192)
- Bottom Hole Location: 310' FNL, 460' FEL (39.48886, 107.80958)

Federal 31-41-2
- Surface Location: 4' FNL, 1168' FEL (39.48967, 107.81208)
- Bottom Hole Location: 330' FNL, 1380' FEL (39.44877, 107.81284)

Federal 31-41-3
- Surface Location: 4' FNL, 1198' FEL (39.48967, 107.81219)
- Bottom Hole Location: 350' FNL, 2300' FEL (39.48868, 107.81609)

Federal 31-41-10
- Surface Location: 4' FNL, 1183' FEL (39.48967, 107.81213)
- Bottom Hole Location: 880' FNL, 2300' FEL (39.48723, 107.81610)

Federal 31-41-11
- Surface Location: 4' FNL, 1138 FEL, (39.48967, 107.81197)
- Bottom Hole Location: 860' FNL, 1380' FEL (39.48732, 107.81284)

Federal 31-41-12
- Surface Location: 55' FNL, 1073' FEL (39.48954, 107.81174)
- Bottom Hole Location: 840' FNL, 460' FEL (39.48740, 107.80958)

Federal 31-41-13

- Surface Location: 70' FNL, 1073' FEL (39.48949, 107.81174)
- Bottom Hole Location: 1370' FNL, 460' FEL (39.48595, 107.80959)

Federal 31-41-14

- Surface Location: 100' FNL, 1073' FEL (39.48941, 107.81174)
- Bottom Hole Location: 1390' FNL, 1380' FEL (39.48586, 107.81285)

Federal 31-41-22

- Surface Location: 4' FNL, 1153' FEL (39.48967, 107.81203)
- Bottom Hole Location: 1940' FNL, 2300' FEL (39.48432, 107.81612)

Federal 31-41-23

- Surface Location: 115' FNL, 1073' FEL (39.48937, 107.81174)
- Bottom Hole Location: 1920' FNL, 1380' FEL (39.48441, 107.81286)

Federal 31-41-24

- Surface Location: 85' FNL, 1073' FEL (39.48945, 107.81174)
- Bottom Hole Location: 1900' FNL, 460' FEL (39.48449, 107.80960)

Latitudes and Longitudes are based on NAD 83

APPLICANT: Petrogulf Corporation

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Proposed Action:

The proposed action would approve a multiple well pad, a gas and water gathering system, and APDs for eleven exploratory gas wells on BLM administered land located in the Helmer Gulch Field in T6S, R93W. The proposed action would involve construction, drilling, completion and production activities for the eleven directionally drilled gas wells, and associated infrastructure. A map of the project area is attached as Appendix A. The proposed action would approve the initial drilling and development of 5 of the 11 wells with 10-acre spacing in calendar year 2006, and then allow for the drilling and development of the remaining 6 wells in calendar year 2007 based on the production performance of the initial 5 wells. The remaining wells would be developed following an evaluation of the gas extraction from the initial wells, and would be dependent on factors, such as, commodity prices, changes in technology, and capital availability.

The APDs filed with the GSFO include drilling and surface use plans that cover mitigation of impacts to vegetation, soil, water, and other resources. Mitigation not incorporated by Petrogulf in the drilling and surface use plans will be attached as Conditions of Approval to an approved APD by the BLM.

Petrogulf originally proposed to drill six directional wells at this location in 2001, and environmental assessment, CO-140-2001-044 EA, was performed to analyze the environmental effects of the proposed action. With the approved mitigation measures the review resulted in a finding of no significant impact on the human environment.

The proposed wells are located approximately 4.5 miles southwest of the city of Rifle in Garfield County, Colorado, and approximately 1 mile east of Beaver Creek Road on the slopes of Flatiron Mesa. Construction work would start in late July of 2006, and the duration for drilling and completion is approximately 45 days for each well.

Access Road Construction

The proposed access road will be new crown and ditch construction for the entire length of road. The proposed road will begin at the Mead C pad, located in T6S R93W Section 30 NE ¼ SW ¼, and cross an existing Encana gas sales line which is located in a 75 foot wide right of way (ROW). The proposed access road will then travel parallel to the gas line on the south side of the ROW for approximately 600 feet, cross the pipeline to the north side of the ROW and travel for approximately 1700 feet before turning south to cross the pipeline and travel the remaining distance to the pad. The proposed access road will have a 20 foot travel way with borrow ditches, and extend approximately 3800 feet. The travel way will be topped with a sufficient amount of aggregate to support all-weather use, and dust control will be applied, as needed. Road maintenance will be performed as needed to ensure a safe travel way. A road plan and profile have been developed to support this effort.

Petrogulf currently maintains a State of Colorado General Permit for Stormwater Discharges Associated With Construction Activity for its operations on Taughenbaugh Mesa. A copy of the current Stormwater Management Plan (SWMP) used to support current drilling operations in the Taughenbaugh Mesa area is attached as Appendix B. The SWMP will be updated as needed to support construction activities associated with the Helmer Gulch Fed 31-41 drill pad.

Well Pad Construction

The well pad will be cleared of all vegetation and leveled for drilling. Topsoil will be stockpiled, and woody vegetation will be mulched for use in reclamation. The corners will be rounded to reduce the cut and fill as much as possible. The sides of the well pad will be bermed to prevent stormwater from flowing off the pad and into nearby drainages. The stormwater will be directed to an opening in the berm that leads off the pad to a sediment trap. The channel from the opening to the sediment trap, and the overflow from the trap will be lined with rip-rap to dissipate energy and control erosion. The well pad will include a lined reserve pit to hold fresh water for a closed-loop drilling system, and drill mud and cuttings, as needed.

Gas Gathering and Water Pipeline Construction

Petrogulf has teamed with Canyon Gas Resources, L.L.C. to manage gas gathering. Canyon has submitted a right-of-way application to construct and operate the gas gathering line. A steel gas gathering line, up to 18” in diameter, will run from the Helmer Gulch 31-41 pad to the Mead C pad where it will tie to an existing 12” main gathering line which flows to the West Rifle compressor station. There is no interim booster compression.

Construction will be performed with a 50-foot wide ROW. The ROW will be cleared of vegetation, and a utilities trench dug with a wheel trencher, or backhoe. The utilities trench will be approximately 3 feet wide and approximately 6 feet deep, and have a total of length of approximately 2950 feet. Following construction, a 30-foot ROW will be needed for maintenance purposes. The Encana pipeline is set approximately 25 feet off the south edge of the 75 foot ROW, and the center of the Canyon line will have a 25 foot offset from the center of the Encana line.

In addition, the utilities trench will also include a water gathering line. The gas line and the plastic polymer water line will lie in the bottom of the trench separated by sand bags. Produced

water will be delivered to one of the Mead pads, A through C, where it will be stored pending disposal. Water gathering and storage on the Mead pads will minimize truck traffic, aid in dust control and reduce noise and visual impact. Water disposal will occur through a commercial disposal facility.

Total Surface Disturbance

The total expected surface disturbance for this project is 13.0 acres. Approximately 5.2 acres would be disturbed for construction of the well pad. This would include the well pad, the topsoil and subsoil piles. Approximately 4.4 acres would be disturbed for new road construction. The access road will require a 50 foot wide construction corridor to allow for the safe passage of construction equipment, and will have a total length of approximately 3800 feet. Approximately 3.4 acres would be disturbed for construction of the utilities trench. The trench will require a 50 foot wide construction corridor to allow for the safe passage of construction equipment, and will have a total length of approximately 2950 feet.

Current construction plans do not include temporary use areas. Equipment storage will occur on the Mead C pad, and on the Helmer Gulch Fed 31-41 drill pad.

Long Term Surface Disturbance

Long term interim use activities will require approximately 5.1 acres to support production activities. The well pad will be reclaimed back approximately 75% to 1.3 acres to support a staging area for future drilling operations. Approximately 1.7 acres will be required for road use based on a length of 3840 feet, and a 20 foot travel way. Approximately 2.0 acres will be required to maintain the utilities trench based on a 30 foot wide ROW and a 2950 foot length. The long term surface disturbance associated with the Helmer Gulch 31-41 drill pad is approximately 0.44% of the 1,160 acres in Petrogulf's federal lease, COC-64181.

Drilling and Completion

Petrogulf proposes to initially drill and complete 5 of the 11 proposed wells in calendar year 2006. If the gas wells prove to be productive, Petrogulf anticipates drilling the remaining 6 wells in calendar year 2007. If the wells are unproductive, they will be properly plugged and the entire well pad and access road will be reclaimed. Each well will require 20-25 days for drilling, and approximately 20 days for completion.

Petrogulf is also studying the use of a closed loop drilling system. A closed loop system separates the drilled solids from the drilling fluid during the drilling process, and moves the solids into a storage tank. The fluids are pumped to a separate tank for re-use during the drilling process. At the end of the drilling process, the remaining drilling fluid may be transported to the next drill site and used to drill the subsequent well. Petrogulf will still construct a reserve pit, but will limit its use to storing fresh water for use in the drilling process.

A closed loop system offers substantial benefits, such as, reducing the amount of water needed to support drilling, reducing truck traffic associated with water delivery, eliminating contaminated pit water that places waterfowl and wildlife at risk, and greatly reducing drilling waste. The dried drilled solids will be buried in the reserve pit at interim closure.

If a closed loop drilling system is not available for use, Petrogulf proposes to use the traditional drilling process which includes the use of a reserve pit.

Surface Facilities

Current plans limit permanent operating surface facilities to three phase separators capable of handling four wells each, a gas metering station and two 400 barrel condensate tanks. All of the permanent fixtures on the well pad, i.e., the phase separators, well heads, and condensate tanks will be painted a Shale Green (5Y 4/2) color, unless otherwise directed by the BLM authorized officer.

Interim Reclamation
Following well completion activities, Petrogulf proposes to reduce the size of the well pad by 75% to support well production operations. For interim reclamation, slopes will be reshaped and stabilized to match the original topography. The disturbed areas will be reseeded using seed mixes as directed by the BLM. The disturbed areas will be fenced until vegetation has been reestablished and can withstand wildlife grazing.

Noxious Weed Management
Petrogulf will monitor the project area for the presence of any Colorado-listed noxious weed at least once or twice annually during the growing season until final reclamation of the pad is complete. Petrogulf will promptly treat and control any noxious weeds by contracting with a licensed commercial pesticide applicator. A Pesticide Use Proposal must be approved by the BLM prior to use of herbicides.

Final Reclamation
All surface soil disturbances will be reseeded with native vegetation, and final reclamation goals, objectives, timelines, measures and monitoring methods will be in accordance with Appendix I, Surface Reclamation of the 6/98 GSFO's Draft Supplemental EIS for Oil & Gas Leasing Development or subsequent GSFO Reclamation Standards which may supersede the 1998 guidelines.

The stipulations attached to the lease, COC-64181, that affect the Helmer Gulch 41-31 drill pad are:

1. A Controlled Surface Use Stipulation for the purpose of protecting Erosive Soils and Slopes Greater Than 30 Percent. The proposed action is in conformance with the stipulation since the steepest slope is approximately 16%, and the proposed action will meet the objectives for erosion control, site stability, and reclamation. A map depicting steep slopes and erosive soils for the project area is included as Attachment C.

2. A Controlled Surface Use Stipulation for protecting BLM sensitive species. The site was evaluated and found not to be suitable habitat for *Penstemon harringtonii* or any other BLM sensitive species. A sensitive species survey report has been filed under a separate cover with the GSFO.

The proposed action will be implemented consistent with the oil and gas leases, federal regulations (43 CFR 3100), the Record of Decision and Resource Management Plan Ammendment March 1999, and the operational measures included in the APD as well as the Conditions of Approval (COA) attached to the APD. The proposed action includes drilling and completion operations, installation of production facilities (pipeline, phase separators, etc.), production of natural gas, and intermediate and final reclamation measures. The APD includes a drilling program, and a multi-point surface use and operations plan that includes details of well pad construction and interim reclamation.

No Action Alternative:

The No Action Alternative is that the wells would not be permitted, and therefore the wells would not be drilled. Petrogulf Corporation holds a valid and current oil and gas lease for the area where the proposed eleven Helmer Gulch Federal 31-41 wells would be located. Once an oil and gas lease is issued, the lessee/operator has been granted the right to develop the mineral rights, subject to the conditions of the lease. The No Action Alternative constitutes denial of the Proposed Action. Since the proposed action is consistent with the ROD and the Oil and Gas Leasing EIS, rejecting the APDs for the wells is not a reasonable alternative.

ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD:

Separate Well Locations
Separate well pads with vertical well bores could be proposed for each directionally drilled well proposed. This alternative could result in as any as 11 well pads and roads, but will not be analyzed since the surface disturbance and other impacts would be much greater than the proposed action of drilling directional well bores.

Alternate Access Road and Utilities Corridor Routes
On-site visits to the project area occurred on April 26, July 10 and July 17, 2006. During the onsite, the routes for the proposed access road and the utilities corridor were reviewed. The original proposed route placed the road on the existing Encana pipeline ROW from its beginning at the Mead C drill pad, to its final turnoff at the Helmer Gulch Fed 31-41 drill pad. The route for the access road was relocated to address issues associated with visual resources, and safety. The new route will reduce visual impact, and provide a safer, all-weather route to the drill pad.

The route for the utilities corridor (gas gathering and water gathering pipelines) was also examined. The proposed utilities corridor originally ran parallel to the access road from the Mead C pad to the Helmer Gulch Fed 31-41 drill pad. The on-site reviews prompted the team to reroute the utilities corridor and keep it on the Encana ROW for the majority of the route to reduce additional surface disturbance of the more mature wooded areas that will be crossed by the access road. The utilities trench will rejoin the road when the access road begins the climb from the Encana ROW to the well pad. The trench will parallel the road as it follows the natural contours of the hill side.

NEED FOR THE ACTION:

The need for the proposed action allows Petrogulf an opportunity to develop its federal lease, COC-64181, by drilling 11 exploratory wells and, if successful, to produce commercial quantities of gas from its federal lease. This activity is an integral part of BLM's gas leasing program under authority of the Mineral Leasing Act of 1920, as amended by the Federal Land Policy and Management Act of 1976 and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. Additionally, oil and gas exploration and development is recognized as an appropriate use of public lands in the Glenwood Springs Resource Management Plan as amended by the Glenwood Springs Resource Area, Resource Management Plan Amendment, published March 1999.

PLAN CONFORMANCE REVIEW:

The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.30):

Name of Plan: Glenwood Springs Resource Management Plan

Date Approved: Amended in November 1991 – Oil and Gas Leasing and Development – Final Supplement Environmental Impact Statement; amended November 1996 – Colorado Standards and Guidelines; amended in August 1997 – Castle Peak Travel Management Plan; amended in March 1999 – Oil and Gas Leasing & Development Final Supplemental Environmental Impact Statement; amended in November 1999 – Red Hill Plan Amendment; and amended in September 2002 – Fire Management Plan for Wildland Fire Management and Prescriptive Vegetation Treatment Guidance.

Decision Language: The proposed Helmer Gulch Federal 31-41 Drill Pad will be located within Region 4 of the FSEIS. One of the objectives of the FSEIS is to facilitate orderly, economic and environmentally sound exploration and development of oil and gas resources using balanced multiple-use management. The development of other resource uses/values within this unit is allowed consistent with the management objectives for oil and gas resources.

Another objective and requirement of the FSEIS is the submittal of a Geographic Area Plan (GAP) that describes a minimum of two to three years activity for operator-controlled federal leases within a reasonable geographic area (to be determined jointly with the BLM). The GAP will be used to plan development of federal leases within the area, to account for well locations, roads, and pipelines, and to identify cumulative environmental effects and appropriate mitigation. A GAP for the proposed action is not required since the well bores are considered exploratory in nature.

The lease, COC-64181, was issued in December 2000, with appropriate stipulations attached that were required to be in conformance with the FSEIS. The stipulations allow the BLM to manage oil and gas development as called for in the FEIS. The proposed action has been reviewed for compliance with this plan (43 CFR 1610.5, BLM 1617.3), and is in conformance with the objectives for this management unit.

Standards for Public Land Health:
In February 1997, the Colorado Standards for Public Land Health became effective for all public lands in Colorado (BLM, 1998). These standards apply to five categories of resource values: 1) upland soils, 2) riparian systems, 3) plant and animal communities, 4) threatened and endangered species including BLM sensitive species, and 5) water quality. Standards describe conditions needed to maintain public land health and relate to all uses of the public lands.

There was a Land Health Assessment completed for this area in 2005 – The Rifle West Land Health Assessment – The vegetation portion determined that this area of the landscape was not meeting Standard 3. Problems noted were the widespread invasion of cheatgrass with a corresponding loss of other functional groups such as perennial native grasses and forbs. Also, sagebrush communities were dominated by old, decadent sagebrush with poor recruitment. This is just the vegetation component. The terrestrial wildlife and aquatic wildlife components were also analyzed in this Land Health Assessment. The impact analysis must address whether the proposed action of any alternatives being analyzed would result in impacts that would maintain, improve, or deteriorate land health conditions for that specific resource value. These analyses are located in specific elements listed below:

AFFECTED ENVIRONMENT / ENVIRONMENTAL IMPACTS / MITIGATION MEASURES

Approving individual APDs is contemplated by the FSEIS, which addressed the environmental impacts of oil and gas development. Implementing the proposed action is consistent with the Preferred Alternative described in the FSEIS. The environmental impacts of the Preferred Alternative are described in the FSEIS and will not be repeated here. For this EA, discussion of the environmental impacts will be limited to site-specific information not included in the FSEIS. In some cases, the conclusions of the FSEIS will be summarized if necessary to address public issues raised in scooping or to provide information necessary to the decision maker.

In addition, the discussion of environmental impacts will be limited to those remaining after reviewing the APD, the application and conformance to the FSEIS, and any changes or additions to proposal resulting from the on-site exam. The APD and subsequent review and adjustments result in on-the-ground requirements and development of site-specific Standard Conditions of Approval to provide the best location of the proposal to minimize and accomplish the objectives of the Glenwood Springs Reclamation Policy.

CRITICAL ELEMENTS

AIR QUALITY

Lease Stipulations: None

Affected Environment:

The Helmer Gulch Fed 31-41 Project Area is located in a semiarid (dry and cold), mid-continental climate regime. The area is typical of the western high country with abundant sunshine, low humidity, low rainfall and cold, snowy winters. The nearest meteorological measurements were collected at Rifle, Colorado (1910-2005) (WRCC 2006) and the project area is approximately six miles southwest of Rifle.

The annual average total precipitation at Rifle is 11.61 inches and includes an average total snowfall of 38.6 inches with December and January being the snowiest months. Precipitation is evenly distributed throughout the year. Table 1 shows the mean monthly temperature ranges and total precipitation amounts.

The Rifle area has cool temperatures with average daily temperatures (in degrees Fahrenheit; °F) ranging between 9.4 °F (low) and 36.8 °F (high) in mid winter and between 52.0 °F (low) and 90.2 °F (high) in mid summer. The frost-free period (at 32 °F) generally occurs from mid-May to mid-September.

Table 1. Mean Monthly Temperature Ranges and Total Precipitation Amounts.

Month	Average Temperature Range (°F)	Total Precipitation (inches)
January	9.4-36.8	0.86
February	16.5-43.8	0.77

March	24.2-53.7	0.95
April	31.4-64.2	1.02
May	38.7-74.0	1.00
June	43.2-90.2	0.73
July	52.0-90.2	1.02
August	50.4-87.6	1.13
September	41.4-79.4	1.11
October	31.1-67.3	1.2
November	21.3-51.4	0.89
December	12.4-39.4	0.93
ANNUAL	31.2-64.3	11.61

Source: (WRCC 2006)

Figure 1 shows the relative frequency of winds, with radial distributions by speed class, indicating the direction of the wind source. Table 2 provides the wind direction distribution in a tabular format. From this information, it is evident that the winds originate from the northwest to southwest nearly 33 percent of the time. The annual mean wind speed is approximately 4 mph. The frequency and strength of the winds greatly affect the dispersion and transport of air pollutants. The potential for atmospheric dispersion is good (although nighttime cooling will enhance stable air, inhibiting air pollutant mixing and transport). Dispersion conditions will be the greatest along ridges, plateaus, and on mountain tops. Table 3 shows the wind speed distribution.

Table 2. Wind Direction Frequency Distribution for Rifle, CO.

Wind Direction	Percent of Occurrence
N	3.1
NNE	2.3
NE	2.6
ENE	2.7
E	3.3
ESE	2.7
SE	2.3
SSE	3.0
S	2.9
SSW	2.9
SW	4.0
WSW	6.8
W	8.7
WNW	7.6
NW	6.0
NNW	3.9

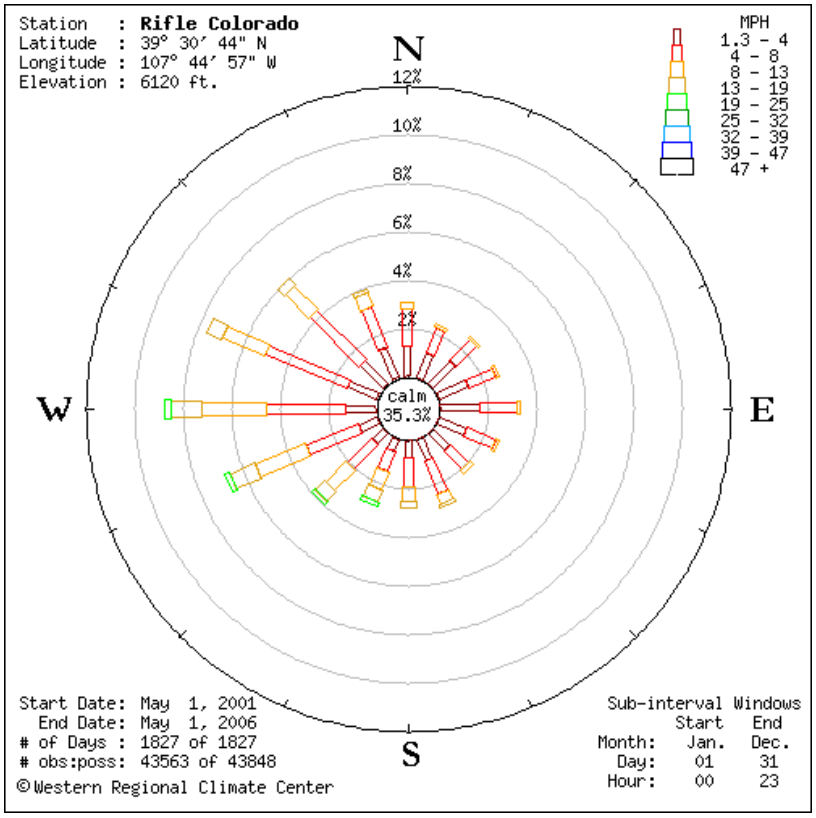
Source: WRCC 2006 - Rifle meteorological data collected 2001-2006.

