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OLSSON ASSOCIATES

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COGCC

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	Other: _____

TO:	Alex Fischer	**DATE:**	7/1/13
ADDRESS:	Colorado Oil & Gas Conservation Commission 1120 Lincoln St, Ste 801 Denver, CO 80203		
PHONE:	(303) 894-2100 , Ext. 5138	**PROJECT #:**	012-1372
		PHASE:	100
FROM:	Craig Richardson	**TASK:**	100001
RE:	Marathon 32C Produced Water Pond		

	MATERIAL:	QUANTITY	DATE	DESCRIPTION
	Correspondence			
	Plans			
	Reports			
	Specifications			
X	Other	1	6/28/13	CD of Form 28 Application sent 6/28/13

REMARKS:		
	For your approval	**NOTES:**
X	For your use	
	As requested	
	For review & comment	
	Other	
	Comments	

Cc:

760 Horizon Drive, Suite 102
Grand Junction, CO 81506

TEL 970.263.7800
FAX 970.263.7456

www.olssonassociates.com

Index

Marathon Oil Company
32C Produced Water Pond

OLSSON ASSOCIATES

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 815065 | TEL 970.263.7800 | FAX 970.263.7456

Application Form and Authorization

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 815065 | TEL 970.263.7800 | FAX 970.263.7456

FORM 28 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

Surety ID: _____

CENTRALIZED E&P WASTE MANAGEMENT FACILITY PERMIT

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

OGCC Operator Number: 53650
Name of Operator: Marathon Oil Company
Address: 743 Horizon court, Suite 220
City: Grand Junction **State:** CO **Zip:** 81506

Contact Name and Telephone:
Eric Ward
No: 970.244.5735
Fax: 970.245.6287

Surface Owner (if different than above): Marathon 50%, Berry 50%
Address: 950 17th St, Ste 2400
City: Denver **State:** CO **Zip:** 80202 **Phone:** 303-825-3344

Facility Name: Marathon Water Storage Facility - Pond 32C
Address: Approx 17 miles NW of Parachute off Garden Gulch Rd.
City: Parachute **State:** CO **Zip:** 81635
Phone: _____ **Fax:** _____

Location (QtrQtr, Sec, Twp, Rng, Mer): SESW, S32, T6S, R96W, 6th PM
Latitude: 39.56780
Longitude: -108.19393

T35

Complete the Attachment Checklist

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

1. Is the site in a sensitive area? ☐ Y ☑ N

2. What are the average annual precipitation and evaporation rates for the site?
Precipitation: 16 inches/year Evaporation: 40 inches/year

3. Has a description of the site's general topography, geology and hydrology been attached? ☑ Y ☐ N

4. Has a description of the adjacent land use been attached? ☑ Y ☐ N

5. Has a 1:24,000 topographic map showing the site location been attached? ☑ Y ☐ N

6. Has a site plan showng drainage patterns, diversion or containment structures, roads, fencing, tanks, pits, buildings and any other pertinent construction details been attached? ☑ Y ☐ N

7. If site is not owned by the operator, is written authorization of the surface owner attached? ☑ Y ☐ N

8. Has a scaled drawing and survey showing the entire section(s) containing the proposed facility been attached? ☑ Y ☐ N

9. What measures have been implemented to limit access to the facilty by wildlife, domestic animals or by members of the public? Briefly explain.
The pond is enclosed by an existing fence and is netted. A manned security post is located at the base of Garden Gulch Road which provides access to the facility.

10. Is there a planned firelane of at least 10 feet in width around the active treatment areas and within the perimeter fence? ☑ Y ☐ N

11. Is there an additional buffer zone of at least 10 feet within the perimeter firelane? ☐ Y ☑ N

12. Have surface water diversion structures been constructed to accommodate a 100-year, 24-hour event? ☑ Y ☐ N

13. Has a waste profile been calculated according to Rule 908.b.6? ☑ Y ☐ N

14. Has facility design and engineering been provided as required by Rule 908.b.7? ☑ Y ☐ N

15. Has an operating plan been completed as required by Rule 908.b.8? ☑ Y ☐ N

16. Has ground water monitoring for the site been provided? ☐ Y ☑ N ***Attach Water Analysis Report, Form 25, for each monitoring well installed.***