Table 3. Wind Speed Distribution.

Wind Speed (miles/hour)	Percent of Occurrence
0-4.0	16.0
4.0-7.5	40.3
7.5-12.1	26.4
12.1-19.0	13.7
19.0-24.7	2.7
Greater than 24.7	1.0

Source: WRCC 2006 - Rifle, CO meteorological data collected 2001-2006.

Figure 1. Wind Rose for the Helmer Gulch Fed 31-41 Project Area.



Source: WRCC - Rifle, CO meteorological data collected 2001-2006.

The Colorado Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants at all locations to which the public has access. Although specific air quality monitoring has not been conducted in-field, regional air quality monitoring has been conducted near the study area. Air pollutants measured in the region for which ambient air quality standards exist include: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns in effective diameter (PM_{10}), particulate matter less than 2.5 microns in effective diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). Background pollutant concentrations for these pollutants are compared to the CAAQS and NAAQS in Table 4.

As shown in Table 4, regional background values are well below established standards, and all areas within the cumulative study area are designated as attainment for all criteria pollutants. Background air quality concentrations are combined with modeled project-related air quality impacts of the same averaging time periods, and the total predicted impacts are compared to applicable air quality standards.

Federal air quality regulations adopted and enforced by CDPHE limit incremental emissions increases to specific levels defined by the classification of air quality in an area. The Prevention of Significant Deterioration (PSD) Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict. The project area and surrounding areas are classified as PSD Class II. The PSD Class I areas located within 100 miles of the project area are Flat Tops Wilderness (approx. 37

miles NE), Maroon Bells – Snowmass Wilderness (approx. 65 miles SE), West Elk Wilderness (approx. 65 miles SE), Black Canyon of the Gunnison National Monument (approx. 70 miles S), Eagles Nest Wilderness (approx. 95 miles E), and Arches National Park (approx. 95 miles SW). Dinosaur National Monument (approx. 80 miles NW) is listed as a Federal Class II area, but is regulated as a Class I area for SO_2 by CDPHE. These sensitive areas have the potential to be impacted by cumulative project source emissions. Regional background pollutant concentrations, as well as NAAQS, CAAQS, and PSD Class I and II Increments, are presented in 4.

Table 4. Air Pollutant Background Concentrations, Colorado and National Ambient Air Quality Standards, and Prevention of Significant Deterioration (PSD Increments (ug/m^3).

Pollutant/Averaging Time	Measured Background Concentration	Colorado and National Ambient Air Quality Standards	Incremental Increase Above Legal Baseline PSD Class I	PSD Class II
Carbon Monoxide (CO) [1]				
1-hour	1,145	40,000	n/a	n/a
8-hour	1,145	10,000	n/a	n/a
Nitrogen dioxide (NO_2) [2]				
Annual	9	100	2.5	25
Ozone [3]				
1-hour	173	235	n/a	n/a
8-hour	145	157		
Particulate Matter (PM_{10}) [1]				
24-Hour	41	150	8	30
Annual	11	50	4	17
Particulate Matter ($PM_{2.5}$) [4]				
24-Hour	18	65	n/a	n/a
Annual	8	15	n/a	n/a
Sulfur dioxide (SO_2) [5]				
3-hour (NAAQS)	24	1,300	25	512
3-hour (CAAQS)	24	700	25	512
24-hour (NAAQS/CAAQS)	13	260	5	91
Annual (NAAQS/CAAQS)	5	80	2	20

[1] Background data collected at American Soda, Piceance 2003-2004 (CDPHE 2006).
[2] Background data based on a rural default that is based on Southern Ute stations near Ignacio (CDPHE 2006).
[3] 1-hour ozone based on Mesa Verde, 2003 data. 8-hour ozone based on CASTNET in Mesa Verde, Canyonlands, and Gothic (CDPHE 2006).
[4] Background data collected at 515 Patterson, Grand Junction, CO (CDPHE 2006).
[5] Background data collected at Unocal, 1983-1984 (CDPHE 2006).

Environmental Consequences/Mitigation:

The Helmer Gulch Fed 31-41 drill pad project includes constructing one well pad, an access road, a utilities trench, drilling eleven wells, and installing two 400 bbl condensate tanks, several

pumps to move water, and a small heater associated with the phase separators. The project does not include construction of any compressor stations or installation of any generators, dehydration units or other treatment processes. Well pad and road construction are anticipated to take two weeks.

Air quality would decrease during construction of the Helmer Gulch wells due to pollutants generated from drilling and well pad construction. These pollutants include combustion emissions and fugitive dust associated with construction equipment and vehicles. Construction activities would take place during the hours of 7:00 a.m. and 6:00 p.m. each day for approximately 2 weeks. Once construction activities are complete air quality impacts will also cease. Drilling (1100 hp Drilling Rig) all eleven wells is anticipated to take a little over one year (1.4 years) and assumes each well will take 24 days to drill, 20 days to complete and drill utilization will be approximately 40 percent. Table 5 annual emission rates from the Helmer Gulch Fed 31-41

Table 5. Potential Emissions from Drilling and Construction Activities

Source	Pollutant	Emission Factors (g/hp-hr)	Yearly Hours of Operation (hrs)	Annual Emissions (tons/year)	Reference
Drilling	NO_x	6.9	8760	29.3	Tier I
1100 HP Drill Rig	CO	8.5	8760	36.1	Tier I
	VOC	1	8760	4.2	Tier I
	PM_{10}	0.4	8760	1.3	Tier I
	$PM_{2.5}$		8760	0.2	EPA Multiplier
	Formaldehyde	0.0018	8760	0.06	AP42 Table 3.3-2
Construction	PM10	1.2	Tons/acre/month	2.8	AP42 13.2.3.3
2 dozers, 1 scrapper, 1 maintainer, duration 2 weeks	PM2.5			0.4	EPA Multiplier

The anticipated air impacts associated with well pad construction, utilities trench construction and drilling are limited in duration and are anticipated to be minor sources. The emissions from drilling are not anticipated to impact any of the Class I areas. These activities are also not anticipated to exceed any ambient air quality standards.

Once the wells are installed ancillary equipment will be installed associated with production and operation including: two 400 bbl condensate tanks, several water pumps, and small heaters associated with the separators. The pumps are anticipated to small 10-25 hp units and will be used to move water from the sites. Similarly, small 500 BTU/hr heaters will be installed on the separators. The emissions from the pumps and heaters are anticipated to be negligible. The emissions from the condensate tanks are provided in Table 6. The calculated estimates assume that 15 bbl/day of water will be produced from each well and approximately 10 percent of the produced water will be condensate.

Table 6. Condensate Tank Emission Estimates

Source	Pollutant	Emission Factors (lb/bbl)	Production (bbl/day)	Annual Emissions (tons/year)	Reference
2-400 BBL Condensate Tanks	VOC	10	35	30	CDPHE Guidance for Garfield County

The anticipated air impacts associated with the condensate tanks are minor. If condensate production increases, emissions can be recalculated using TANKs and extended fuel analyses. If VOC emissions need to be reduced, a vapor recovery of thermal destruction system can be installed.

The potential effect on Air Quality Related Values (visibility and acid deposition) in Class I areas are considered in a NEPA analysis. The BLM recently published the Roan Plateau draft Environmental Impact Statement. The DEIS included a cumulative analysis of oil and gas development in the Glenwood Springs Resource Area that included approximately the effects from about 3,500 new wells in the future. The analysis concluded that this level of development, along with other reasonably foreseeable pollutant sources, would have no adverse effect on Air Quality Related Values at either Flat Tops or Maroon Bells. Therefore, it can be concluded that the much smaller level of development of the Helmer Gulch Federal 31-41 Drill Pad would not have effect on these Class I areas.

Impacts of the No Action Alternative:
None. If the proposed action is not implemented then there will not be any air pollutant emissions from drilling, construction, or operation.

Mitigation**:**
The drill rig and construction equipment will be maintained in good operating condition to ensure that engines are running efficiently. Vehicles and construction equipment with emission controls will also be maintained to ensure effective pollutant emission reductions.

Fugitive dust will be minimized by the following procedures. At the request of residents, counties, or BLM, unsurfaced roads that generate excessive dust will either be watered, covered with a county or BLM approved chemical binder, or other dust control method satisfactory to the landowner.

Traffic controls may be implemented including decreased speed limits with appropriate enforcement, or other traffic calming methods to minimize fugitive dust. All unpaved areas of the project will be sufficiently watered to prevent fugitive dust from causing a public nuisance or violation of any ambient air standards. Speed limit reductions will be a minimum of 10 mph below the posted speed limit on unpaved roads, or greater as determined in the field based on site conditions. Disturbed areas will be revegetated as soon as possible after construction of a given segment is completed.

If condensate production increases to a level where VOC emissions need to be reduced, a vapor recovery or thermal destruction system can be installed to minimize emissions.

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

Lease Stipulations: None

Affected Environment:

There are no proposed or designated Areas of Critical Environmental Concern (ACECs) located within or adjacent to the proposed action. The nearest ACEC is the Lower Colorado River Cooperative Management Area (LCRCMA), located approximately 1.8 miles north of the proposed action. The LCRCMA protects important wildlife and riparian values of the Colorado River. The proposed action would not affect the LCRCMA or other ACECs managed by the GSFO.

Environmental Consequences/Mitigation:

No existing or proposed ACECs would be affected by the proposed project.

CULTURAL RESOURCES

Lease Stipulations: None

Cultural resources are fragile and nonrenewable remains of prehistoric and historic human activity, occupation, or endeavor as reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, traditional cultural properties and natural features that were of importance in human history. Cultural resources comprise the physical remains themselves, the areas where significant human events occurred even if evidence of the event no longer remains, and the environment surrounding the actual resource. The cultural resources inventory was initiated by Grand River Institute in 2001 (Conner 2001; GSFO #1101-4) and completed and analyzed by Alpine Archaeological Consultants, Inc. in 2004, 2005 and 2006 (Neely and Pfertsh 2004, Kinner-Ferris 2006; GSFO #8305-1). Because of the sensitive nature of cultural resources, the technical reports for this project are not included with the EA.

The National Historic Preservation Act (NHPA) of 1966 and the Archaeological Resource Protection Act of 1979 provide for the protection of significant cultural resources. Section 106 of the NHPA describes the process that federal agencies must follow to identify, evaluate, and coordinate their activities and recommendations concerning cultural resources. Significant cultural resources (historic properties) are defined as those listed on, or eligible for listing on, the National Register of Historic Places (NRHP). Significant cultural resources are generally at least 50 years old and meet one or more of the criteria presented in 36CFR60.

Affected Environment:

For the purposes of this analysis, the study area for the identification of cultural resources was defined the Area of Potential Effect (APE) for the Helmer Gulch Fed. 31-41 drill pad and two associated access roads. To accommodate potential changes to pad size, location and orientation, and access road alignment, a buffer around these areas was also inventoried. The study area is in the Piceance Basin of Garfield County, approximately 2 miles southwest of the town of Rifle, Colorado.

Environmental Consequences/Mitigation:

Issues and Significance Criteria
Impacts to cultural resources that are caused directly or indirectly by project activities would be significant only if they occur to a historic property Disturbance to historic properties, is an adverse effect, and should be avoided or the adverse effects mitigated.

Impacts of the Proposed Project
No historic properties were identified during the inventory, therefore formal consultation was not initiated with the Colorado State Historic Preservation Officer and a determination of “No Historic Properties Affected” was made based upon results of the inventories, the National Historic Preservation Act (16 U.S.C. 470f), the BLM/SHPO National Programmatic Agreement (1987) and Colorado Protocols (1998).

Indirect long term cumulative impacts from increased access and personnel could result in a range of impacts to known and undiscovered cultural resources in the vicinity of the location, from illegal collection and excavation to vandalism.

Impacts of the No Action Alternative
This alternative would be neither beneficial nor detrimental to cultural resources.

Mitigation Measures
A standard Education/Discovery Condition of Approval for Cultural Resource protection is included under 12(d) of the Surface Use Plans of the APDs. The importance of the Education/Discovery Stipulation needs to be stressed to the proponent and their contractors informing them of their responsibilities to protect and report any cultural resources encountered on public land during operations under this permit. Should any cultural resources that were not identified during the Class III surveys be encountered, all activities at that location will be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out.

ENVIRONMENTAL JUSTICE

Lease Stipulations: None

Affected Environment:

The proposed action is not expected to create a disproportionately high and adverse human health impact or an environmental effect on minority or low-income populations within the area.

Environmental Consequences/Mitigation:

N/A

FARMLAND, PRIME AND UNIQUE

Lease Stipulations: None

Affected Environment:

No prime or unique farmlands would be affected by the proposed action.

Environmental Consequences/Mitigation:

N/A

FLOODPLAINS, WETLANDS AND RIPARIAN ZONES

Lease Stipulations: A Controlled Surface Use Stipulation for the purpose of protecting Riparian and Wetland Zones. For those within 500 feet of the outer edge of the riparian or wetland vegetation, activities associated with oil and gas exploration and development, including roads, pipelines and wellpads, may require special design, construction, and implementation measures, including relocation of operations beyond 200 meters, in order to protect the values and functions of the riparian and wetland zones. Such measures will be based on the nature, extent and value of the riparian vegetation are most important to the function of the riparian zone and will be avoided.

Affected Environment:

Floodplain habitats occur along the intermittent drainages within Helmer Gulch, but no floodplain habitat would be impacted by the proposed action. No wetland habitats or riparian zones have been documented along Helmer Gulch. The proposed action is outside the protected area which is in the E2NE of Section 29 of Township 6S, Range 93W.

Environmental Consequences/Mitigation:

Indirect and cumulative impacts, i.e., sedimentation to floodplains, are discussed under the Water Quality (Surface and Ground Water) section of this EA. No well pads or new access roads would be located within the riparian corridors or wetlands. Therefore, there will be no impact to these resources.

GEOLOGY AND MINERALS

Lease Stipulations: None

Affected Environment:

The site is underlain by claystone, siltstone, sandstone, and conglomerate bedrock of the Wasatch and Ohio Creek Formations (Tweto et al., 1978). The target zones for natural gas to be extracted lie within the Cretaceous-age Williams Fork formation (5119 to 8169 feet below the surface) and the Cameo Coal beds (8169 to 8669 feet below the surface).

The project area lies within an area of relatively low seismic risk (Algermissen, 1969). No faults, active or inactive, are located within the vicinity of the site (Tweto et al., 1978). The site is located in an area of unstable slopes which are subject to natural translational or rotational landslides and/or earthflows (Soule and Stover, 1985).

The site is located within the Rulison gas field, an area of early Tertiary and late Cretaceous gas-bearing formations, within the larger Piceance sedimentary basin (Wray et al., 2002). The site also lies within the Uinta Coal Region which contains Cretaceous Age coal-bearing formations (Rushworth et al., 1988) although, at the site, these deposits are too deep to be economically exploitable.

Environmental Consequences/Mitigation:

INVASIVE, NON-NATIVE SPECIES and NOXIOUS WEEDS

Lease Stipulations: None

Affected Environment:

The pad and proposed road lie within pinyon/juniper and sagebrush shrubland. There are dense patches of cheatgrass (*Bromus tectorum*) that occupy the understory of the pad and the proposed road. It also grows alongside the roadbed that will be improved to provide access to the well site. Cheatgrass is on the Colorado Weed List (CWMA, 2006). No other infestations of weeds on the Colorado Weed List were noted during the biological surveys conducted during April and June. Very few native plants occur in the project area.

Environmental Consequences:

Surface-disturbing activities provide a niche for the invasion and establishment of noxious and non-native species, particularly when these species are already present in the surrounding area. Because cheatgrass is already a component of the vegetation on the pad and along the road, the potential for cheatgrass invasion following construction is extremely high.

Mitigation:

In order to minimize the high potential for invasion of cheatgrass and other weeds, these steps will be taken:

- All disturbed areas not needed for immediate access to the wells will be seeded with a mixture of native shrubs and grasses, and native or desirable non-native forbs. The seed mix designed to reclaim the disturbed areas can be found in the Vegetation section. Petrogulf Corporation will adhere to the specified seed mix and will continue with reclamation activities, including additional reseeding if necessary, until interim reclamation objectives are achieved.
- The seed will be certified free of noxious weeds. All seed to be applied to public land must have a valid seed test, within one year of the acceptance date, from a seed analysis lab by a registered seed analyst (Association of Official Seed Analysts). The seed lab shall show no more than 0.5 percent by weight of other weed seeds; and the seed lot shall contain no noxious, prohibited, or restricted weed seeds" according to the All States Noxious Test. Seed may contain up to 2.0 percent of "other crop seed" by weight which includes the seed of other agronomic crops and native plants; however, a lower percent of other crop seed is recommended. Seed tags shall be supplied to the Glenwood Springs BLM Energy Office Ecologist at least 14 days prior to the date of proposed seeding for acceptance. Seed which does not meet the above criteria shall not be applied to public lands.
- A Standard Condition of Approval is attached requiring Petrogulf Corporation to monitor for the presence of any Colorado-listed noxious weeds at least once or twice annually during the growing season until final reclamation of the pad is complete. The project proponent will promptly treat and control any noxious weeds. A Pesticide Use Proposal must be approved by BLM prior to the use of herbicides.

Because cheatgrass is already abundant in the general vicinity, it may not be feasible to completely eliminate it from the project area. Therefore, if the area adjacent to the project site contains less than a 50% cover of cheatgrass, interim reclamation will be considered acceptable

when the cover of cheatgrass on the project site does not exceed 5%. If the area adjacent to the project site contains more than a 50% cover of cheatgrass, interim reclamation will be considered acceptable when the cover of cheatgrass on the project site does not exceed 50%.

MIGRATORY BIRDS

Affected Environment:

The project area is comprised primarily of pinyon-juniper woodlands with a grass and forb understory. Given this vegetation the project area provides cover, forage, breeding, and nesting habitat for a variety of migratory birds. A few species found on the U. S. Fish and Wildlife Service's Birds of Conservation Concern list may be present including the Gray Vireo, Pinyon Jay, and Black-throated Gray Warbler.

Raptors

A variety of raptor species are known to exist in this area, including, but not limited to; turkey vulture, golden eagle, northern harrier, red-tailed hawk, Swainson's hawk, and American kestrel. A raptor survey was conducted by O&G Environmental on behalf of Petrogulf Corporation during April of 2006. No active nest sites were identified within the greater Helmer Gulch project area.

Environmental Consequences/Mitigation:

The proposed action will result in the removal of a total of 13.4 acres of vegetation due to pad, road, and pipeline construction. Some of the vegetation loss will be short-term until such time as interim reclamation is completed. Total long-term vegetation/habitat loss is estimated at 8.6 acres. Where larger pinyon and juniper trees are removed and replaced with grasses and forbs, the vegetation/habitat will not function as it does in its current capacity. This will result in a loss of cover, forage, breeding and nesting habitat. If vegetation clearing is conducted during the spring nesting season then the action could result in the destruction of nests and/or eggs. The action will further fragment habitat and reduce habitat patch size and connectivity in the area. Use of heavy equipment will likely displace birds away from preferred habitats for a short time due to noise and human presence.

The development of reserve pits in the project area may be expected to attract waterfowl and other migratory birds for purposes of resting, foraging, or as a source of free water. The extent and nature of the problem is not well defined, but management measures must be conservative and relegated to preventing bird contact with produced water and drilling and completion fluids that may pose a problem (e.g., acute or chronic toxicity, compromised insulation).

<u>Mitigation:</u>

It will be the responsibility of the operator to comply with the Migratory Bird Treaty Act with respect to "take" of migratory bird species. As such, the operator is requested to prevent use by migratory birds of reserve pits, produced water pits, and evaporation pits, that store or are expected to store fluids which may pose a risk to such birds (e.g., migratory waterfowl, shorebirds, wading birds and raptors) during completion and after completion activities have ceased. Several established methods to prevent bird access are known to work. Methods may include but are not limited to netting, the use of bird-balls, or other alternative methods that

effectively prevent bird access/use. Regardless of the method used, it will be applied within 24 hours after completion activities have begun. All lethal and non-lethal events that involve migratory birds will be reported to the Natural Resource Specialist immediately upon their discovery.

NATIVE AMERICAN RELIGIOUS CONCERNS

Lease Stipulations: None

Affected Environment:

At present, no Native American concerns are known by the GSFO within the project area. However, the Southern Ute tribe has identified all of the surrounding areas as their native homeland. If new data are disclosed, new terms and conditions may have to be added to the permit to accommodate these concerns.

Environmental Consequences/Mitigation:

Should any cultural resources that were not identified during the Class III surveys be encountered, all activities at that location will be suspended until the provisions of the National Historic Preservation Act and enabling legislation have been carried out. A standard Education/Discovery Condition of Approval for Cultural Resource protection is included under 12(d) of the Surface Use Plans of the APDs.

THREATENED, ENDANGERED, and SENSITIVE SPECIES

Affected Environment:

According to the latest species list from the U. S. Fish and Wildlife Service, the following federally listed and candidate species may reside or be impacted by actions occurring in Garfield County: bald eagle (*Haliaeetus leucocephalus*), Canada lynx (*Lynx canadensis*), Mexican spotted owl (*Strix occidentalis*), black-footed ferret (*Mustela nigripes*), Uinta Basin hookless cactus (*Sclerocactus glaucuc*), Parachute beardtongue (*Penstemon debilis*), DeBeque phacelia (*Phacelia submutica*), yellow-billed cuckoo (*Coccyzus americanus*), razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), bonytail chub (*Gila elegans*), and humpback chub (*Gila cypha*).

Specific to the project location, no Federal or State listed Threatened or Endangered species, or Federal Proposed or Candidate species are known to occur in the project area. BLM sensitive species located in the area and which may be affected by project activities are addressed below.

Harrington beardtongue (*Penstemon harringtonii)*

The BLM Sensitive plant species Harrington beardtongue has been observed approximately one mile south, southwest, and southeast of the proposed project area in the general vicinity of Flatiron Mesa. According to Colorado's Rare Plant Field Guide (CRPFG, 1999) habitat for Harrington beardtongue is open sagebrush or, less commonly, pinyon-juniper habitats. Soils are typically rocky loams and rocky clay loams derived from coarse calcareous parent materials ranging in elevation from 6,800-9,200 ft. While this species is known to occur in the area, the density of sage and pinyon-juniper cover at the proposed site is likely to preclude the presence of Harrington

beardtongue. Surveys for Harrington beardtongue were conducted in 2004 and 2005. A survey for the penstemon was conducted on June 13 and 14, 2006 by Dan Fillipi, O&G Environmental Consulting LLC, at the well pad location and along the proposed access road. The botanical survey was a 40-acre survey centered on the pad and at least 100 ft buffer on the proposed road. Harrington's beardtongue was not observed on the proposed well pad or along the access road, nor is there suitable habitat for this species in the project area.

Analysis on the Public Land Health Standard for Threatened & Endangered species: The area where Harrington's penstemon is found has experienced increasing levels of natural gas development in the past few years. The facilities and associated disturbances frequently take place in or immediately adjacent to existing populations of the rare plant. Although the disturbances are usually relocated to minimize direct losses to the population, often a portion of the occurrence is impacted by construction activities and potential habitat is being lost. Furthermore, indirect impacts associated with invasion of noxious weeds or competition from aggressive non-native species may cause additional impacts to the populations.

Standard 4 is presently being met for this species, but the populations are at risk due to increasing natural gas development within its habitat. The proposed action should not result in a failure of the area to achieve Standard 4 for special status, threatened or endangered species.

WASTES, HAZARDOUS OR SOLID

Lease Stipulations: None

Affected Environment:

There are no Superfund sites, hazardous waste sites, toxic release sites, waste water dischargers, or air emission sites within one-mile of the proposed action (EPA, 2006). All wastes associated with the project will be managed in accordance with the applicable oil and gas regulations and on-shore orders.

Environmental Consequences/Mitigation:

Use of a closed-loop drilling system will reduce the amount of solid waste associated with the drilling process, and potentially allow for beneficial use of solid waste in the construction of berms.

WATER QUALITY – GROUND

Lease Stipulations: None

Affected Environment:

No water supply wells exist within one-half mile of the Federal 31-41 Drill Pad, T.6 S., R. 93 W., Sections 30 and 31. Table 8 lists the 40 domestic and stock water wells within and near the Helmer Gulch Geographic Area. These wells are generally completed in lenticular sands within the Wasatch Formation, or in shallow alluvial deposits in Helmer Gulch. As

described in the Drilling Program section of this document, surface casing will be cemented into the borehole from the surface to 1500 feet deep, adequately protecting any potential fresh water zones penetrated.

Table 8. Water Wells Within and Near Helmer Gulch Geographic Area

Permit #	Use	Well Yield	Well Depth	Water Level	Twp Rng	Section	Qtrs	Feet to Sec lines
128264	dom	0	0	0	6S, 93W	19	NWNW	
151226	dom	0	0	0	6S, 93W	19	SWNW	2500N, 1200W
23340F	dom	0	0	0	6S, 93W	19	NWSW	
91059	household	0	0	0	6S, 93W	20	NWNW	
45735FR	dom	0	0	0	6S, 93W	20	NESW	2561S, 1596W
60638	dom	15	0	0	6S, 93W	20	SWSW	
229543	household	0	0	0	6S, 93W	21	NWNE	100N, 2000E
126351	dom	0	0	0	6S, 93W	28	SENW	
126348	dom	0	0	0	6S, 93W	28	NESW	
156538	dom	0	0	0	6S, 93W	30	NENW	1100N, 1600W
25731F	irrig	0	0	0	6S, 93W	31	NWNW	190N, 656W
212420	dom	4.5	12	0	6S, 93W	30	NENE	366N, 1180E
109238	dom	0	99	19	6S, 93W	21	NWNE	650N, 1420E
45735F	dom	15	120	70	6S, 93W	20	SENW	2715S, 1750W
221943	dom	8	130	85	6S, 93W	20	NWSW	2400S, 4100E
227537	household	7	130	90	6S, 93W	30	NWNW	1250N, 150W
262716	dom	15	145	10	6S, 93W	19	SWNE	1681N, 2230E
32393	dom	8	147	80	6S, 93W	31	SENW	
109238A	dom	1.5	150	70	6S, 93W	21	NWNE	50N, 1575E
247477	dom, stock	15	160	129	6S, 93W	19	SENW	1620N, 2740E
206279	dom	10	180	147	6S, 93W	19	SESE	800S, 500E
74008	household	6	200	100	6S,	19	NWSW	2000S, 900W

					93W			
49477F	dom	15	200	145	6S, 93W	19	NESW	1350S, 1920W
117935A	dom	10	224	119	6S, 93W	19	NESW	2353S, 1760W
200884	dom	4.2	235	83	6S, 93W	30	SWNW	3500S, 4100E
45475F	dom	10	240	150	6S, 93W	19	NESW	2500S, 2900E
255718	dom	10	240	185	6S, 93W	19	NWSE	1690S, 2210E
170967	dom	3	250	230	6S, 93W	30	NENW	150N, 2000W
59657A	dom	10	255	155	6S, 93W	20	SWSW	750S, 400W
209345	dom	5	260	150	6S, 93W	21	SESE	125S, 200E
153709	household	12	265	223	6S, 93W	19	SESW	200S, 1400W
218194	dom	3	280	160	6S, 93W	21	NESE	1400S, 900E
227538A	dom, irrig	5	280	235	6S, 93W	30		150N, 350W
199383	dom, stock	4.6	280	254	6S, 93W	21	NWSW	1420S, 4010E
227538	dom	5	290	250	6S, 93W	30	NWNW	150N, 323W
71777	dom	5	300	80	6S, 93W	21	NWNE	250N, 2150E
221306	dom	10	302	270	6S, 93W	21	SESW	1000S, 3100E
37665	dom	12	310	200	6S, 93W	19	NWSW	
201481	dom	10	318	267	6S, 93W	21	SWSW	1000S, 1100W
211934	dom	0	320	0	6S, 93W	21	NWSE	1500S, 1600E
From Colorado DNR Division of Water Resources, Records Section								

Environmental Consequences/Mitigation:

Drilling and construction will be done in accordance with the Drilling Program herein, and utilizing best management practices, no significant adverse impact to groundwater aquifers and quality is anticipated.

Analysis on the Public Land Health Standard for water quality:

WATER QUALITY – SURFACE

Lease Stipulations: None

Affected Environment:

The proposed action is bound on the east by an unnamed ephemeral drainage, and on the west by Helmer Gulch with several unnamed ephemeral drainages in between, and occurs within an unnamed sub-watershed. The drainages are G-Type (Rosgen, 1996) channels and are characterized by steep slopes consisting of juniper woodlands. Runoff from the pad may ultimately flow north and northwest through unnamed ephemeral drainages to Helmer Gulch, which is tributary to the Colorado River north of the proposed area. No springs will be affected by the proposed action.

The State of Colorado has developed *Stream Classifications and Water Quality Stadards* (CDPHE, Water Quality Control Commission, Regulation No. 37) that identify beneficial uses of water and numeric standards used to determine allowable concentrations of water quality parameters. The ephemeral drainages are designated as use-protected stream segments. The use-protected designation refers to waters that the State of Colorado has determined do not warrant the level of protection provided by the outstanding waters designation or the antidegradation rule (CDPHE, Water Quality Control Commission, Regulation No. 31).

These segments are classified Cold Aquatic Life – Class 2; Recreation – Class 2; Agricultural; and suitable for Domestic Water Supply. Numeric standards include a comprehensive list of physical, biological, inorganic, and metal standards that have been established to protect the designated uses above. At this time there is no water quality data for the unnamed ephemeral drainages.

The State of Colorado has developed a *303(d) List of Water Quality Limited Segments Requiring TMDLS* (CDPHE, Water Quality Control Commission, Regulation No. 93) that identifies stream segments that are not currently meeting water quality standards with technology based controls alone. Helmer Gulch and the unnamed ephemeral drainages are within the Lower Colorado River Basin segment COLCLC13a that consists of tributaries to the Colorado River below Parachute Creek. These two drainages are not listed for any impairment.

The State of Colorado has developed a *Monitoring and Evaluation List* (CDPHE, Water Quality Control Commission, Regulation No. 94) that identifies water bodies suspected to have water quality problems. The two unnamed ephemeral drainages do not fall into any listed segment. However, the Colorado River from Parachute Creek to the Gunnison River (segment COLCLC02) is listed for sediment.

Environmental Consequences/Mitigation:

Proposed activities would temporarily remove soil and vegetation resulting in an increase in erosion potential and offsite sedimentation. With measures to control runoff water in place, reestablishment of vegetation, and proper engineering of roads; the potential for sediment transport to the ephemeral drainages and Helmer Gulch would be minimized. The following mitigation measures will be implemented to protect surface water.

- The operator will consult with the State of Colorado Water Quality Control Division regarding stormwater discharge permits prior to commencing construction activities. All construction activities that disturb once acre or greater require a stormwater discharge permit. Written documentation to the Authorized Officer is required to indicate that appropriate permits have been obtained or are not required by the permitting agency.
- Roads will be crowned, ditched, surfaced, and constructed to BLM Gold Book standards.
- Well pads will be constructed to BLM Gold Book standards. Fill slopes will be seeded to minimize erosion and protected with silt fences to prevent sediment from leaving the site.
- An engineered reserve pit will be requird to store drilling muds, cuttings, fracing material, and any other byproducts of production activities.

WILD AND SCENIC RIVERS

Lease Stipulations: None

Affected Environment:

There are no un-studied rivers, rivers found to eligible or designated Wild and Scenic Rivers (WSR) within the proposed project area.

Environmental Consequences/Mitigation:

No eligible or designated WSRs will be affected by the proposed project.

WILDERNESS

Lease Stipulations: None

Affected Environment:

There are no Wilderness Areas (WAs), Wilderness Study Areas (WSAs), or citizens proposed wilderness areas located within or adjacent to the proposed action (GSFEIS 1983).

Environmental Consequences/Mitigation:

No existing WAs, WSAs, or citizens proposed wilderness area that would be affected by the proposed project.

<u>NON-CRITICAL ELEMENTS</u>

HYDROLOGY AND WATER RIGHTS

See Water Quality, Surface and Ground sections.

NOISE

Lease Stipulations: None

Affected Environment:

There would be increased levels of noise during the construction, drilling, and completion phases of the proposed action. However, the elevated noise levels would be temporary and would be most noticeable along the existing and proposed access roads used to haul equipment. These noise impacts are not expected to be significant. The Colorado River corridor is well shielded from the proposed well pad by mature, native vegetation, such as pinyon-juniper vegetation and if left undisturbed would absorb some of the noise during the construction, drilling, and completion phases. There are no sensitive residential or recreational receptors nearby that would be impacted.

Environmental Consequences/Mitigation:

Where possible, avoid/minimize removal of the mature stands of pinyon-juniper vegetation on the north end of the proposed pad.

PALEONTOLOGY

Lease Stipulations: None

Affected Environment:

This proposed project falls within a Class II area, which is considered an area not considered high in paleontological value, and is unlikely to produce fossils. The entire proposed disturbance is on land with dense soil and vegetation, and there are no exposed rock outcrops, boulders or rocks from any Class I formations that will be disturbed. The project area has not been identified as requiring an inventory prior to project approval.

Environmental Consequences/Mitigation:

If fossils are located in the project area, the discovery can be mitigated by ceasing operations and notifying the BLM authorized officer. A standard Education/Discovery Condition of Approval for paleontological discovery will accompany APD approval.

RANGE MANAGEMENT

Lease Stipulations: None

Affected Environment: The proposed access road will have a 20 foot travel way with borrow ditches, and extend approximately 3800 feet. This would be equivalent to 1.75 acres of area lost for vegetative production. Production from this area consists mostly of pinyon and juniper woodland and is of varying value to livestock. Forage production lost would be less than one Animal Unit Month (AUM).
The proposed road crosses section 30 which is part of the Beaver Mamm Allotment. There are two operators permitted on this allotment for a total of 628 AUMs. The following table shows cattle numbers and season of use.

45	CATTLE	5/15/2004	10/15/2004
79	CATTLE	5/15/2001	10/15/2001

The dominant vegetation type in the project area is juniper woodlands.

Environmental Consequences/Mitigation:

Forage production lost would be less than one Animal Unit Month (AUM).

If construction of the road leads to damage of any range improvement projects such as fence lines and water developments the holder of proposed road ROW will be responsible for replacement of such improvements immediately. If the road crosses fence lines it is recommended that a cattle guard is placed in the road.

RECREATION

Lease Stipulations: None

Affected Environment:

No recreation areas primitive or developed are located within or adjacent to the proposed action (GSFEIS 1983). Further, on BLM-administered lands, the Recreation Opportunity Spectrum (ROS) is a classification system and a prescriptive tool for recreation planning and management. ROS classes include primitive (P), semi-primitive non-motorized (SPNM), semi-primitive motorized (SPM), roaded natural (RN), rural (R), and modern urban (MU). The proposed action is located within designated RN ROS areas.

The RN physical and social recreation setting is typically characterized by a natural appearing environment with moderate evidence of the sights and sounds of man, where modification and use practices are evident, but harmonize with the natural environment (GSDEIS 1982).

Environmental Consequences/Mitigation:

There are no developed or primitive recreation areas that would be affected by the proposed project. The proposed action will not conflict with the RN ROS classification objectives.

SOILS

Lease Stipulations: A Controlled Surface Use Stipulation for the purpose of protecting Erosive Soils and Slopes Greater Than 30 Percent. Special design, construction, and operation and reclamation measures will be required to limit the amount of surface disturbance, to reduce erosion potential, to maintain site stability and productivity, and to ensure successful reclamation in identified areas of highly erosive soils and of slopes greater than 30 percent. Highly erosive soils are soils in the “severe” and “very severe” erosion classes based on NARCS Erosion Condition mapping. Areas identified in the RMP as Erosion Hazard Areas and Water Quality Management Areas are also included in this stipulation. Implementation may include relocation of operations beyond 200 meters.

A No Surface Occupancy Stipulation for the purpose of protecting Steep Slopes. To maintain site stability and site productivity, on slopes greater than 50 percent. This NSO does not apply to pipelines.

Affected Environment:

The pad and access road will be located in an area of soils identified as Torriorthents-Rock outcrop complex, steep (Harman and Murray, 1985). Torriorthents make up about 60 percent of this complex, rock outcrop makes up 25 percent, and about 15 percent is comprised of intermittent areas of other soils. The soils in this complex are generally clayey to loamy containing variable amounts of gravel, cobbles, and stones. The rock outcrop is claystone, siltstone, sandstone, and conglomerate of the Eocene- and Paleocene-age Wasatch and Ohio Creek Formations. These soils are located on foothills and mountainsides with slopes ranging from 15-70 percent. The depth to bedrock is shallow to moderately deep (less than 60 inches). Drainage, permeability, and runoff are variable. This soil complex is used for limited grazing, wildlife habitat, and recreation.

According to the NRCS soil survey (Harman and Murray, 1985), the water erosion hazard for these soils is moderate to severe for this soil complex, varying with slope. Slopes at the pad average 5 to 10 percent and range from 5 to 35 percent along the access road. Therefore, the water erosion hazard would be moderate for most of the affected area based on NRCS data. However, data provided by the BLM Glenwood Springs Field Office (2006) indicate that the pad and access road are within a low water erosion hazard area. There is no wind erosion hazard for the rock outcrop areas and a moderate wind erosion hazard for the Torriorthents soils. Reclamation of the plant communities native to these soils is expected to be challenging based on their land capability class of VIIe (on a scale of I to VIII).

Environmental Consequences/Mitigation:

No drilling activities will occur in the soil classed as Torriorthents-Rock outcrop complex, steep. Clearing, grading, and movement of construction equipment within the pad and access road footprint will remove the protective vegetation cover from these soils accelerating the erosion process. Water erosion of soils associated with well pad development is a concern because it results in loss of valuable topsoil by sheet, rill, and gully erosion. Eroded topsoil and subsoil contribute to increased sedimentation of area streams and wetlands. Sedimentation adversely affects water quality and aquatic life in perennial water bodies located downstream of the Proposed Project.

On both the well pad and access roads, there will be the potential for accidental spills or leaks of petroleum products and hazardous materials during pad construction, drilling, and well operation. Leaks and spills will cause soil contamination and an associated decrease in soil fertility and revegetation potential.

Impacts of the project on soil resources would be minimized by implementing measures for handling topsoil and subsoil, erosion control, compaction, spill control, and reclamation. These measures include:

- Adherence to the Controlled Surface Use Stipulation for Erosive Soils as required by the BLM Glenwood Springs Field Office.
-

- Topsoil would be stripped to a depth of 6 to 12 inches depending on its depth. Any subsoil stripped during grading would be stored separately from topsoil to prevent mixing. During reclamation, soils would be returned to their pre-construction locations.
-
- The well pad will be constructed in accordance with BLM Gold Book standards including Best Management Practices (BMPs) designed to minimize erosion and offsite sedimentation. Temporary erosion and sediment control BMPs may include silt fences, soil roughening, diversion channels, graveled surfaces, and sedimentation basins (if needed). These BMPs would be put in place immediately following clearing and grading of the pad and access road. These structures/measures would be actively maintained and would be removed during reclamation, as appropriate.
-
- Effects of leaks and spills of petroleum products and hazardous materials would be minimized by implementation of the project Spill Prevention, Control, and Countermeasures Plan. Measures would include use of containment structures, regular inspection of machinery and storage containers, over-excavation of spill-impacted soils, and disposal of impacted soils and cleanup material at authorized facilities.

- The proposed access road will be crowned, ditched, graveled, and include drainage features in accordance with BLM Gold Book standards. Initial gravel application will be a minimum of 4 inches. The road will be periodically re-graveled when ruts exceed 6 inches in depth or as directed by the BLM authorized officer.

- During site reclamation, compacted soils would be loosened using a tractor-pulled ripper or similar device. The pad and access road would be returned to their preconstruction contours. All disturbed areas would be seeded with BLM/NRCS-recommended seed mixes. Permanent erosion control measures such as slope breakers, mulch, and erosion-control netting would be installed where needed.

Analysis on the Public Land Health Standard for Upland Soils:

With implementation of successful topsoil handling procedures, effective erosion and sediment controls, and application of appropriate BMPs for restoration, the Proposed Project would be unlikely to prevent achievement of Standard 1.

ACCESS AND TRANSPORTATION

Lease Stipulations: None

Affected Environment:

There will be approximately .75 miles of new roads constructed in association with the proposed action. The use of multi-well pads and directional drilling minimizes the need for new access road construction.

Environmental Consequences/Mitigation:

Develop a water gathering system to deliver produced water to a central collection point to minimize water gathering by truck, which will reduce truck traffic, aid in dust control and reduce

noise and visual impact. In addition, the use of a closed-loop drilling system will allow for the re-use of drilling fluids and reduce truck traffic associated with the delivery of water for use in the drilling process.

VEGETATION

Lease Stipulations: None

Affected Environment:

Juniper woodlands are the dominant vegetation type in the proposed project area. This cover type has a mixed understory of shrub, forb, and graminoid species whose production is limited by the degree of canopy closure. As described in the FSEIS (1999) on page 3-9: "Juniper woodlands (juniper and pinyon with an understory of serviceberry, mountain mahogany and Mormon tea): This is the most extensive type found in the Glenwood Springs Resource Area. It generally occurs on the southern slopes of the lower foothills just above the semi-desert scrub and is often interspersed with the semi-desert scrub and low elevation sagebrush type. The juniper woodland habitat provides important food and cover for wintering mule deer and elk, food and cover for a variety of small mammals and birds, and is usually defined as severe winter range and crucial habitat for mule deer and elk. Several raptor species nest in the juniper woodlands."

The pad and proposed road site consists primarily of juniper (*Juniperus* spp.) woodlands with only the occasional pinyon pine (*Pinus edulis*) in the area. Basin big sagebrush (*Artemisia tridentate ssp. tridentata*) is scattered throughout the understory and is mixed with dense patches of cheatgrass, and scattered individuals of prickly pear (*Opuntia* spp.) and other cactus, perennials, annuals, and herbs. The ROW that is adjacent to the site contains western wheatgrass (*Pascopyrum smithii*), crested wheatgrass (*Agropyron cristatum*), broom snakeweed (*Gutierrezia sarothrae*), and some common penstemons (*Penstemon* spp., but not harrington's). No large infestations of noxious weeds other than cheatgrass were observed in the area.

Environmental Consequences/Mitigation:

<u>Environmental Consequences:</u> The total expected surface disturbance for this project is 13.4 acres. Approximately 5.7 acres would be disturbed for construction of the well pad. This would include the 400 foot by 330 foot well pad, the topsoil and subsoil piles. Approximately 4.0 acres would be disturbed for new road construction. The access road will require a 45 foot wide construction corridor to allow for the safe passage of construction equipment, and will have a total length of approximately 3840 feet. Approximately 3.7 acres would be disturbed for construction of the utilities trench. The trench will require a 45 foot wide construction corridor to allow for the safe passage of construction equipment, and will have a total length of approximately 3600 feet. In order to accommodate ongoing access to the wells, about 75% of the total disturbance would not be reclaimed during the life of the wells. With implementation of reclamation practices identified in the COA's, establishment of desirable herbaceous vegetation on the unused portions of the pad and road could be restored within 2 to 3 years. The establishment of mature shrubs could take from 5 to 25 years. The juniper woodlands would likely take from 100 to 300 years to return to pre-construction conditions. However, because of

the periodic workovers and the potential for additional well bores to be drilled from this pad, it is likely that vegetation would remain in an early seral stage for the life of the wells. The disturbed site would have a high probability of invasion by noxious and invasive non-native species. The success or failure of revegetation would affect other resources including soils, surface water quality, wildlife, visual resources, and livestock grazing.

Mitigation: Impacts to vegetation will be minimized by implementing the following reclamation measures:

- Vegetation removal will be minimized to the extent necessary to allow for safe and efficient construction activities.
- Trees and slash will be used for erosion control at the base of the fill slopes.
- Pre-construction contours, drainage patterns, and topsoil will be restored.
- Noxious and invasive weeds will be controlled as discussed in the Invasive, Non-Native Species section.
- The project area will be fenced to exclude livestock grazing for the first two growing seasons or until the seeded species or native volunteer species become firmly established. The seeded species will be considered firmly established when at least 50% of the new plants are producing seed.
- A specified seed mix designed to meet interim reclamation standards using a mixture of native shrubs and grasses, and native or desirable non-native forbs will be used. Revegetating the area will help prevent noxious and invasive weed establishment, maintain big game winter range habitat and prevent erosion. The following seed mix and rates will be used on all disturbed surfaces within the project area:

Species of Seed	**Variety**	**Drilled Application Rate* (PLS lbs/acre)**
fourwing saltbush	Rincon	5.0
thickspike wheatgrass	Critana	2.6
western wheatgrass	Arriba	3.0
bluebunch wheatgrass	P-7	2.7
northern sweetvetch		3.0
small burnet	Delar	2.4
TOTAL		**18.7 PLS lbs/acre**

***** In areas that cannot be drilled, broadcast seed at twice the application rate and cover ¼ to ½ deep with a harrow or drag bar.

At the time the surveys were conducted cheatgrass occurred in dense patches but was not the dominant vegetation type at the location. If cheatgrass were to become dominant at the location before construction begins, the BLM would require including either Sandberg's bluegrass or squirreltail in the grass mix because both compete well with cheatgrass. The mix would need to be adjusted to keep shrubs at 20%, grasses at 60%, and forbs at 20%.

Analysis on the Public Land Health Standard for plant and animal communities (partial, see also Wildlife, Aquatic and Wildlife, Terrestrial):

The Rifle West Land Health Assessment, completed in 2005, determined that this portion of the landscape was not meeting Standard 3. Problems noted were the widespread invasion of cheatgrass with a corresponding loss of other functional groups such as perennial native grasses and forbs. Also, sagebrush communities were dominated by old, decadent sagebrush with poor recruitment. The surface disturbance associated with the proposed action has the

potential to encourage expansion and dominance of the site by cheatgrass. The Invasive, Non-native Species section includes provisions to revegetate the disturbances with native vegetation and to control noxious weeds. If successfully revegetated, the proposed action may result in a localized improvement in vegetative conditions by improving the density, frequency and composition of native plant species.

VISUAL RESOURCES

Affected Environment

Petrogulf's proposed multi-well pad and associated facilities are located in an area classified as Visual Resource Management (VRM) Class IV in the Glenwood Springs Resource Area (GSRA) 1984 Resource Management Plan (RMP).

The BLM's Visual Resource Inventory Manual describes the methodology used to inventory BLM lands into four visual resource inventory classes (BLM, 1986). VRM classes represent the relative value of the visual resource. They provide a basis for considering visual value objectives defining how the visual resource is to be managed. VRM Class I is most protective of the resource and VRM Class IV allows the most modification to the existing character of the landscape. The VRM Class IV objectives are as follows:

- Class IV: The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements (BLM 1986). The Class IV objective defined in the Glenwood Springs RMP states; however, that these changes should reflect what could be a natural occurrence within the characteristic landscape.

No Class I or Class II VRM areas are located within or adjacent to the proposed action. The Colorado River corridor is classified as a Class II VRM area and is located approximately 1.7 miles north of the proposed action. The proposed activities are located within the immediate viewshed of Rifle and the I-70 corridor, where the existing landscape character consists of remote areas located adjacent an existing rural setting, southwest of Rifle, Colorado. The proposed project area is located primarily within undeveloped areas, with similar oil and gas facilities beginning to dot the surrounding landscape. Juniper woodlands dominate the landscape, which has a mixed understory of shrubs, forbs, and graminoid species. The landform is dominated by rolling terrain with shallow to deep well drained soils supporting the juniper woodlands.

The BLM visual resource guidelines generally assess potential contrasts by also identifying the Line, Color, and Texture of the existing landscape and vegetation. The landscape and vegetative line for the project area would be characterized as digitate to transitional edges due to existing horizontal and diagonal landforms and vegetation zones. The Color of the site would be characterized as brown-gray to green (within the gaps of vegetation) and light green to dark green (the vegetation). The texture of the proposed site ranges from medium to fine. An existing pipeline ROW is located north of the proposed well pad and the pipeline and access road would either utilize a portion of the existing ROW or be located adjacent to it.

Two Key Observation Points (KOPs) were selected for completing the visual impact analysis. The first KOP was located approximately 1.5 miles northeast of the project area in Section 20, T6S, R93W. The KOP consisted of a graveled pull-off area on the north side of Beaver Creek Road. The first KOP is located within VRM Class IV areas; a Visual Contrast Rating Worksheet was prepared at this location. The second KOP was located north of the I-70 corridor, in Section 16, T6S, R93W. The KOP consisted of the bench within the Rest Area located off the I-70 Rifle Exit (north). This KOP is not located within VRM Class I through IV areas, but within Urban areas. Both KOP's consisted of inferior angles of view. Copies of the completed worksheets were filed under separate cover with the BLM GSFO for their records.

Environmental Consequences

For the short term, the proposed action would add a moderate presence to the landscape during the drilling and completion phase (10 months to 1 year) due to around the clock operations associated with the well pad. Nighttime activities would be limited to the well pad; the drilling mast would be illuminated during night time hours for safety reasons. The drilling and completion rig would create contrast in the landscape, given the vertical nature of drilling and completion rigs. Activities associated with the access road and pipeline would also be moderate, since activities would be temporary and only occur during daytime hours. Exposure of subsurface soil would cause contrast in the landscape until the ROW is reclaimed. Further, pre-construction planning has allowed ample time to develop mitigation measures to properly site the access road and pipeline so that they would not dominate or draw attention to the landscape from the nearby viewsheds of Rifle and the I-70 corridor (see mitigation section below).

For the long term, activities associated with the completed multi-well pad would be limited to ground level activities not visible to the casual observer. The drilling and completion rigs would be removed as soon as activities have been completed, removing the vertical contrast. Over time the pipeline ROW would be revegetated and look similar to the existing, adjacent pipeline ROW. Petrogulf's use of a multi-well pad has prevented the construction of additional wells pads, roads, and pipelines that would otherwise be required for multiple single-well pads. Nonetheless, the location of the proposed multi-well pad and associated pipeline and access road are located in steep topography which could result in higher contrast due to above average cut and fill slopes which expose bare ground. Visual mitigation shall be considered during and after construction.

The angle of view from both KOP's was inferior and the distance was greater than 1.5 miles. Given the angle of view, distance from populated areas, and the diagonal (sloped) line and texture of the proposed project area, the casual observer would find it difficult to assess what activities would be occurring. The placement of the proposed pipeline and access road can be viewed from some portions of the county road and the Colorado River corridor, including I-70 and Rifle, but the distance would greatly obscure the proposed activities when the below mitigation measures have been properly implemented. The proposed pipeline would be located adjacent to an existing pipeline ROW increasing the diagonal, linear view of the disturbance areas, but once the reseeded vegetation has reestablished itself, the disturbance feature would blend into the natural surroundings. The reseeded project area (pipeline ROW) would look similar to other natural features on the Roan Plateau caused by natural fires. Once the proposed pipeline leaves the existing pipeline ROW, it would parallel the access road up to the pad to minimize additional scarring of the landscape. The placement of the well pad is hidden from the county road, the I-70 corridor, and the town of Rifle.

The access road has been placed where possible along the existing pipeline ROW and where possible within the edge of the juniper woodlands adjacent to the existing pipeline ROW. In steep terrain areas where new disturbance would be required, the access road will follow the topography as near as possible to soften the introduction of the linear feature into the surrounding landscape. The exposed edges of the access road would be revegetated immediately following construction activities. Interim mitigation measures shall be considered during and after construction.

The protection and impacts of development of VRM Classes, landscape character, and scenic quality on split estate lands is discussed in chapters 3 and 4 of the Final Supplemental Environmental Impact Statement (FSEIS) prepared by the Glenwood Springs Field Office (FSEIS 1999). The proposed action will not affect any of the key viewing areas or viewsheds described in the FSEIS and would conform to VRM Class IV objectives if the below mitigation measures are implemented.

Mitigation

The following site specific mitigation measures and design features will be incorporated into the project to minimize visual impacts.

- To help mitigate the contrast of bare, re-contoured slopes, Petrogulf will:
    - Site the access road/pipeline to follow the existing topography, once it leaves the Encana ROW to minimize linear contrasting of the surrounding viewshed;
    - Where appropriate, toe-stake the northern and eastern slopes of the access road to ensure that spoil does not go into undisturbed areas;
    - Install retaining rock along the toe-staked access road edge to further reduce the ability of spoil to leave the authorized ROW and to minimize the exposure of bare slopes. Also install retaining rock along the edge of the well pad to minimize exposure of bare slopes;
    - Install fabric to minimize exposure of bare slopes (well pad, access road, and pipeline, where appropriate);
    - Feather cleared lines of vegetation;
    - Save and re-distribute cleared trees, debris, and rock over reshaped cut and fill slopes;
- All facilities will be painted the following standard environmental color: Shale Green (5Y 4/2) to blend in with the vegetation background;
- Where possible, above ground facilities (tanks) shall be low-profile;
- Interim reclamation of the disturbed areas will begin as soon as practical to reduce erosion from exposed slopes;
- Final reclamation of all temporary construction areas shall begin as soon as possible and restored to preconstruction conditions as near as possible to reduce the exposure time of bare areas.

WILDLIFE, AQUATIC

Affected Environment:

Helmer Gulch and its tributaries are considered to be intermittent by the USGS and no fish species are known to exist in the streams of the project area. However, these ephemeral

streams drain directly into the Colorado River located approximately 2 miles to the north. The Colorado River contains a diverse array of fishes and aquatic insects.

Environmental Consequences/Mitigation:

Construction activities associated with the proposed project will initially remove 13.4 acres of upland vegetation. Some areas will be be revegetated but total long-term upland habitat loss will total 8.6 acres. This will result in both short-term and long-term erosion and soil loss. Short-term losses will result where all soils are disturbed until such time as proper revegetation is in place to stabilize soils. Long-term soil loss and sedimentation will be associated with the new road which will be in place and in use for several years. Sediment can impact some fish species that prefer clear water and clean gravels for spawning. Sediment can smother fish eggs, reduce water quality, and also reduce aquatic insect productivity. Due to the close proximity of the proposed action to Helmer Gulch, the following mitigation will be implemented to minimize negative impacts associated with soil loss and sediment transport.

Mitigation:

- The proposed access road will be crowned, ditched, graveled, and include drainage features in accordance with BLM Gold Book standards. In addition, the proposed well pad will be constructed to BLM Gold Book standards and include Best Management Practices (BMPs) designed to minimize erosion and offsite sedimentation.

Analysis of the Public Land Health Standard for plant and animal communities (includes analysis on standard 3, partial, see also Vegetation and Wildlife, Terrestrial): Habitat/riparian management are a concern in areas that suffer from intensive natural gas development, and more specifically, poor quality roads and culverts adjacent to each stream, and increases in numbers and miles of well pads, roads, and pipelines that are all contributing increased sediment. High sediment loads also limits aquatic insect productivity. Many aquatic insects require clean gravels and cobbles relatively free of sediment. Standard 3 is presently being met for this species, but the populations are at risk due to increasing natural gas development within its habitat. The proposed action should not result in a failure of the area to achieve Standard 3 for special status, threatened or endangered species.

WILDLIFE, TERRESTRIAL

Lease Stipulations: None

Affected Environment:
Many terrestrial animals are known to exist in the project area. This summary will focus on those species whose seasonal ranges have been delineated by the Colorado Division of Wildlife (CDOW) and have associated management objectives outlined by the BLM. The proposed project area lies within elk winter range and mule deer winter range and winter concentration range (CDOW, 2004). The CDOW monitors and manages these populations in Data Analysis Units (DAU) and Game Management Units (GMU). The site is found in deer DAU D-12, and elk DAU E-14, and in GMU 42. (CDOW, 2004)

The population objective in 2005 for elk in DAU E-14 was 10,500 animals. The population estimate was 10,300 animals. The population objective in 2005 for deer in DAU D-12 was 29,500 animals. The population estimate for this DAU was approximately 26,279 animals.

Mule deer and elk numbers vary naturally due to a variety of environmental and biological factors, and in response to hunting pressure. As a result, populations have varied dramatically over the past several decades. Mule deer numbers were substantially higher in the early 1960's and have since declined. Elk numbers within the landscape area have varied in response to winter die-offs, and appear to be on the increase. Past use coupled with ongoing current use of limited winter range habitats by both species may at least in part account for the less than desirable range conditions (browse species condition) found in some areas. Mule deer and elk concentration on winter range and repeated heavy use of browse species can reduce plant vigor and productivity over time. Factors related to localized population issues include increasing natural gas development, roads, pipelines, powerlines, residential developments, Interstate 70, and limited winter range among others (BLM, 2005).

Environmental Consequences/Mitigation:

The proposed action will result in the removal of a total of 13.4 acres of vegetation due to pad, road, and pipeline construction. Some of the vegetation loss will be short-term until such time as interim reclamation is completed. Total long-term vegetation/habitat loss is estimated at 8.6 acres. Where larger pinyon and juniper trees are removed and replaced with grasses and forbs, the vegetation/habitat will not function as it does in its current capacity. This will result in a loss of cover and forage habitat. The action will further fragment habitat and reduce habitat patch size and connectivity in the area. Use of heavy equipment will likely displace deer and elk away from preferred habitats for a short time due to noise and human presence.

Mitigation

As the proposed site exists in big game winter habitat, the BLM stipulates that no construction, drilling or completion activities will occur between January 15 and March 15. (FSEIS, 1999) In addition, site reclamation and remote monitoring of well sites will help to minimize post construction disturbance to local big game populations and other terrestrial wildlife species.

Analysis of the Public Land Health Standard for plant and animal communities (includes analysis on standard 3, partial, see also Vegetation and Wildlife, Aquatic): The Rifle West Land Health Assessment, completed in 2005, determined that habitat fragmentation, loss of habitat, and increased human use associated with natural gas exploration and development is resulting in a failure to meet Standard 3 or a trend away from meeting Standard 3 for wildlife. Mule deer numbers, in particular, are lower than DOW population objectives for the landscape and lower than the habitat should be able to support in the absence of fragmentation issues. The driving surface of the roads and the working portion of the pads remain unvegetated for the life of the wells. However, unreclaimed well pads and roads or improperly reclaimed pads and roads are also contributing to the failure to meet this standard. Oil and gas development activities should conform to Best Management Practices for the industry. This should include gravelling roads which are susceptible to erosion and promptly reclaiming all unused portions of wellpads and roads with a mix of native grasses, forbs and shrubs to meet BLM's Reclamation Policy and Land Health Standards.

OTHER NON-CRITICAL ELEMENTS:

CUMULATIVE IMPACTS SUMMARY

The 2004 Draft Roan Plateau Resource Management Plan & Environmental Impact Statement released in November 2004 (BLM 2004) analyzed five alternatives for oil and gas development in the Roan Plateau planning area. These alternatives assessed impacts, including cumulative impacts, for oil and gas scenarios ranging from 855 to 1,582 new gas wells on public lands. The drilling of the wells addressed in this Environmental Assessment is well below the range of development analyzed in the DEIS.

Since the completion of the 1999 Oil and Gas Leasing and Development FEIS, the number of wells analyzed in subsequent NEPA documents has exceeded the 230 federal wells forecast in the RFD for lands outside the Naval Oil Shale Reserve (NOSR) Production Area. However, drilling technology advancements have drastically reduced the expected surface disturbance of 3.4 acres per well or 1,020 acres from federal wells analyzed in the 1999 FSEIS. For example, the long-term surface disturbance from well pads is o.61 acres per well. The FSEIS analysis was based on a reasonably foreseeable development scenario, including the number of wells, well spacing, required equipment, and assumed pollutant emission rates. Since completion of the FSEIS, the majority of new wells have been directionally drilled and, in many instances, are being drilled from existing well pads thereby reducing the overall anticipated surface impact addressed in the 1999 FSEIS.

The air quality analysis conducted in the 2004 DEIS assesses the cumulative impacts to the airshed from oil and gas development within and around the Roan Plateau Planning Area. The Proposed Action addressed in this document, which includes well pad and road construction, well drilling and well completion work typical for oil and gas development, would not represent an increase in emissions beyond that anticipated in the 2004 DEIS.

PERSONS / AGENCIES CONSULTED

Alpine Archaeological Consultants, Inc. (cultural resource inventory)

Name	EA Section	Qualifications
Mike Stanley Project Manager	Proposed Action and Alternatives Affected Environment / Environmental Consequences / Mitigation Measures Cumulative Impacts Summary	M.S. - Environmental Science and Engineering B.S. - Mechanical Engineering
William Mahoney	Cumulative Impacts Summary Environmental Justice Farmlands, Prime and Unique Geology and Minerals Wastes, Hazardous or Solid Soils Transportation, Travel/Access	M.A. - Geography B.A. - Geology A.S. - Hazardous Materials Technology Professional Geologist - Wyoming
JoDell Mizoue	Air Quality	B.S. - Chemical Engineering Professional Engineer - Colorado, Wyoming
Kim Redman	Cultural Resources	M.A. – Anthropology R.P.A.
Daniel Padilla	Areas of Critical Environmental Concern Wild and Scenic Rivers Wilderness Recreation Noise Visual Resources	B.S. - Biology
Chris Hines	Floodplains, Wetlands & Riparian Zones Invasive, Non-Native Species Migratory Birds Threatened, Endangered, and Sensitive Species Range Management Vegetation Wildlife, Aquatic Wildlife, Terrestrial	B.S. - Natural Resource Management Minor, Spatial Information Management (GIS) Certified Wetland Delineation & Management
Dan Fillipi	Floodplains, Wetlands & Riparian Zones Invasive, Non-Native Species Migratory Birds Threatened, Endangered, and Sensitive Species Range Management Vegetation Wildlife, Aquatic Wildlife, Terrestrial	B.S. – Botany Wetlands Delineator Certification Black-footed Ferret Survey Certification
Tom Cavanaugh	Water Quality, Surface and Ground Water Hydrology and Water Rights	M.S. - Geology B.S. - Geological Engineering Certified Professional Geologist

LIST OF BLM INTERDISCIPLINARY REVIEW:

Resource Parameter / Area of Responsibility	Responsible IDT Member
Air Quality	Jeff O'Connell
Areas of Critical Environmental Concern	Kay Hopkins
Cultural Resources	Cheryl Harrison, John Brogan
Environmental Justice	Bill Barter
Farmlands, Prime and Unique	Bill Barter
Floodplains	Mark Wimmer
Invasive, Non-Native Species	Cheryl Harrison, John Brogan
Migratory Birds	Tom Fresques
Native American Religious Concerns	Cheryl Harrison, John Brogan
Threatened, Endangered and Sensitive Species	Tom Fresques (wildlife), Carla Scheck (plants) Beth Brenneman (plants)
Wastes, Hazardous or Solid	Bill Barter
Water Quality Surface and Ground (including 404 permits issued)	Jeff O'Connell
Wild and scenic Rivers	Kay Hopkins
Wildneress	Kay Hopkins
Wetlands and Riparian Zones	Mike Kinser
Soils	Jeff O'Connell
Vegetation	Beth Brenneman
Wildlife, Aquatic	Tom Fresques
Wildlife, Terrestrial	Tom Fresques
Travel / Access	Brian Hopkins, Dorothy Morgan
Geology and Minerals (Adverse Energy Impact Statement)	Jim Wilkinson, Bruce Fowler
Hydrology / Water Rights	Jeff O'Connell
Paleontology	Bill Barter
Range Management	IsaacPittman
Realty Authorizations	Vaughn Hackett
Recreation	Kay Hopkins
Socio-economics	Brian Hopkins
Visual Resources	Kay Hopkins

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FONSI

CO-2006-084 EA

The environmental assessment analyzing the environmental effects of the Proposed Action has been reviewed. The Proposed Action with any approved mitigation measures result in a Finding of No Significant Impact on the human environment. Therefore, an environmental impact statement is not necessary to further analyze the environmental effects of the Proposed Action.

DECISION RECORD

DECISION: It is my decision to implement the Proposed Action as described and approve the Applications for Permit (APD) for 11 wells: 31-41-1, 31-41-2, 31-41-3, 31-41-10, 31-41-11, 31-41-12, 31-41-13, 31-41-14, 31-22, 31-41-23, 31-41-24, with the Conditions of Approval in order to provide for the orderly, economical and environmentally sound exploration and development of oil and gas resources on valid oil and gas leases.

This decision does not modify any lease terms and stipulations attached to the specific leases involved. Depending on the magnitude of future changes, additional NEPA compliance documentation may be necessary if determined to be outside the scope of the analysis.

RATIONALE: The rationale for selecting the Proposed Action:

1. Approval of the Proposed Action is validating the rights granted with the federal oil and gas leases to develop the leasehold to provide commercial commodities of oil and gas.

2. The environmental impacts have been mitigated with measures included in the Surface Use Plan and attached Conditions of Approval.

MITIGATION MEASURES: Mitigation Measures for the Proposed Action are listed in the environmental assessment. Standard and site-specific mitigation measures are outlined in the environmental assessment and will be included and/or referenced in individual APDs.

NAME OF PREPARER: Mike Stanley, Project Manager/Senior Scientist
O&G Environmental Consulting, L.L.C.

SIGNATURE OF AUTHORIZED OFFICIAL: _____
Authorized Officer

DATE SIGNED: 7/28/06

SURFACE USE CONDITIONS OF APPROVAL

1. A pre-construction meeting shall be conducted prior to beginning any dirt work approved under this EA. The operator shall contact the BLM Authorized Officer Bill Barter at 970-947-5217 at least 5 working days prior to beginning operations to schedule the meeting. The operator is responsible for having all contractors present (dirt contractors, drilling contractor, pipeline contractor, project oversight personnel, etc.) including the overall field operations superintendent. The operator shall provide all contractors copies of the BLM Conditions of Approval, and all other documents pertinent to the work each will perform, such as, approved road plans, well pad plats, gas line surveys, etc.

2. The operator will consult with the State of Colorado Water Quality Control Division regarding Stormwater Discharge Permits prior to commencing construction activities. All construction activities that disturb one acre or greater require a Stormwater Discharge Permit. Written documentation to the BLM Authorized Officer is required within 30 days of the APD approval date to indicate that appropriate permits have been obtained. Written documentation may be a copy of the Stormwater Discharge Permit, or an official verification letter from the State Water Quality Control Division to the operator that includes the Permit Certification Number. For further information contact Jeff O'Connell, Hydrologist of the Glenwood Springs Energy Office at 970-947-5215, or Jeffrey_O'Connell@blm.gov. Appropriate documents may be sent via electronic mail, faxed (970-947-5267), or mailed to Jeff O'Connell at the Glenwood Springs Energy Office.

3. The operator will consult with the US Army Corps of Engineers to obtain approval prior to discharging fill material into waters of the US in accordance with Section 404 of the Clean Water Act. Waters of the US are defined in 33 CFR Section 328.3. Written documentation to the BLM Authorized Officer is required within 45 days of the APD approval date to indicate that the US Army Corps of Engineers has been notified prior to construction, or that 404 Permits have been obtained or are not required by the permitting agency. Written documentation may be a copy of the Pre-Construction Notification (PCN) Form or an official verification letter from the US Army Corps of Engineers to the operator stating that a permit has been issued or is not required for the activities in question. For further information contact Jeff O'Connell, Hydrologist of the Glenwood Springs Energy Office at 970-947-5215, or Jeffrey_O'Connell@blm.gov. Appropriate documents may be sent via electronic mail, faxed (970-947-5267), or mailed to Jeff O'Connell at the Glenwood Springs Energy Office.2.

4. The operator is required to monitor for the presence of any Colorado-listed noxious weeds at least once or twice annually during the growing season until final reclamation of the pad is complete. The operator will promptly treat and control any noxious weeds. A Pesticide Use Proposal must be approved by BLM prior to the use of herbicides.

5. The operator is responsible for applying dust abatement measures as needed or directed by the Authorized Officer. The level and type of treatment (watering or application of various dust agents, surfactants and road surfacing material) may be changed in intensity and must be approved by the Authorized Officer. Dust control is needed to prevent heavy plumes of dust

from road use that create safety problems and disperses heavy amounts of particulate matter on adjacent vegetation.

6. To help preserve big game winter range; construction, drilling or completion activities are not permitted from January 15 to March 15.

ROAD AND PAD:

7. The access road will be crowned, ditched, graveled and included drainage features in accordance with the BLM Gold Book. Initial gravel application will be a minimum of 4 inches. The road will be reprieved when ruts exceed 6 inches in depth or as directed by the BLM Authorized Officer.

8. Toe stake steep side of fill slope on access road at 2.5:1 to assure construction does not extend into undisturbed areas. Place retaining rock on steep sections of fill slope to prevent the movement of fill if available.

9. Preserve trees, debris, and rock and redistribute over cut and fill slopes after seeding. Any pinon trees removed during construction activities will be chipped and buried in the toe slope or removed fornt eh site within 24 hours to Colorado State Forest Service-approved site.

10. Culverts will be installed during no flow or low flow conditions at drainage crossings and will be required to pass a 25-year or greater storm event. The 25-year storm event for the proposed action area is approximately 1.6 inches of precipitation in 6 hours.

11. Gas and waterlines will be placed in the disturbed area of the constructed roadway unless otherwise directed.

12. Operator will be responsible for providing timely year-round road maintenance and cleanup on the access road. A regular schedule for maintenance will include, but not be limited to, blading, ditch and culvert cleaning, road surface replacement and dust abatement. The road will be crowned, ditched, and drained with culverts and/or water dips. Initial gravel application will be a minimum of 4 inches. When rutting within the traveled way becomes greater then 6 inches, gravel will be applied as approved by the Authorized Officer.

13. All facilities will be painted Shale Green (5Y 4/2) to blend with the vegetation background.

14. Produced water will be piped through a below surface gathering system to holding tanks located on an adjoining private surface facility, such as, the Mead A, B or C well pads.

15. The cut and fill slopes will be protected against rilling and erosion with measures such as water bars, lateral furrows, or other measures approved by the Authorized Officer. Weed free straw bales, straw “wattles”, straw matting or a well-anchored fabric silt fence will be used on cuts and fill slopes to protect against soil erosion.

16. During well pad, road and/or pipeline construction, topsoil will be stripped to a minimum depth of 6 inches and segregated from other subsurface material piles (ie. excess material from reserve pit construction). If topsoil is less than 6 inches, the top 6 inches of surface material will be stripped and piled.

17. Feather cleared lines of vegetation during construction to reduce straight-line contrast.

18. Install fabric to minimize exposure of bare slopes (well pad, access road, and pipeline where appropriate).

19. The reserve pit will consist of a synthetic impermeable liner with a permeability of less than 10^{-7} cm/sec. The liner will be properly installed so as not to leak and compatible with all anticipated materials. Liner thickness will be at least 12 mils and resistant to UV rays, chemicals, and punctures.

20. A minimum of 2 feet of freeboard shall be maintained in the reserve pit. Freeboard is measured from the highest level of drilling fluids and cuttings in the reserve pit to the lowest surface elevation of ground at the reserve pit perimeter.

21. It will be the responsibility of the operator to comply with the Migratory Bird Treaty Act with respect to "take" of migratory bird species. As such, the operator is requested to prevent use by migratory birds of reserve pits, produced water pits, and evaporation pits, that store or are expected to store fluids which may pose a risk to such birds (e.g., migratory waterfowl, shorebirds, wading birds and raptors) during completion and after completion activities have ceased. Several established methods to prevent bird access are known to work. Methods may include but are not limited to netting, the use of bird-balls, or other alternative methods that effectively prevent bird use. All lethal and non-lethal events that involve migratory birds will be reported to the Petroleum Engineer Technician immediately.

22. Reclamation Plan. Refer to Appendix I. Surface Reclamation of the 6/98 GSFO's Draft Supplemental EIS for Oil & Gas Leasing Development (pages I-1 through I-8) for specific reclamation goals, objectives, timelines, measures and monitoring methods. These guidelines will be followed in completing the reclamation of disturbed surfaces on well pads, access roads and pipelines

Interim Reclamation:

23. Interim reclamation of will begin as soon as drilling activities are completed. If revegetation cannot be completed in the fall of the year of construction, all disturbed areas will be seeded with short-lived sterile hybrid grass to control erosion over the winter.

24. Vegetation removal will be minimized to the extent necessary to allow for safe and efficient construction activities.

25. Pre-construction contours, drainage patterns will be restored allowing for placement of production facilities and use of maintenance equipment.

26. Upon completion of backfilling, leveling, ripping to minimum 18 inch depth on 2 foot centers, and recontouring, the stockpiled topsoil will be evenly spread over the reclaimed areas(s). Prior to reseeding, all disturbed surfaces will be scarified and left with a rough surface. No depressions will be left that would trap water and form ponds.

Seed Mix Application Practices

27. A specified seed mix designed to meet interim reclamation standards while providing forage

and browse for wintering elk and deer using a mixture of native shrubs and grasses and native or desirable non-native forbs shall be applied. The following seed mix and rates will be used on all disturbed surfaces:

The following seed mix and rates will be used on all disturbed surfaces within the project area:

Species of Seed	Variety	Drilled Application Rate* (PLS lbs/acre)
fourwing saltbush	Rincon	5.0
thickspike wheatgrass	Critana	2.6
western wheatgrass	Arriba	3.0
bluebunch wheatgrass	P-7	2.7
northern sweetvetch		3.0
small burnet	Delar	2.4
TOTAL		**18.7 PLS lbs/acre**

***** In areas that cannot be drilled, broadcast seed at twice the application rate and cover ¼ to ½ deep with a harrow or drag bar.

28. The above rate of application is listed in pounds of pure live seed (PLS)/acre. The seed will be certified free of noxious weeds. All seed to be applied to public land must have a valid seed test, within one year of the acceptance date, from a seed analysis lab by a registered seed analyst (Association of Official Seed Analysts). The seed lab shall show no more than 0.5 percent by weight of "other weed" seeds; and the seed lot shall contain no "noxious, prohibited, or restricted weed" seeds according to the All States Noxious Test. Seed may contain up to 2.0 percent of "other crop" seed by weight which includes the seed of other agronomic crops and native plants; however, a lower percent of other crop seed is recommended. Seed tags or other official documentation shall be supplied to the Glenwood Springs BLM Energy Office Ecologist at least 14 days prior to the date of proposed seeding for acceptance. Seed which does not meet the above criteria shall not be applied to public lands.

29. The prepared seedbed will be seeded within 24 hours after completing dirt work unless a change is requested by the operator and approved by the Authorized Officer. Prepare the seedbed by contour cultivating 4-6 inches deep. Drill seed ¼ to ½ inch deep following the contour. All seeding will be conducted after September 1 and prior to ground frost. Spring seeding will be done after the frost leaves the ground and no later than May 15th. If the seeding is unsuccessful, operator will be required to make subsequent seedings until the reclamation objectives identified in Appendix I. Surface Reclamation of the 6/98 GSFO's Draft Supplemental EIS for Oil & Gas Leasing Development are met.

30. The project area will be fenced to exclude livestock grazing for the first two growing seasons or until the seeded species or native volunteer species become firmly established. The seeded species will be considered firmly established when at least 50% of the new plants are producing seed.

31. Petrogulf Corporation will adhere to the specified seed mix and will continue with reclamation activities, including additional reseeding if necessary, until interim reclamation objectives are achieved.

32. If seeding and other erosion controls are not successful additional measures such as hydroseeding, erosion control mats or manmade erosion control products may be required as determined by the BLM Authorized Officer.

33. Because cheatgrass is already abundant in the general vicinity, it may not be feasible to completely eliminate it from the project area. Therefore, if the area adjacent to the project site contains less than a 50% cover of cheatgrass, interim reclamation will be considered acceptable when the cover of cheatgrass on the project site does not exceed 5%. If the area adjacent to the project site contains more than a 50% cover of cheatgrass, interim reclamation will be considered acceptable when the cover of cheatgrass on the project site does not exceed 50%.

34. The operator will submit an annual reclamation report by December 31 to the Authorized Officer. The report will document compliance with all aspects of the reclamation objectives. The report will specify if the reclamation objectives are likely to be achieved and actions needed to meet these objectives.

35. All persons in the area who are associated with this project must be informed that if anyone is found disturbing historic, archaeological, or scientific resources, including collecting artifacts, the person or persons will be subject to prosecution.

36. Pursuant to 43CFR10.4(g), the BLM authorized officer must be notified, by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43CFR10.4 (c) and (d), activities must stop in the vicinity of the discovery and the discovery must be protected for 30 days or until notified to proceed by the authorized officer.

37. If in connection with operations under this contract the project proponent, his contractors, subcontractors, or the employees of any of them, discovers, encounters or becomes aware of any objects or sites of cultural or paleontological value or scientific interest such as historic or prehistoric ruins, graves or grave markers, fossils, or artifacts, the proponent shall immediately suspend all operations in the vicinity of the cultural or paleontological resource and shall notify the BLM authorized officer of the findings (16 U.S.C. 470h-3, 36CFR800.112). Operations may resume at the discovery site upon receipt of written instructions and authorization by the authorized officer. Approval to proceed will be based upon evaluation of the resource. Evaluation shall be by a qualified professional selected by the authorized officer from a federal agency insofar as practicable. When not practicable, the holder shall bear the cost of the services of a non-federal professional.

Within five working days the authorized officer will inform the holder as to:

- whether the materials appear eligible for the National Register of Historic Places;
- the mitigation measures the holder will likely have to undertake before the site can be used (assuming in situ preservation is not necessary); and,
- a time frame for the authorized officer to complete an expedited review under 36 CFR 800.11, or any agreements in lieu thereof, to confirm through the State Historic Preservation Officer that the findings of the authorized officer are correct and the mitigation is appropriate.

The proponent may relocate activities to avoid the expense of mitigation and/or the delays associated with this process, as long as the new area has been appropriately cleared of resources and the exposed materials are recorded and stabilized. Otherwise, the proponent will be responsible for mitigation costs. The authorized officer will provide technical and procedural

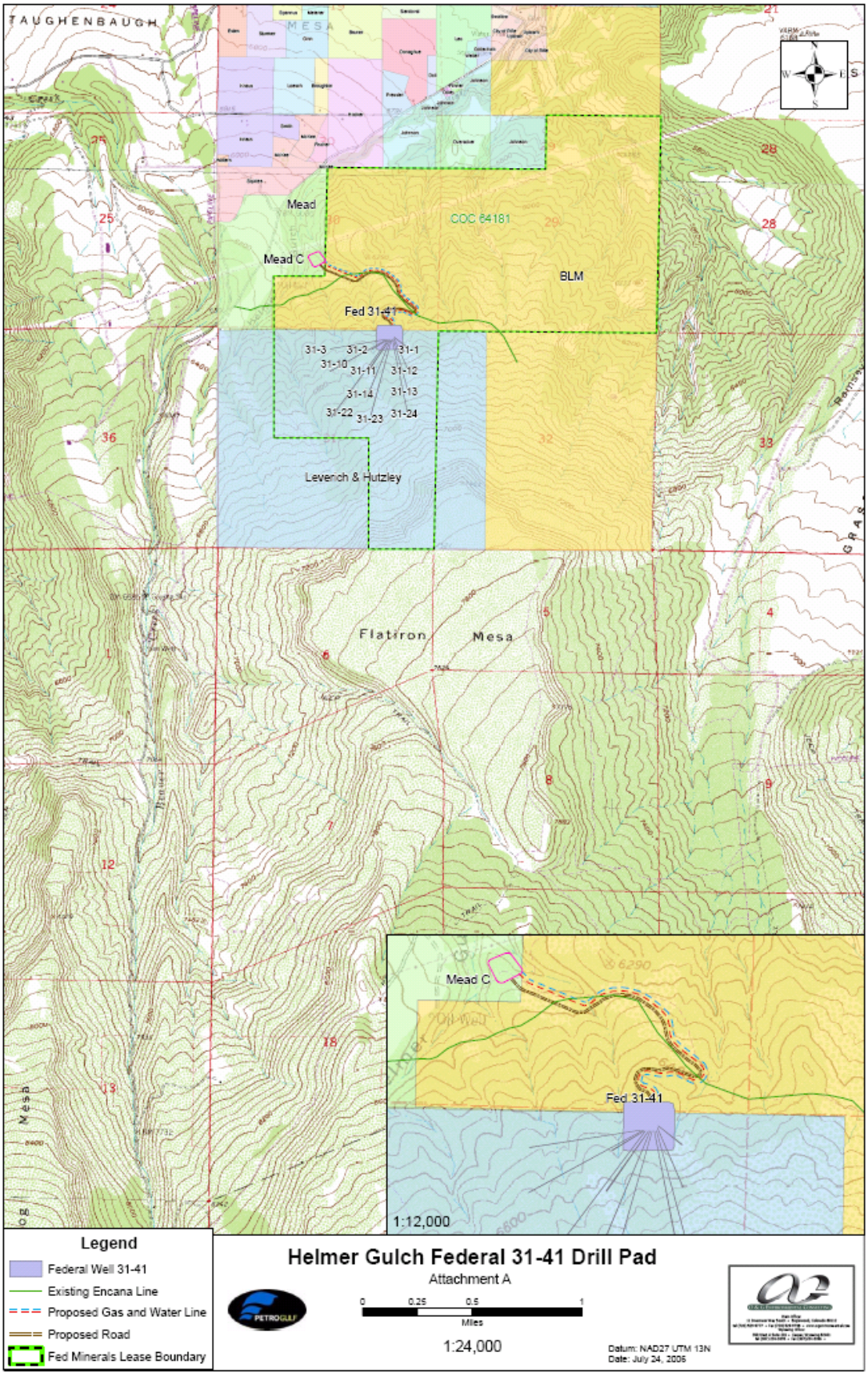
guidelines for the conduct of mitigation. Upon verification from the authorized officer that the required mitigation has been completed, the proponent will then be allowed to resume construction.

Antiquities, historic, prehistoric ruins, or objects of scientific interest that are outside of the authorization boundaries but directly associated with the impacted resource will also be included in this evaluation and/or mitigation.

Antiquities, historic, prehistoric ruins, or objects of scientific interest, identified or unidentified, that are outside of the authorization and not associated with the resource within the authorization will also be protected. Impacts that occur to such resources, which are related to the authorizations activities, will be mitigated at the proponent's cost including Native American consultation cost.

All persons associated with operations under this authorization must be informed that any objects or sites of paleontological or scientific value, such as vertebrate or scientifically important invertebrate fossils, shall not be damaged, destroyed, removed, moved or disturbed. If in connection with operations under this authorization any of the above resources are encountered the proponent shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the BLM authorized officer of the findings. The discovery must be protected until notified to proceed by the authorized officer.

As feasible, the proponent shall suspend ground-disturbing activities at the discovery site and immediately notify the BLM authorized officer of any finds. The BLM authorized officer will, as soon as feasible, have a BLM-permitted paleontologist check out the find and record and collect it if warranted. If ground-disturbing activities cannot be immediately suspended, the proponent shall work around or set the discovery aside in a safe place to be accessed by the BLM-permitted paleontologist.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Proposed Road
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Helmer Gulch Federal 31-41 Drill Pad
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Date: July 24, 2006

Attachment B

PETROGULF CORPORATION

HELMER GULCH
STORM WATER MANAGEMENT PLAN

November 2005

Petrogulf Corporation
518 17th Street, #1455
Denver, CO 80202

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PETROGULF
STORM WATER MANAGEMENT PLAN
For The Helmer Gulch Project

Petrogulf Corporation plans to develop its Helmer Gulch lease, which encompasses Sections 19, 20, 29, 30, and 31 of T6S; R93W in Garfield County, Colorado. This project is being undertaken to evaluate and produce the marketable hydrocarbon resources in this acreage.

1. **SITE DESCRIPTION**

Petrogulf will be employing best management practices in the area by constructing up to 12 wells per pad to minimize surface disturbance in the area. Each well pad is expected to disturb about 4 acres. Associated roads and pipelines will contribute additional disturbance. Total disturbance per pad is expected to be approximately 6 Acres.

The project area is located in the Southern Rocky Mountain physiographic province along the northern slopes of Battlement Mesa. The Colorado River valley is directly north. The site location is on a terrace remnant with sediments dominated by Quaternary age Bull Lake and Pinedale gravels and alluviums at the foot of Flatiron Mesa. The river and tributaries, including Helmer Gulch which cuts through the north end of the project area, have cut through older, Tertiary-age Wasatch and Ohio Creek Formation sandstones, claystones, mudstones, and conglomerates.

Surface sediments consist of a brown to reddish brown silty loam with angular to subangular gravels and cobbles. The elevation of the project area runs from 5320 feet to 7540 feet above sea level.

Vegetation is open juniper woodlands, with open sagebrush meadows interspersed throughout the area. Vegetation groundcover throughout is generally well spaced and healthy. The bottom of Helmer Gulch is covered in Cheat and Pepper grass.

Every well pad will have specific requirements for construction which will be negotiated with the surface owner or land manager, or United States government under the Bureau of Land Management. In addition, each pad will use appropriate procedures and construction techniques to minimize the addition of solids in to the flowing surface water which contributes to the degradation of drinking water in the US. These best management practices (BMPs) will be discussed in detail later in this plan.

A. DESCRIPTION OF CONSTRUCTION ACTIVITY

1. CONSTRUCTION OF THE ROADS:

- Disturbance of new areas should be avoided whenever possible. Whenever possible, existing roads will be utilized or expanded to minimize the amount of surface disturbance.
- Roads are placed in order to minimize cut and fill requirements.
- Roads are placed and constructed to avoid erosion potential to the greatest degree possible.
- In some instances, the natural substrate is sufficient to stabilize the road; otherwise, roads are graveled where necessary.

- If cut and fill is necessary, those areas are stabilized with gravel, natural substrate, and reestablishment of vegetation or with alternative means.
- Site-specific BMPS are implemented where necessary to control erosion due to road construction.

2. CONSTRUCTION OF THE WELL PADS:

3. CONSTRUCTION OF PIPELINES:

B. SEQUENCE OF EVENTS

1. Construction of the roads:

Roads are located and constructed prior to well drilling. Roads are graveled and/or otherwise stabilized where necessary.

2. Construction of the well pads:

Well sites are leveled and the reserve pit is excavated. The wells are drilled, completed and then production equipment is set. After production equipment is set, the producing area is graveled and/or compacted.

3. Construction of pipelines:

Pipeline trench is ripped, pipe is placed and trench is refilled. Recontouring and stabilization takes place as necessary.

C. AREA OF DISTURBANCE

The estimated area of disturbance will cover approximately 6 acres per pad. It is projected that there will be a maximum of 30 pads built in the project area.

D. ESTIMATE OF RUNOFF COEFFICIENT

The construction sites will be located on some improved areas, pasture land, and on previously unimproved areas. The runoff coefficient for unimproved areas is 0.10 to 0.30. The relatively flat terrain and established vegetation present in this construction site indicates the runoff coefficient would be in the lower limits of the 0.10 to 0.30 range.

Several planned well pads will be set on steep slopes, and will incorporate engineering techniques to ensure minimum erosion to the soil and surrounding areas.

E. DESCRIPTION OF EXISTING VEGETATION

Vegetation at these construction sites consists of small juniper woodlands, with open sagebrush meadows interspersed throughout the area and pine trees. There are grassy pasture lands to the north end. The raw land is a mixture of forest and open range. Vegetative cover on the project area is approximately 85%. The Individual Site Form located in Appendix A describes existing vegetation at the construction site.

F. OTHER POTENTIAL POLLUTION SOURCES

During drilling activities; drilling, completion and production chemicals and petroleum substances will be stored on site. The raw materials will be placed on pallets and covered from the elements to minimize waste and unintentional contact with the environment. Some of these substances will be used and in the reserve pit. The drilling contractor will have adequate spill prevention and spill response procedures in place.

G. NON-STORMWATER DISCHARGE

Non-stormwater discharges are not expected at any site in the project area. In the event of an unexpected spill, proper procedures will be in place to ensure cleanup to restore the site.

H. RECEIVING WATERS

The construction area is located in the Helmer Gulch Basin. Runoff from the field development will flow into this intermittent stream and then to Last Chance Ditch and then into the Colorado River.

2. **SITE MAP**

A site map for the project is contained in appendix A. The site map will be modified as needed to reflect field conditions during construction. Examples of the pads are also found here.

3. **CONTROLS - GENERAL BEST MANAGEMENT PRACTICES**

The following is a list of common Best Management Practices (BMPs) which Petrogulf employs during construction activities. Erosion control implementation will be conducted under the guidance of persons experienced in construction techniques. Local factors will be evaluated to determine what BMP's are suitable and practical for each construction site.

A. EROSION CONTROL

1. The size of each construction site will be kept as minimal as possible due to constraints of the landowners and the BLM. Each pad will be minimized to the extent practical to prevent unnecessary disturbance of local soils. Significant grade changes will be minimized when practical.

2. Water diversion structures will be constructed when deemed appropriate. These structures include hay bales, interceptor berms, water bars and interceptor swales. A list and explanation of BMPs is included in Appendix B.

3. Roads and the well pad will be stabilized as soon as practical after construction.

B. ROAD CONSTRUCTION

1. Existing roads are will be used whenever possible.

2. Roads are placed along flat ridgelines where possible. Roads are placed to avoid erosion potential to the greatest degree possible.

3. Stream Crossings are avoided when possible. Existing crossings or bridges will be used. If a stream will be crossed culverts will be put in place.

4. Vehicles are confined to authorized traffic routes.

C. WELL PADS

1. Slopes will be minimized to lessen erosion rates, and to keep precipitation which does not fall on the pad off the pad and what falls on the pad stay as to the extent possible. Sediment settlement ponds will be incorporated when necessary.

2. Wetlands, shallow ground water, and flood plains are to be avoided whenever possible.

3. The well pad will be constructed as small as possible to minimize soil and surface disturbance.

4. Hay bales, interceptor berms, water bars and/or interceptor swales will be placed up gradient of the site to divert stormwater around the disturbed area.

5. Trenches are dug around the rig to collect spills and wash water.

6. Absorbents, drop liners, and catch basins are used to collect spills and drips.

D. SPACING FOR EROSION CONTROL

1. If waterbars are necessary, waterbar spacing on the location will be as follows:

% SLOPE	SPACING INTERVAL
2 or less	200 feet
2 to 4	100 feet
4 to 5	75 feet
5 or more	50 feet

E. RE-SEEDING

1. Where necessary, disturbed areas will be re-seeded as recommended by the Surface Management Agency or the Soil Conservation Service. Seed will be planted using a drill, and in areas not suitable for drilling, the seed will be broadcasted and raked, or chained to cover the seed. Re-seeding will begin as soon as practical after the wells have been put into production.

F. STORMWATER MANAGEMENT

1. To prevent or control potential erosion hay bales, silt fences, mulch, interceptor dikes and swales are utilized where necessary. These structures either prevent runoff from flowing over disturbed areas or dissipate the velocity and reduce the sediment loading of disturbed area runoff. Specific BMPs are listed and explained in Appendix B.

2. To prevent or control potential erosion, water bars, drainage dips, and wing ditches are utilized where necessary. These structures divert the water runoff from the disturbed areas into the vegetated areas, dissipate the velocity, and reduce the sediment loading. Specific BMPs are listed and explained in Appendix B.

3. See individual construction site maps in appendix A for specific BMPs at specific locations.

4. MATERIALS HANDLING AND SPILL PREVENTION

During drilling activities; drilling, completion and production chemicals, fuels, and crude oil products may be stored on site. Some of these are contained within the reserve pit. The drilling contractor will have adequate spill prevention and spill response procedures in place.

5. FINAL STABILIZATION AND LONGTERM STORM WATER MANAGEMENT

A. Final Stabilization of Well Pad:

Following initial construction activities, the well pad is stabilized. The area of vehicle travel and production equipment is graveled. The rest of the well site is considered finally stabilized after the site has been revegetated, compacted and/or graveled. Natural substrate may also serve as stabilization material.

B. Final Stabilization of Pipelines:

Pipelines disturbances occur within the road right of way and final stabilization will occur during final stabilization of roads.

C. Final Stabilization of Roads:

Roads are considered finally stabilized after they are compacted and/or graveled. In some cases, it may be necessary to stabilize road banks with natural substrate, gravel, revegetation or other appropriate stabilization techniques.

6. OTHER CONTROLS

A. All equipment and vehicular access is confined to existing roads and the established right of way corridor.

B. No construction or routine maintenance activities will be done during periods when the soil is too wet to adequately support construction equipment. If such equipment creates surface ruts in excess of 12 inches deep, it will be deemed that the soil conditions are too wet to adequately support construction equipment. Construction activities will not continue until soil conditions improve.

C. Construction sites shall be maintained in sanitary conditions at all times; waste materials at these sites shall be disposed of promptly and at appropriate waste disposal sites.

D. A contractor will be used to provide and maintain potable toilets where necessary.

7. **INSPECTION AND MAINTENANCE**

A. Maintenance

The new construction sites will be routinely patrolled and inspected by an authorized company employee or representative to check for problems, such as erosion, erosion control failure, right of way condition, unauthorized encroachment on the right of way, and any other situations that could cause a safety or environmental hazard, or require preventive maintenance.

B. Inspection

1. Inspection of the construction areas will be performed by the field supervisor and field personnel.

a. During construction, the disturbed areas, structural control measures, and locations where vehicles enter the site shall be inspected at least once every fourteen (14)-calendar days and within 24 hours of any precipitation and/or snowmelt event that causes surface erosion.

b. After completion of the construction, but prior to returning the disturbed areas to approximate preconstruction conditions, the disturbed areas shall be inspected at least once a quarter.

c. An inspection report shall be immediately prepared and signed by the individual conducting the inspection. If the report describes deficiencies in pollution control structures or procedures, such deficiencies shall be corrected as quickly as possible.

d. Copies of the inspection form and an example are attached as Appendix D.

C Retention of Reports

1. Copies of the inspection reports shall be retained at the construction site except when the project is shut down for the season. If necessary, during seasonal shutdown, copies of the inspection reports shall be retained at the permittee's field office.
2. Copies of the reports shall be provided to the Administrator upon request, and such reports shall be retained by the permittee for a minimum of three years.

D. Collection and Submission of Self Monitoring information

1. Upon written notification from the Administrator, the permittee shall collect and report storm water effluent or ambient water quality data of the type and at the frequency specified by the Administrator.

8. **TERMINATION**

A. Notice of Inactivation

1. When the project has been finally stabilized so that the slopes and vegetation approximate preconstruction conditions, the permittee no longer requires coverage under this permit. At that time, the permittee shall submit to the Administrator the Inactivation Notice included as Appendix E of this permit.

2. Upon receipt of the notice, the Administrator will provide the permittee with written confirmation that coverage under this permit has been terminated.

9. **PLAN RETENTION**

During construction, the pollution prevention plan shall be retained at the construction site whenever practical. During seasonal shut downs, the plan shall be retained at the permittee's off-site office. A copy of the plan shall be made available to the Administrator upon request.

10. **CERTIFICATION**

To the best of my knowledge, this plan is accurate and representative of the conditions at this site and includes the control procedures that will be employed during construction.

NAME	TITLE	DATE

Appendix A

Site Map & List of Construction Site Location

Helmer Gulch Wells
Locations

Permits applied for as of November 30th, 2005 (For a complete list of wells please contact Petrogulf Corp.)

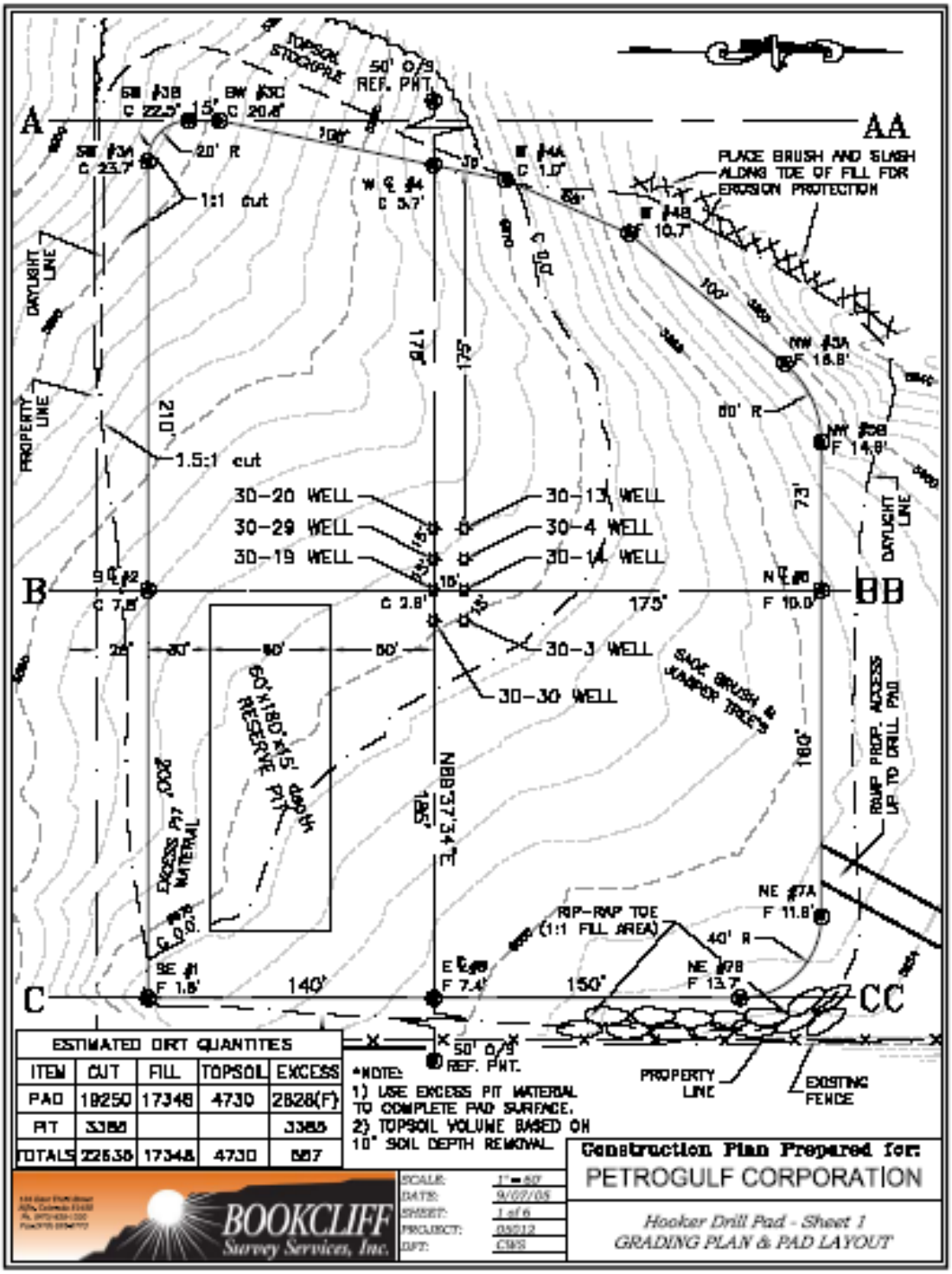
Well name	Latitude	Longitude	of Surface Hole
Hooker 30- 3	39° 30' 03.7481"	-107° 48' 47.0523"	
Hooker 30- 4	39° 30' 03.7460"	-107° 48' 47.4349"	
Hooker 30-13	39° 30' 03.7450"	-107° 48' 47.6262"	
Hooker 30-14	39° 30' 03.7471"	-107° 48' 47.2436"	

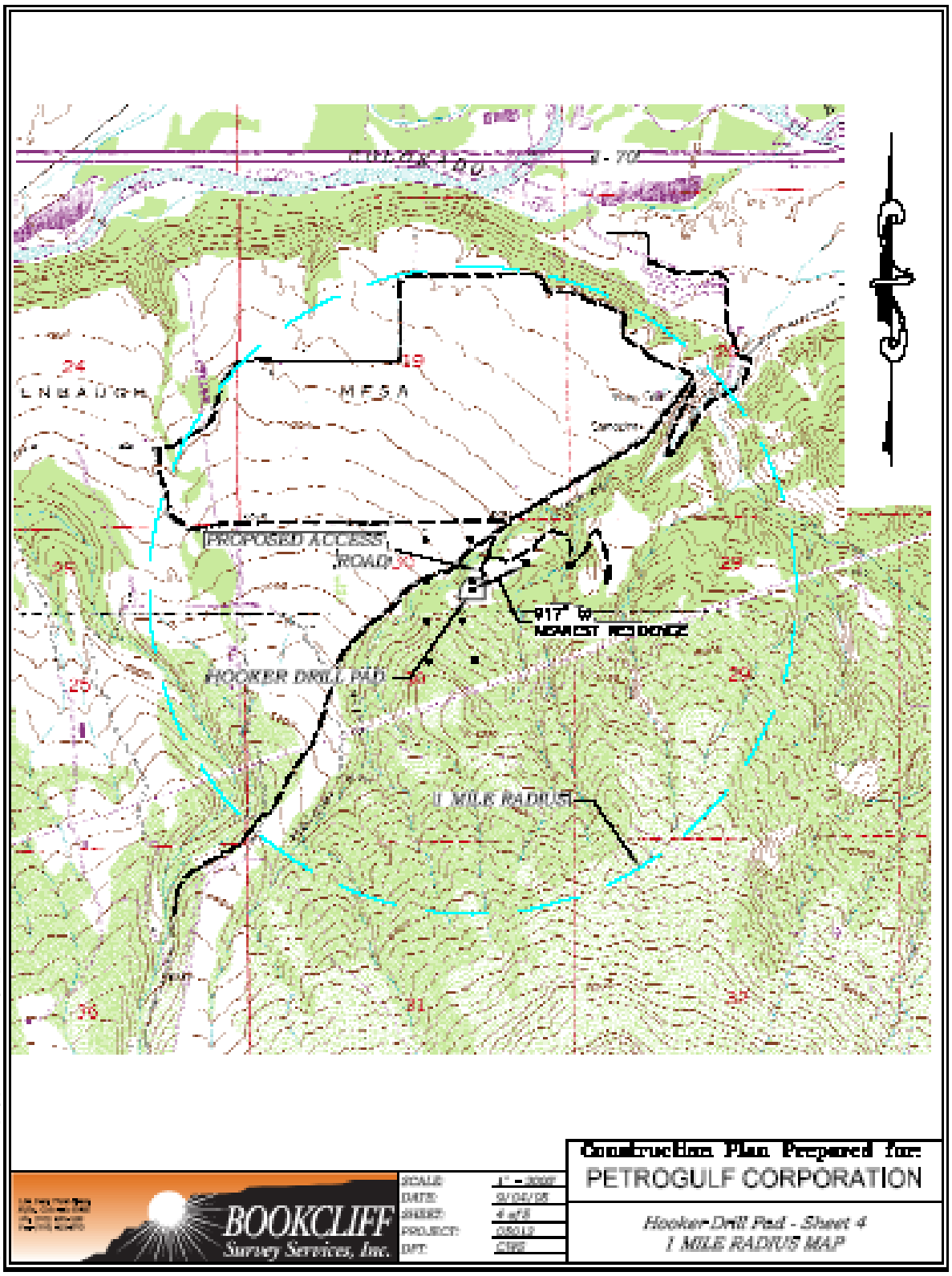
Well name	Latitude	Longitude	of Bottom Hole
Hooker 30- 3	39° 30' 11.7279"	-107° 48' 47.7976"	
Hooker 30- 4	39° 30' 11.6778"	-107° 48' 57.1725"	
Hooker 30-13	39° 30' 05.1573"	-107° 48' 56.9906"	
Hooker 30-14	39° 30' 05.0612"	-107° 48' 47.4826"	

Additional Wells which may be drilled but no drilling permits applied for yet.

Well name	Latitude	Longitude	of Surface Hole
Hooker 30-19	39° 30' 03.5989"	-107° 48' 47.2422"	
Hooker 30-20	39° 30' 03.5968"	-107° 48' 47.6248"	
Hooker 30-29	39° 30' 03.5978"	-107° 48' 47.4335"	
Hooker 30-30	39° 30' 03.5999"	-107° 48' 47.0509"	

Well name	Latitude	Longitude	of Bottom Hole
Hooker 30-19	39° 29' 58.6768"	-107° 48' 49.3474"	
Hooker 30-20	39° 29' 58.6369"	-107° 48' 56.8086"	
Hooker 30-29	39° 29' 52.1165"	-107° 48' 56.6267"	
Hooker 30-30	39° 29' 52.1666"	-107° 48' 47.2526"	


A
AA
B
BB
C
CC
TOPSOIL STOCKPILE
50' O/S REF. PNT.
PLACE BRUSH AND SLASH ALONG TOE OF FILL FOR EROSION PROTECTION
1:1 cut
1.5:1 cut
DAYLIGHT LINE
PROPERTY LINE
30-20 WELL
30-29 WELL
30-19 WELL
30-13 WELL
30-4 WELL
30-14 WELL
30-3 WELL
30-30 WELL
60'x180'x15' RESERVE PIT
EXCESS PIT MATERIAL
SAGE, BRUSH & JUNIPER TREES
RAMP PROP. ACCESS UP TO DRILL PAD
RIP-RAP TOE (1:1 FILL AREA)
N88°37'34"E
175'
140'
150'
PROPERTY LINE
EXISTING FENCE
ESTIMATED DIRT QUANTITIES
ITEM | CUT | FILL | TOPSOIL | EXCESS
PAD | 19250 | 17348 | 4730 | 2628(F)
PIT | 3385 | | | 3385
TOTALS | 22635 | 17348 | 4730 | 557
*NOTE:
1) USE EXCESS PIT MATERIAL TO COMPLETE PAD SURFACE.
2) TOPSOIL VOLUME BASED ON 10" SOIL DEPTH REMOVAL.
Construction Plan Prepared for:
PETROGULF CORPORATION
BOOKCLIFF Survey Services, Inc.
SCALE: 1" = 50'
DATE: 9/07/05
SHEET: 1 of 6
PROJECT: 05012
DFT: CWS
Hooker Drill Pad - Sheet 1
GRADING PLAN & PAD LAYOUT



Construction Plan Prepared for:

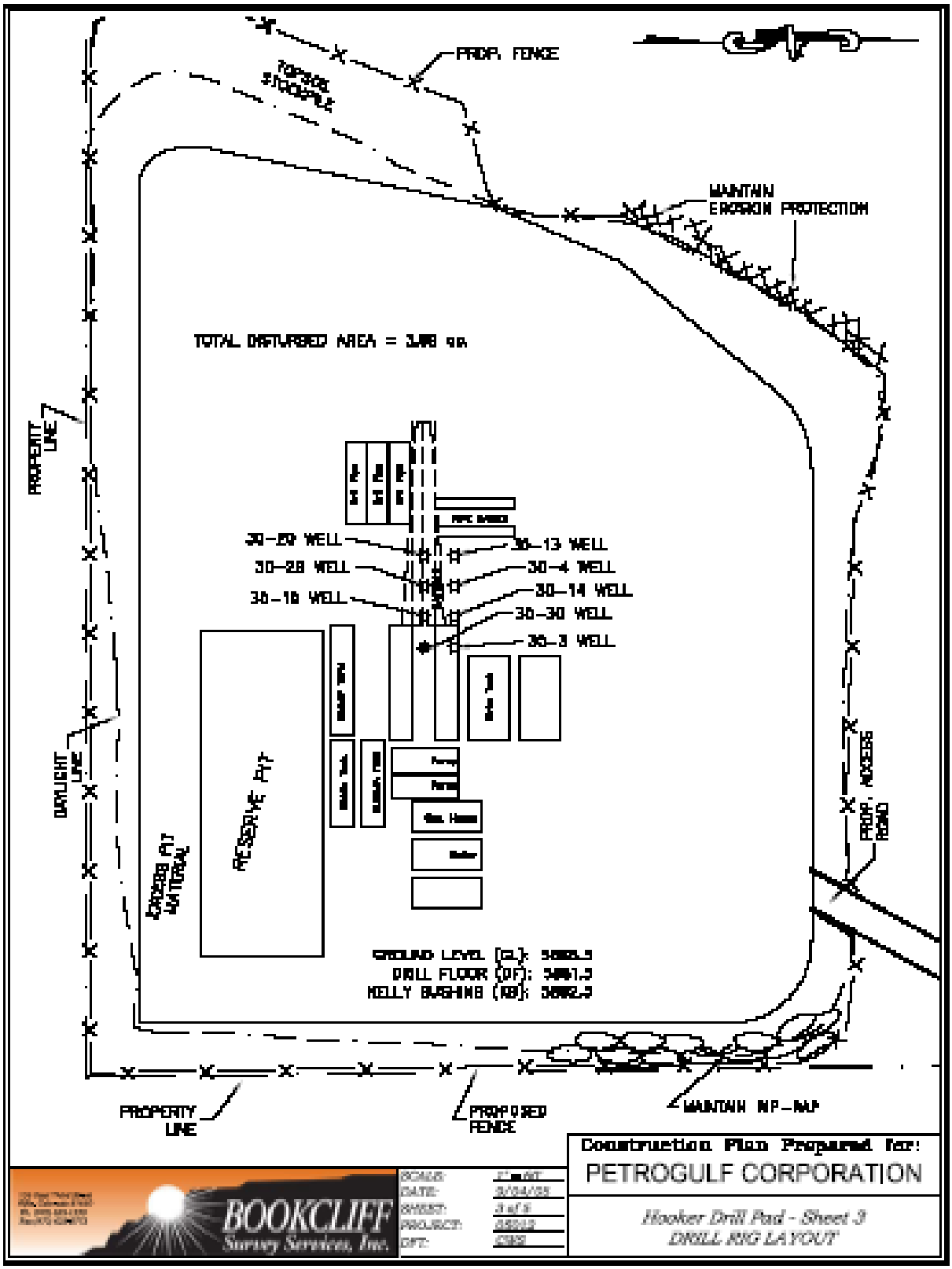
PETROGULF CORPORATION

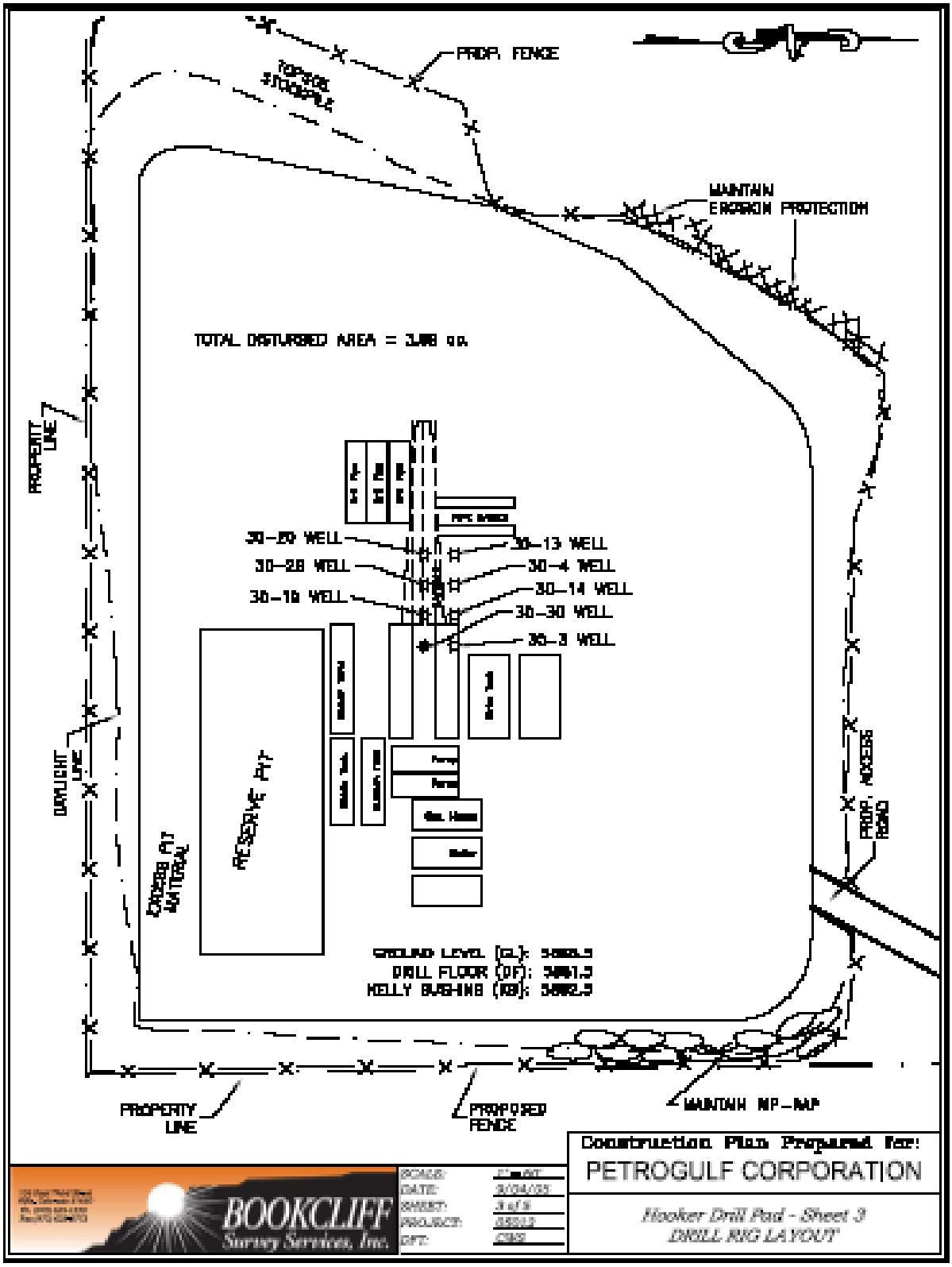
Hooker Drill Pad - Sheet 4

1 MILE RADIUS MAP

BOOKCLIFF Survey Services, Inc.

SCALE:	1" = 2000'
DATE:	9/04/08
SHEET:	4 of 8
PROJECT:	08012
DFT:	CBS


PROP. FENCE
MAINTAIN EROSION PROTECTION
TOTAL DISTURBED AREA = 3.98 ac.
PROPERTY LINE
30-20 WELL
30-28 WELL
30-16 WELL
30-13 WELL
30-4 WELL
30-14 WELL
30-30 WELL
30-3 WELL
RESERVE PIT
DAYLIGHT LINE
PROP. ACCESS ROAD
PROPERTY LINE
PROPOSED FENCE
MAINTAIN NP-MAP
Construction Plan Prepared for:
PETROGULF CORPORATION
BOOKCLIFF Survey Services, Inc.
Hooker Drill Pad - Sheet 3
DRILL RIG LAYOUT


PROP. FENCE
TOPSOIL STOCKPILE
MAINTAIN EROSION PROTECTION
TOTAL DISTURBED AREA = 3.08 ac.
PROPERTY LINE
30-29 WELL
30-28 WELL
30-16 WELL
30-13 WELL
30-4 WELL
30-14 WELL
30-30 WELL
35-3 WELL
RESERVE PIT
DAYLIGHT LINE
CLOSED PIT MATERIAL
PROP. ACCESS ROAD
GROUND LEVEL (GL): 5080.5
DRILL FLOOR (DF): 5081.5
KELLY BUSHING (KB): 5082.5
PROPERTY LINE
PROPOSED FENCE
MAINTAIN NP-MAP
Construction Plan Prepared For:
PETROGULF CORPORATION
BOOKCLIFF Survey Services, Inc.
SCALE:
DATE: 3/24/05
SHEET: 3 of 3
PROJECT:
DFT:
Hooker Drill Pad - Sheet 3
DRILL RIG LAYOUT

Appendix B

Best Management Practices (BMP)

Best Management Practices (BMP)

In order to address the requirements of storm water pollution at construction sites, a variety of techniques should be employed to reduce soil erosion, site sediment loss, and manage construction-generated waste. This section provides design criteria for a variety of techniques to address these issues. These techniques, or BMPs, consist of both temporary and permanent solutions to reduce pollution from a construction site.

The majority of best management practices (BMPs) address onsite soil losses. For construction sites, soil loss, in the form of erosion and sedimentation; because of storm events and wind, constitute the majority of pollution generated from a construction site. BMPs which address erosion and sediment control are much more site specific than waste management techniques. Erosion and sediment control BMPs are dependent upon site slopes, drainage patterns and quantities, and other site-specific conditions. Waste management consists of "good housekeeping" practices which are dependent upon the type of construction and the quantity and type of building materials.

The following provides a method of selecting BMPS applicable to construction sites along with design criteria for each BMP. There may also be state or local manuals which list common BMPS for your region.

In preparing the SWPPP, the designer must first use the BMP selection guide to determine BMPS applicable to the site. The fact sheets following the selection guide detail the design and maintenance requirements, limitations, and purpose of each design and the techniques. These provide the tools for the designer to select the appropriate BMPS and locate them onsite to effectively reduce sediment loss and erosion.

Information is also provided on maintenance of the control devices, as well as what should be checked during required inspections.

For the preparation of this document, the State of Californias' Storm Water BMP Handbook was used. It is a very good reference on BMPs with much detail. The site can be found at www.cabmphandbooks.com

BMP SELECTION GUIDE

Erosion Control - These BMPs protect the soil before erosion occurs. They are primarily used around areas of construction to either limit the flows across the site, or limit the erosion in areas disturbed but not active.

BMP Name	Primary Purpose	Rating
Silt Fences	Detain sediment –laden water, provide for sedimentation behind the fence	Very Effective
Diversion Dike	Route flows around areas of disturbance	Very Effective
Gravel Bag berm	Pond sheet flow runoff, allowing sediment	Effective
Fiber Rolls	Intercept runoff, reduce flow and velocity and provides sediment removal from runoff	Very Effective
Pipe Slope Drain	Route overland flow on a slope into a pipe to protect the slope	Effective
Vegetation	Provide natural soil protection through seeding, hydro-mulch or phasing	Very Effective
Preservation of Existing Vegetation	Careful preservation of existing vegetation minimizes removal of trees, grasses, etc. which preserves soil	Effective
Mulching	Protect disturbed soil with a layer of hay	Very Effective
Erosion Control Mats	Protect disturbed soil or slopes with geo-textile and biodegradable fabrics	Effective

Many of these BMPs will be used in the construction and development of the Helmer Gulch project. Site specific BMPs will be chosen on an as best basis, depending on time required, cost to install, and availability of expertise to install and maintain.

Preventing soil loss from the area is a concern for Petrogulf as is the prevention of additional silt and soil into the Colorado River. The industry in the area is under scrutiny from the public and regulators and Petrogulf wishes to minimize erosion as much as possible.

SEDIMENT LOSS PREVENTION

Construction activities normally result in disturbance on the site due to wading operations, clearing, and other operations. Erosion will occur in these disturbed areas and BMPS must be used to contain the sediment from these disturbed areas.

The following techniques reduce soil loss from the site by retaining the soil through sedimentation or filtration of the runoff.

BMP Name	Primary Purpose	Rating
Silt Fence	Slow and filter runoff to retain sediment	Effective
Straw Bales	Slow and filter runoff to retain sediment	Effective
Sediment Basin	Large pond with controlled outflow which allows sediment to settle out of runoff	Very Effective and strongly recommended for sites larger than 10 acres
Stabilized Construction Entrance	Reduces offsite sediment tracking from trucks and construction from equipment	Moderate Effectiveness but required to address offsite tracking
Sandbag Berm	Provide sedimentation and filtration for runoff under concentrated conditions in creeks, channels, and drainage swales	Effective For Severe Applications
Wind Erosion Control	Applying water or dust palliatives to prevent/alleviate dust nuisance generated by construction activities	Effective
Hydraulic Mulch	Protects exposed soil from erosion by raindrop impact or wind	Effective
Check Dams	Reduce velocity of surface flow and reduce amount of sediment traveled	Very Effective
Interceptor Swale	Route flows around areas of disturbance	Very Effective

WASTE MANAGEMENT

These techniques will be used on the majority of construction projects due to their general application of reducing waste from construction activities.

They form the basis of general housekeeping procedures which should be followed during construction.

BMP Name	Primary Purpose	Rating
Solid Waste Management	Techniques for management of paper, packaging, general building materials, etc.	Very Effective
Material Use	Prevent/reduce the discharge of pollutants by using alternative products, minimizing hazardous material use onsite, and training employees and contractors.	Effective
Hazardous Waste	Management of paints, chemicals, Management fertilizer, oil and grease, etc.	Very Effective
Liquid Waste Management	Procedures and practices to prevent discharge of pollutants to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.	Very Effective
Spill Prevention and Control	Prevent/reduce discharge of pollutants by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.	Very Effective
Sanitary/Septic Waste Management	Proper sanitary and septic waste management prevent the discharge of pollutants by providing convenient, well-maintained facilities, and arranging for regular service and disposal.	Very Effective

For detailed descriptions on use of specific BMPs, refer to the Appendix C of this report when needed. Some of the more common BMPs are explained below.

Silt Fence

Description

A silt fence consists of geotextile fabric stretched between either wooden or metal posts with the lower edge of the fabric securely embedded in the soil. The fence is typically located downstream of disturbed areas to intercept runoff in the form of sheet flow. Silt fence provides both filtration and time for sedimentation to reduce sediment and it reduces the velocity of the runoff. Properly designed silt fence is economical since it can be relocated during construction and reused on other projects.

Primary Use

Silt Fence is normally used as a perimeter control for downstream of construction sites. It is only feasible for non-concreted, sheet flow conditions.

Applications

Silt fence is an economical means to treat overland, non-concentrated flows for all types of projects. Silt fences are used as perimeter control devices for both site developments and linear (roadway) type projects. They are most effective with coarse to silty soil types. Due to the potential of clogging, silt fence should not be used with clay soil types.

In order to reduce the length of the silt fence, it can be placed adjacent to the downstream side of the construction activities.

Design Criteria

Fences are to be constructed along a line of constant elevation (along a contour lime).
Maximum slope adjacent to the fence is 1:1.
Maximum distance of flow to the silt fence shall be 150 feet.
Maximum concentrated flow to silt fence shall be 1 CFS.
If 50% or less of the soil, by weight, passes the U.S. Standard sieve No. 200, Select the Equivalent Opening Size (E. O. S.) to retain 35% of the soil.
Maximum EQS shall be 70 (#70 sieve). Minimum EQS shall be 100 (#100 sieve).
If 85% or more of soil, by weight, passes the U. S. Standard sieve No. 200, silt fences shall not be used due to clogging.

Sufficient room for the operation of sediment removal equipment shall be provided between the silt fence and other obstructions in order to properly maintain the fence. The ends of the fence shall be turned upstream to prevent bypass of storm water.

Limitations

Minor ponding will occur at the upstream side of the silt fence resulting in minor localized flooding.

Fences which are not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence. Silt fences subject to areas of concentrated flow (waterways with flows >1 cfs) are not acceptable.

Silt fence can interfere with construction operations, therefore planning of access routes onto the site is critical.

Silt fence can fail structurally under heavy storm flows, creating maintenance problems and reducing the effectiveness of the system.

Maintenance Requirements

Inspections should be made on a regular basis, especially after a large storm event, if the fabric becomes clogged, it should be cleaned or if necessary, replaced.

Sediment should be removed when it reaches approximately one-half the height of the fence.

Interceptor Swale

Description

An interceptor swale is a small v-shaped or parabolic channel which collects runoff and directs it to a desired location. It can either have a natural grass lining or, depending on slope and design velocity, a protective lining of erosion matting, stone or concrete.

Primary Use

The interceptor can be used either to direct sediment-laden flow from the disturbed areas into a controlled outlet or to direct 'clean' runoff around disturbed areas. Since the swale is easy to install during early grading operations, it can serve as the first line of defense in reducing runoff across disturbed areas. As a method of reducing runoff across the disturbed construction area, it reduces the requirements of structural measures to capture sediment from runoff downstream of the disturbed area, runoff can be directed into a sediment basin or protected inlet for sedimentation as opposed to long runs of silt fence, hay bales or other filtration methods.

Based on site topography, swales can be effectively used in combination with diversion dikes.

Applications

Common applications for interceptor swales include roadway projects, site development projects with substantial offsite flow affecting the site and sites with large areas of disturbance. It can be used in conjunction with diversion dikes to intercept flows. Temporary swales can be used throughout the project to direct flows from staggering areas, storable and fueling areas along with specific areas of construction. Note that runoff which crosses disturbed areas, or is directed in unstable swales, must be routed into a treatment BMIP such as a sediment basin.

Grass lined swales are an effective permanent stabilization technique. The grass effectively filters both sediment and other pollutants while reducing velocity.

Design Criteria

Maximum depth of flow in the swale shall be 1.5 foot based on 2-year design storm peak flow. Positive overflow must be provided to accommodate larger storms. Side slopes of the swale shall be 3:1 or flatter.

The minimum required channel stabilization for grades less than 2 percent and velocities less than 6 feet per second shall be grass. For grades in excess of 2 percent or velocities exceeding 5 feet per second, stabilization in the form of high velocity erosion control mats, 3" layer of crushed stone or riprap is required. Velocities greater than 12 feet per second will require approval by the local jurisdiction and is discouraged.

Check dams can be used to reduce velocities in steep swales.

Interceptor swales must be designed for flow capacity based on Manning's Equation to insure a proper channel section. Alternate channel sections may be used when properly designed and accepted.

Consideration must be given to the possible outlet. Swales must maintain positive grade to an acceptable outlet.

Limitations

Interceptor swales must be stabilized quickly upon excavation so as not to contribute to the erosion problem they are addressing.

Swales may be unsuitable to the site conditions (too flat or steep). Swales are not effective if there is limited flow capacity.

Maintenance Requirements

Inspection must be made after each significant (0.5" or greater) rain event to locate and repair any damage to the channel or to clear debris or other obstructions so as not to diminish flow capacity. Damages from normal construction activities or storms such as tire ruts, or disturbance of stabilization of the swale, shall be repaired as soon as practical.

Diversion Dike

Description

A diversion dike is a compacted soil mound which redirects runoff to a desired location. The dike is typically stabilized with natural grass for low velocities or with stone or erosion control mats for higher velocities.

Primary Use

The diversion dike is normally used to intercept offsite flow upstream of the construction area and direct the flow around the disturbed soils. It can also be used down stream of the construction area to direct flow into a sediment reduction device such as a sediment basin or protected inlet. The diversion dike serves the same purpose and, based on the topography of the site, can be used in combination with an interceptor swale.

Applications

By intercepting runoff before it has a chance to cause erosion, diversion dikes are very effective in reducing erosion at a reasonable cost. They are applicable to a large variety of projects including site developments and linear projects such, as roadways and pipeline construction. Diversion dikes are normally used as perimeter controls for construction sites with large amounts of offsite flow from neighboring properties. Used in combination with swales, the diversion dike can be quickly installed with a minimum of equipment and cost, using the swale excavation as the dike. No sediment removal technique is required prior to crossing disturbed areas.

Significant savings in structural controls can be realized by using diversion dikes to direct flow to a central area, such as a sediment basin or other sediment reduction structure if the runoff crosses disturbed areas.

Design Criteria

The maximum contributing drainage area should be 10 acres or less depending on site conditions. Maximum depth of flow at the dikes shall be 1 foot.

The maximum width of the flow at the dikes shall be 20 feet. Side slopes of the diversion dike shall he 3:1 or flatter. Minimum width of the embankment at the top shall be 2 feet.

Minimum embankment height shall be 18 inches as measured from the toe of the slope on the upgrade side of the berm.

For velocities of less than 6 feet per second, the minimal stabilization for the dike and adjacent flow areas is grass or erosion control mats. For velocities greater than 6 feet per second, stone stabilization or high velocity erosion control mats should be used. Velocities greater than 12 feet per second must be approved by the local jurisdiction.

The dikes shall remain in place until all disturbed areas which are protected by the dike are permanently stabilized unless other controls are put into place to protect the site.

Limitations

Compacted earth dikes require stabilization immediately upon placement so as not to contribute to the problem they are addressing.

The diversion dike can he a hindrance to construction equipment moving on the site, therefore their locations must be carefully planned prior to installation.

Maintenance Requirements

Dikes must he inspected on a regular basis to determine if silt is building up behind the dike, or if erosion is occurring on the face of the dike. Silt shall be removed in a timely manner. If erosion is occurring on the face of the dike, the slopes of the face shall be stabilized through mulch; either seeding or the slopes of the face shall be reduced.

Vegetation

Description

Vegetation, as a Best Management Practice, is the sowing of annual grasses, small grains or legumes to provide interim vegetation stabilization for disturbed areas.

Primary Use

Vegetation is used as a temporary or permanent stabilization technique for areas disturbed by other structures. As a temporary control, vegetation is used to stabilize stockpiles and barren areas which are inactive for long periods. As a permanent control, grass and other vegetation provide for good protection for the soil along with some filtering for overland runoff Subjected to acceptable runoff velocities, vegetation can provide a good method of permanent storm water management as well as a visual amenity to the site.

Vegetation can be used in conjunction with other techniques in order to assist in establishment of the vegetation. These other techniques include erosion control, matting, swales and dikes to direct flow around newly seeded areas and proper grading to limit runoff velocities during construction.

Applications

Vegetation BMPS techniques can and should apply to every construction project with few exceptions, vegetation effectively reduces erosion in swales, stockpiles, berms, mild to medium slopes and along roadways. Vegetation strips can provide some protection used as a perimeter control for utility and site development construction.

In many cases, the initial cost of temporary seeding maybe prohibitive for stockpiles or other barren areas subject to erosion yet inactive. This initial cost should be weighed with the amount of time the area is to remain inactive, since maintenance cost for vegetated areas is much less than most structural controls.

Design Criteria

Surface Preparation

Interim or final grading must be completed prior to seeding, minimizing all steep slopes. Install all necessary erosion structures such as dikes, swales, diversions, etc., prior to seeding.

Groove or furrow slopes steeper than 3:1 on the contour line before seeding. Seedbed should be well pulverized, loose and uniform.

Plant Selection, Fertilization and Seeding

Use only high quality, USDA certified seed.

Use an appropriate species or species mixture adapted to local climate, soil, conditions and season according to the following table, Consult with the local office of the U.S. Soil Conservation Service (SCS) or Engineering Extension service as necessary for the selection of proper species and application technique in this area.

Seeding rate should be in accordance with local land use requirements. Fertilizer shall be applied according to the manufacturer's recommendation with proper spreader equipment. Typical application rate for 10-10-10 grade fertilizer is 700-1000 lb/acre. DO NOT OVER APPLY FERTILIZER. If hydro seeding is used, do not mix seed and fertilizer more than 30 minutes before application.

Evenly apply seed using cyclone seeder, seed drill, or hydro seeder. Provide adequate water to add in establishment of vegetation. Use of appropriate mulching techniques.

Limitations

Vegetation is not appropriate for areas subjected to heavy pedestrian or vehicular traffic.

As a temporary technique, vegetation may be costly when compared to other techniques. As an example;-vegetation is not appropriate for rock, gravel or course grained soils.

Maintenance Requirements

Protect newly seeded areas from excessive runoff and traffic until established. A watering and fertilizing schedule will be required as part of the SWPPP to assist in the establishment of the vegetation.

Mulching

Description

Mulching is a layer of straw or other material which is spread uniformly over barren areas to reduce the effects of erosion from rainfall. Types of mulch include organic materials, straw, wood chips, bark or other fibers, decomposed granite, and gravel.

Primary Use

Mulch is used to temporarily and/or permanently stabilize clear or freshly seeded areas. It protects the soil from erosion and moisture loss by leasing the effects of wind, water, and sunlight. It also decreases the velocity of sheet flow, thereby reducing the volume of sediment-laden water flow leaving the mulched area.

Applications

Mulch may be used on any construction-related disturbed area for surface protection including:

Freshly seeded or planted areas; areas at risk due to the time being unsuitable for growing vegetation; or areas that are not conducive to seeding or planting.

Design Criteria

Mulch may be used by itself or in combination with netting or other anchors to promote soil stabilization.

Several manufactures provide organic mulch with an attached netting to simplify installation. Installation requirements should adhere to manufacture's specifications and requirements.

Choice of mulch depends largely on slope, climate, and soil type in addition to availability of different materials. Straw and hay are the recommended choice due to their availability and biodegradability.

Mulch should be applied in an even and uniform manner where concentrated water flow is negligible. For areas using straw mulch where the slope is greater than 3-5%, anchoring of the mulch is required.

Limitations

Mulches are subject to removal by wind or water under severe climatic conditions. Mulches lower the soil temperature which may result in longer seed germination periods.

Maintenance Requirements

Mulched areas must be inspected on a weekly basis, and after significant rainfall, for thin or bare spots caused by natural decomposition or weather related events. Mulch in high traffic areas should be replaced on a regular basis to maintain uniform protection.

Straw Bale Dike

Description

A straw bale dike is a temporary barrier constructed of straw bales anchored with wood or steel posts, which is used to intercept sediment-laden runoff generated by small disturbed areas. The hay bales can serve as both a filtration device and a dam/dike device to treat and redirect flow.

Primary Use

A straw bale dike is used to trap sediment-laden storm runoff from a small drainage area with relatively level grades, to allow for reduction of velocity thereby causing sediment to settle out.

Applications

Straw bale dikes are used to treat flow after it leaves a disturbed area on a relatively small (<acre) site. Due to the limited life of the hay bale, it is cost effective for small projects of a short duration. The limited weight and strength of the hay bales makes it suitable for small, flat (<2 percent slope) contributing drainage areas. Due to the problems with the straw degradation and the lack of uniform quality in hay bales, their use is discouraged except for small residential applications.

Straw bales can also be used as check dams for small watercourses such as interceptor swales and borrow ditches. Due to the problems in securely anchoring the bales, only small watercourses can effectively use hay bale check dams.

Design Criteria

Straw bale dikes are to be constructed along a line of constant elevation (along a contour line). Straw bale dikes are suitable only for treating sheet flows across grades of 2% or flatter. Maximum contributing drainage area shall be 0.25 acre per 100 linear feet of dike. Maximum distance of flow to dike shall be 100 feet.

Dimensions for individual bales shall be 30 inches minimum length, 18 inches minimum height, 24 inches minimum width and shall weigh no less than 50 pounds when dry. Each straw bale shall be placed into an excavated trench having a depth of 4 inches and a width just wide enough to accommodate the bales themselves.

Straw bales shall be installed in such a way that there is no space between bales to allow for any kind of seepage. Individual bales should be held in place by no less than two wood or steel stakes driven a minimum distance of 6 inches into undisturbed ground, with the first stake driven at an angle toward the previously installed bale. The ends of the dike shall be turned upgrade to prevent bypass of storm water.

Limitations

Due to a short effective life caused by biological decomposition, straw bales must be replaced after a period of no more than 3 months. During the wet and warm seasons, however, they must be replaced more frequently as is determined by frequent inspections.

Straw bale dikes are not recommended for use with concentrated flows of any kind except for small flows in which they can serve as a check dam.

The effectiveness of straw bales in reducing sediment is very limited. Improperly maintained, straw bales can be a negative impact on the water quality of the runoff.

Maintenance Requirements

Straw bales shall be replaced if there are signs of degradation, such as straw located down stream from the bales, structural deficiencies due to rotting straw in the bale, or other signs of deterioration. Sediment should be removed from behind the bales when it reaches a depth of approximately 6 inches. If the bales become clogged, they should be replaced immediately.

Sediment Basin

Description

A sediment basin is a pond area with a controlled outlet in which sediment-laden runoff is directed to allow settling of the suspended sediment from the runoff it provides treatment for the runoff as well as detention and controlled release of runoff minimizing flood impacts downstream.

Primary Use

Sediment basins should be used for all sites with adequate open space to site the basin. For sites with disturbed areas of 10 acres and larger in a common drainage area, sediment basins are required as either temporary or permanent controls unless specific site conditions limit their use.

Applications

Sediment basins serve as treatment devices which can be used on a variety of project types. It is normally used in site development projects in which large areas of land are available for the basin, a stream or drainage way crosses the site, or a specific water feature is planned for the site. Sediment basins are highly effective when designed for the appropriate storm conditions. It is also reduces maintenance requirements due to the central location of the sediment and minimal structural requirements of the basin.

Design Criteria

Maximum drainage area contributing to the basin shall be 100 acres. Minimum drainage of the basin shall be 3600 cubic feet per acre of contributing drainage area.
Deposited sediment shall be removed when the storage capacity of the basin has been depleted by one-half.

Minimum width of the embankment at the top shall be 8 feet. Minimum embankment slope shall be 3:1. Maximum embankment height shall be 6 feet measured from the toe of slope on the downstream side. The basin outlet shall be designed to accommodate a 10-year design storm without causing damage to the containment structure.

Minimum outlet capacity shall be 0.2 CFS per acre of contributing drainage area. The basin must be laid out such that the effective flow length of the basin should beat least twice the effective flow width.

Limitations

Sediment basins can be rather large depending on site conditions, requiring the use of expensive development area and comprehensive planning for construction phasing prior to implantation.

Storm events which exceed the design storm event can cause damage to the spillway structure of the basin.

Maintenance Requirements

Sediment shall be removed and the basin shall be regraded to its original dimensions at such point where the capacity of the impoundment has been reduced to one-half of its original storage capacity. The removed, sediment shall be stockpiled or redistributed in areas which are protected from erosion.

The basin outlet structure and emergency spillway (if present) should be checked frequently and after each major rain event to check for damage and to insure that obstructions are not diminishing the effectiveness of the structures.

Sand Bag Berm

Description

Sandbag berms consist of stacked sandbags installed across a watercourse to direct flow downstream of disturbed areas. There are overflow pipes located in the top of the berm to allow controlled outflow of water after sedimentation has occurred.

Primary Use

A sandbag berm is a temporary sediment control method that addresses the problem of construction in creeks, channels and other watercourses which carry a constant flow and is subjected to high, concentrated flows. A sandbag berm can also be used to create a small sedimentation pond prior to the completion of a permanent detention basin.

Sandbag berms can be used as check dams in temporary swales or borrow ditches. Sandbag berms are not suitable for typical perimeter controls where sheet flow is prevalent.

Applications

During utility or any type of construction in channels or streambeds, sandbag berms can be used as check dams across channels or streambeds, serve as a barrier for utility trenches or even provide a temporary channel crossing for construction equipment without seriously affecting stream conditions. Sandbag berms can also be installed parallel to the road, providing a corridor of sediment control similar to that provided by a silt fence or hay bales, with the exception that a sand bag dike is capable of controlling much higher flows and is much more durable. For site construction, sandbag berms can be used to divert or direct flow or create a temporary sediment basin with the added dimension of being able to be moved to accommodate changes in construction much more easily than compacted earth berms.

Design Criteria

Dikes are to be constructed along level contours for use as perimeter control devices.
Maximum flow through rate shall be 0.1 CFS per square foot of berm surface.
Minimum height shall be 18 inches.

Minimum width of the berm shall be 18 inches at the top and 48 inches measured at the bottom.

- Maximum side berms shall be 2:1.
- Sandbags shall consist of polypropylene, polyethylene or polyamide woven fabric with a minimum unit weight of 4 ounces per square yard, a mullen burst strength of 300-psi minimum and ultraviolet stability exceeding 70 percent, and shall be filled with coarse sand or pea gravel.
- 4” diameter SDR-35 or greater PVC pipe segments approximately 24 inches in length shall be used immediately below the top layer of sandbags to allow for overflow of the berm.
- For severe velocities or high flows, woven mesh wire can be used to maintain the integrity of the berm.
- Sufficient room for the operation of sediment removal equipment shall be provided between the berm and other obstructions in order to properly remove sediment.
- The ends of the berm shall be turned upgrade or shall tie into natural grades to prevent bypass of storm water.

Limitations

Sandbag berms are a costly, labor-intensive technique which is suitable only for areas subjected to high concentrated flows. The permeability of the berms makes it unsuitable for low flow, perimeter conditions.

Ponding will occur directly upstream from the berm creating the possibility of a flooding concern which should be considered prior to its placement.

For sandbag berms located in high flow areas such as in creeks, the potential for berm damage during high flow increases the requirement for maintenance.

Maintenance Requirements

Inspections should be made on a daily basis and after each rain event. The sandbags shall be reshaped or replaced as needed during the inspection. Silt should be removed when it reaches a depth of six (6) inches. In addition, regular inspections should be made on the PVC pipe segments to assure clear flow.

Erosion Control Mats

Description

An Erosion Control Mat (ECM) is a geotextile or biodegradable fabric placed over disturbed areas to limit the effects on erosion due to rainfall impact and runoff across barren soil. Erosion control mats are manufactured by a wide variety of vendors addressing a wide variety of conditions such as vegetation establishment and high velocity flow. Types of matting include organic (jute, straw) and synthetic (excelsior and fiberglass) materials.

Primary Use

Mats can provide both temporary and or permanent stabilization for disturbed soil or barren areas. It is used for areas difficult to stabilize such as steep slopes, temporary or permanent drainage swales, embankments or high traffic (pedestrian) areas. Some mats are reusable, reducing the initial cost of the installation.

Applications

Mats can be used on any construction-related disturbed area, but are particularly effective for erosion control of fine grained soils, and on short, steep slopes (such as stream banks) where erosion is high and growth of vegetation is slow.

Design Criteria

A mat may be used by itself or in combination with netting to promote soil stabilization. Choice of matting depends largely on slope, climate, soil type, and durability. Mats are usually installed to the manufacturer's recommended guidelines. After appropriate installation, the matting should be checked for: uniform contact with the soil; security of the lap joints; and flushness of the staples with the ground.

Manufacturer's information will verify acceptable applications for a particular product.

Limitations

Although matting is highly effective in controlling erosion, it may be less cost-effective than other BMPs for erosion control and it requires a contractor with considerable mat installation experience.

Maintenance Requirements

Matted areas must be inspected on a weekly basis, and after significant rainfall, for bare spots caused by weather related events. Missing or loosened matting must be replaced or re-anchored.

Pipe Slope Drain

Description

A pipe slope drain is a temporary pipe line typically utilizing flexible pipe that conveys runoff down unstable slopes. They are anchored on each end with some form of headwall to limit erosion and secure the pipe.

Primary Use

A pipe slope drain is used on sites with a long, unstable slope area which is subject to erosion from overland flow crossing unstable or poorly stabilized sloped areas. It is normally used in combination with, interceptor swales or diversion dikes to direct the flow into the pipe area. The pipe slope drain can provide service for a relatively large area. It does not beat the runoff; therefore, if the runoff contains sediment, treatment through a controlled outlet will be required before the flow is released offsite.

Applications

Sites with large berms or grade changes such as roadway embankments are candidates for a pipe slope drain. Since provisions must he made to direct the flow into the pipe drain, some grading is normally required upstream of the pipe slope drain. Installed properly, slope erosion can be greatly reduced (but eliminated) using the drain.

Pipe slope drains also require a stabilized outlet. This is critical since the velocities at the outfall are normally high. Velocity dissipators as well as stone or concrete riprap are typically required to reduce the velocity and spread the flow, reducing erosion. Flow from a pipe slope drain should be routed to a controlled outlet through interceptor swales, diversion dikes or other suitable methods.

Design Criteria

The entrance to the pipe slope drain shall be a standard pre-fabricated flared end section with an integral toe plate extending a minimum of 6 inches from the bottom of the end section. The grade of the entrance shall be 3 percent maximum.

All sections of the pipe slope drain shall be connected using watertight collars or gasketed watertight fittings.

All sediment-laden runoff conveyed by the pipe slope drain shall be directed to sediment trapping facility.

Temporary pipe slope drains are to be sized to accommodate runoff flows equivalent to a 10-year storm as calculated using the Rational Method and Manning's equation, but in no case shall pipes be sized smaller than is shown in the following table:

Minimum Pipe Size	Maximum Contributing Drainage Area
12”	0.5 Acres
18”	1.5 Acres
21”	2.5 Acres
24”	3.5 Acres
30”	5.0 acres

Maximum drainage area for individual pipe slope drains shall be 5 acres. For areas larger than 5 acres, additional drains shall be added.

Both the entrance and out fall of the pipe slope drain should be properly stabilized. Grass can normally be used at the entrance, but armor type stabilization, such as stone or concrete riprap is normally used to address the high velocities of the outfall.

Limitations

Drains must be located away from the construction areas since the drain can easily be damaged by construction traffic.

Securing the pipe to the slope can be difficult and require significant maintenance during the life of the system. In situations where pipe slope drains convey sediment-laden runoff, pipes can become clogged during large rain, events causing water to overtop the diversion dike thereby creating a serious erosion condition.

Grading is normally required upstream of the pipe slope drain in order to direct flow into the system. This can cause additional cost and maintenance.

A pipe slope drain reduces erosion but does not prevent it or reduce the amount of sediment runoff. Additional measures should be used in conjunction with the pipe slope drain to treat the flow.

Maintenance Requirements

Inspection must be made of the pipe after each sufficient (0.5” or greater) rain event to locate and repair any damage to joints or clogging of the pipe. In cases where the diversion dike has deteriorated from around the entrance of the pipe, it may be necessary to reinforce the dike with sandbags or to install a concrete collar to prevent failure. Signs of erosion around the pipe drain should be addressed in a timely manner by stabilizing the area with erosion control mats, crushed stone, concrete or other acceptable methods.

Appendix C

BMP Details & Diagrams

Insert CA BMPs here.

Appendix D

Inspection;

Inspection Sheet and Form

INSTRUCTIONS FOR COMPLETING AN INSPECTION REPORT

1. Inspection of the construction areas will be performed by the field supervisor and field personnel.

2. During construction, the disturbed areas, structural control measures and locations where vehicles enter the site shall be inspected at least once every fourteen (14)-calendar days and within 24 hours of any precipitation and/or snowmelt event which exceeds 0.5 inches.

3. After completion, of the construction, but prior to returning the disturbed areas to approximate preconstruction conditions, the disturbed areas shall be inspected at least once a quarter.

4. An inspection report shall be immediately prepared and signed by the individual conducting the inspection. If the report describes deficiencies in pollution control structures or procedures, such deficiencies shall be corrected immediately.

5. Completed inspection reports must be kept with the SWPPP that covers the construction site.

Example Inspection Report on next page

Petrogulf Corporation Piceance Basin – Garfield County, Colorado

Site I.D.:_____ Date / Time:_____/_____

Inspector:_____

Inspection Type: New Construction_____ Biennial_____ Quarterly/Routine_____ Precipitation Event_____
Site Type: Well Site_____ Road_____ Ditch or Channel_____ Other_____
Site Status: Construction;_____ Production;_____ Reclaimed;_____ Abandonment;_____

Distance to Waters of State (Dry Swale, Pond, Stream Channel) _____

Vegetation Checklist		
Well Site Revegetated?	_____Yes _____No	
Seed Mixture (if known)		
Area Inspected	Vegetation Density	Comments or Required Action
Adjacent Area Vegetation		___ Open Juniper Woodlands ___ Sagebrush Meadows ___ Pasture Land, leveled for livestock ___ Other, describe
Well Site Cut Slope		___ Rills evident ___ Rocky outcrop, rill free ___ Revegetated, no or minor rills ___ Other
Well Site Fill Slope		___ Rills evident ___ Rocky outcrop, rill free ___ Revegetated, no or minor rills ___ Other

Erosion and Sediment Control Checklist	
Any Sediment Containment Systems on Site?	**___No ___Yes, if yes, are they working? ___Yes ___No; if no describe work that is needed to repair the system.**
Any Erosion Control BMPs on Site?	**___No ___Yes, if yes, are they working? ___Yes ___No; if no describe work that is needed to repair the system.**

Site Observations	
When was the most recent precipitation event?	Days Ago, ____rain/ ____wet snow
Approximate amount of precipitation (inches).	"_____Rain _____Snow
Did stormwater leave well site erosion or sediment controls?	_____Yes _____No _____Hard to tell
Is stormwater on site in secondary containments?	
Any spills or leaks on site (chemicals, water, etc.)?	____No ____Yes, describe; ex. Oil, water
Any Culverts near the site in need of cleanout/BMPs?	____No ____Yes

A record of inspection reports will be kept in the Denver Offices of Petrogulf.

INSPECTION REPORT				
Area Inspected	Date	Name and Signature of Inspector	Title	Observation/Action Taken

Appendix E

Copy of Permit Application,
Inactivation Form

Colorado Department of Public Health & Environment
Water Quality Control Division
WQCD-P-B2
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

FOR AGENCY USE ONLY

REC _____ _____ _____
EFF _____ _____ _____
YEAR MONTH DAY

INACTIVATION NOTICE FOR

CONSTRUCTION STORMWATER DISCHARGE GENERAL PERMIT CERTIFICATION

Please print or type. Form must be filled out completely.

Certification Number: COR-03 __ __ __ __ Taxpayer ID or EIN __ __ __ __ __ __ __ __ __

Permittee (Company) Name: _____

Permittee Address: _____

_____

Phone No. ( )

Site/Facility Name: _____

Construction Site Address/Location: _____

_____

County: Contact Person: _____

Summary of work performed and **description of final site stabilization**: _____

_____

_____

_____

I certify under penalty of law that by the date of my signature below, all disturbed soils at the identified construction site have been finally stabilized; all temporary erosion and sediment control measures have been removed; all construction and equipment maintenance wastes have been disposed of properly; and all elements of the Stormwater Management Plan have been completed.

I understand that by submitting this notice of inactivation, I am no longer authorized to discharge stormwater associated with construction activity by the general permit. I understand that discharging pollutants in stormwater associated with construction activities to the waters of the State of Colorado, where such discharges are not authorized by a CDPS permit, is unlawful under the Colorado Water Quality Control Act and the Clean Water Act.

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (See 18 U.S.C 1001 and 33 U.S.C. 1319.)

_____

Signature of Permit Applicant (Legally Responsible Party) Date Signed

_____

Name (printed) Title

\$97/n/a

Appendix F

Runoff Coefficient Table

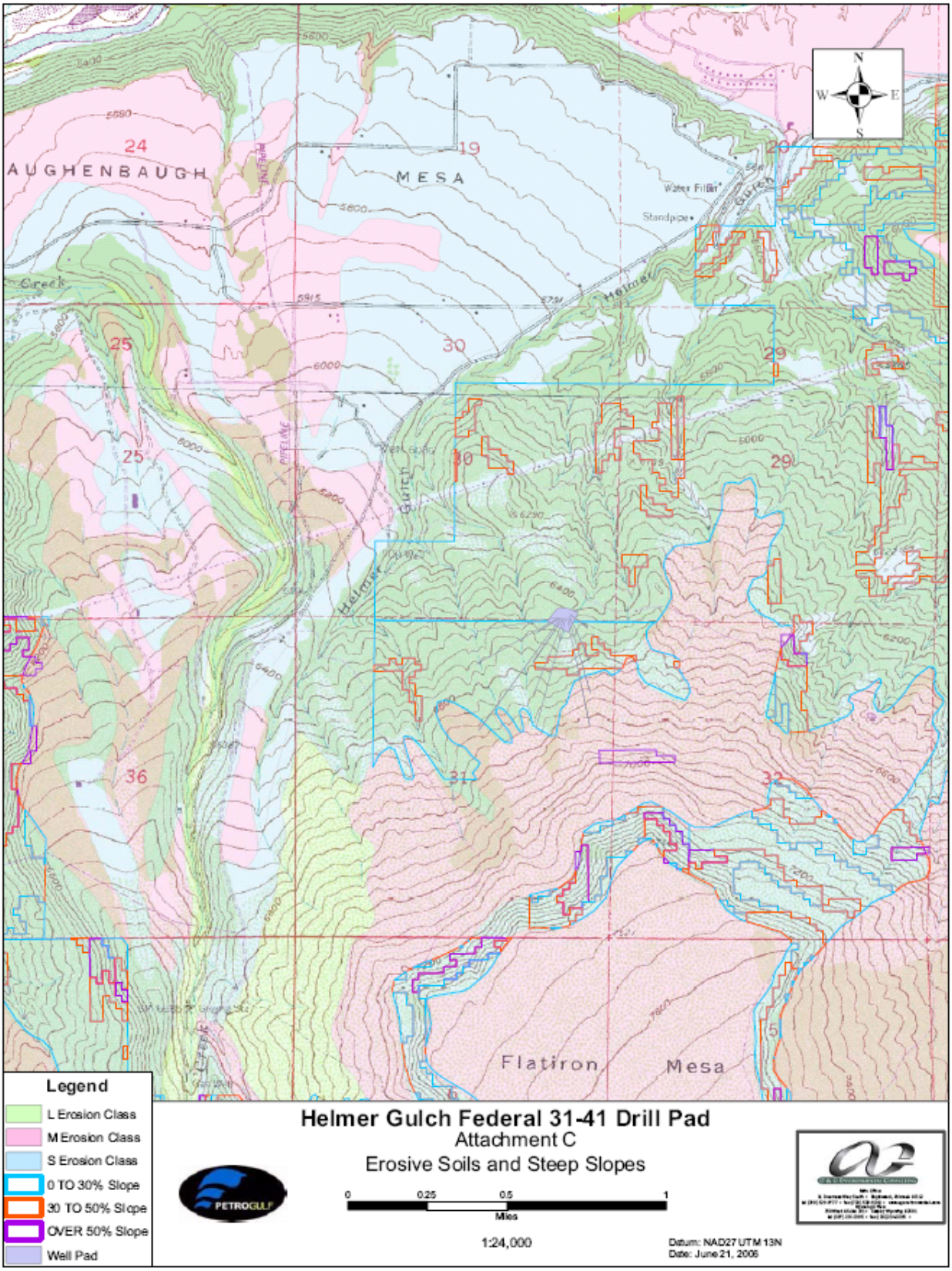
Individual Site Form

Description of Area	Runoff Coefficients
Business	
Downtown areas	0.70 – 0.95
Neighborhood areas	0.50 – 0.70
Residential	
Single-family areas	0.30 – 0.50
Multiunits, detached	0.40 – 0.60
Multiunits, attached	0.60 – 0.75
Residential (suburban)	0.25 – 0.40
Apartment Dwelling areas	0.50 – 0.70
Industrial	
Light areas	0.50 – 0.80
Heavy areas	0.60 – 0.90
Parks, Cemeteries	0.10 – 0.25
Playgrounds	0.20 – 0.35
Railroad yard areas	0.20 – 0.40
Unimproved areas	0.10 – 0.30
Streets	
Asphalt	0.70 – 0.95
Concrete	0.80 – 0.95
Brick	0.70 – 0.85
Drives & Walks	0.75 – 0.85
Roofs	0.75 – 0.95
Lawns – Coarse textured soil (> than 85% sand)	
Slope: Flat 2%	0.05 – 0.10
Average 2-7%	0.10 – 0.15
Steep 7%	0.15 – 0.20
Lawns – Fine textured soil (> 40% clay)	
Slope: Flat, 2%	0.13 – 0.17
Average, 2 – 7%	0.18 – 0.22
Steep, 7%	0.25 – 0.35

Well Site Map

Existing Vegetation_____
Estimate of % Vegetative cover _____
Estimate of runoff coefficient: unimproved _0.10 - 0.30
BMPs Applicable or No Action_____

Individual Site Form
Petrogulf Corp.
Helmer Gulch, CO



Helmer Gulch Federal 31-41 Drill Pad

Attachment C

Erosive Soils and Steep Slopes