17. Has financial assurance been provided as required by Rule 704? ☐ Y ☑ N

18. Has a closure plan been provided? ☑ Y ☐ N

19. Have local government requirements for zoning and construction been complied with? ☑ Y ☐ N

20. Have permits and notifications required by local governments and other agencies been provided? ☐ Y ☑ N

Print Name: Eric Ward

Signed: [signature] Title: Operations Manager Date: 6/28/2013

OGCC Approved: _____ Title: _____ Date: _____

CONDITIONS OF APPROVAL, IF ANY:

Facility Number: 433736

Pit Facility ID: 421284

Supplemental Narrative

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 815065 | TEL 970.263.7800 | FAX 970.263.7456

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

32C CENTRALIZED E&P WASTE MANAGEMENT FACILITY
MARATHON OIL COMPANY
MARCH 2013

According to the 100 Series rules of the Colorado Oil and Gas Conservation Commission (COGCC), a **CENTRALIZED E&P WASTE MANAGEMENT FACILITY** shall mean a facility, other than a commercial disposal facility regulated by the Colorado Department of Public Health and Environment, that (1) is either used exclusively by one owner or operator or used by more than one operator under an operating agreement; and (2) is operated for a period greater than three (3) years; and (3) receives for collection, treatment, temporary storage, and/or disposal produced water, drilling fluids, completion fluids, and any other exempt E&P wastes that are generated from two or more production units or areas or from a set of commonly owned or operated leases.

This supplement to the COGCC Form 28 for Marathon Oil Company's (Marathon) proposed 32C Centralized E&P Waste Management Facility provides additional information required by COGCC Rules 704 and 908. This information is identified in the following sections by reference to the applicable section of Rules 704 and 908. This facility will also be reviewed via a Limited Impact Review (LIR) with Garfield County.

Marathon is proposing to convert an existing pond to a Centralized E&P Waste Management Facility to manage production water generated in the Piceance field. Water will be transported to the proposed facility primarily via pipeline and as needed by truck.

The perimeter of the facility will be fenced and netted in order to restrict wildlife access.

In order to ensure appropriate protection of water quality, Marathon will install up to three (3) groundwater monitoring wells in proximity to the facility. A map demonstrating the proposed location of the monitoring wells is included under the Figures tab.

No permanent sanitation facilities will be required to accommodate operation of the facility. If necessary, human generated wastes will be accommodated by portable toilets placed near the boundary of the proposed facility.

The facility will be accessible to Marathon personnel and will primarily be accessed during normal working daylight hours from approximately 7:30 am to 6:00 pm Monday through Friday.

The existing location is included in Marathon's Stormwater Management Plan (SWMP).

Potable water will not be required for the proposed facility.

A copy of approved permit for air emissions from the facility is included with this submittal.

Significant Dates and Operational History of Proposed 32C Centralized E & P Waste Management Facility

- 11/12/2009 – MRO receives approved Form 15 from Chris Canfield, COGCC.
  - See attached Form 15.
- 8/31/2010 – MRO receives approved permit exempt APEN from CDPHE.
- 9/13/2010 – First use of 32C Pit (produced water trucked to pond), as documented in MRO weekly letter.
  - See attached excerpt from MRO weekly letter.
- 5/25/2012 – MRO finds breach to pit liner.
  - Breach caused by contractor chipping ice to gain access to the pond water.
  - No impacted soil was found below the bottom liner.
- 9/11/2012 – MRO receives updated APEN from CDPHE increasing allowable throughput.
- 4/12/2013 – MRO management receives notification of 2013 liner breach.
  - See attached timeline and documentation.
  - Cause of breach appears to be vandalism, investigation is underway.
  - Refer to previously submitted work plan and documentation connected to the Form 19 and Form 27.

Rule 904.

The facility consists of an existing 0.7 acre pond graded into mountainous terrain that is located on a 3.5 acre pad site. The existing water impoundment pond is enclosed by fence and covered by bird netting. The total working capacity of the water impoundment is currently planned to be 32,039 bbls. If approved, this facility will be utilized 100% by Marathon operations.

Liner: Material: Reinforced Polyethylene (RPE), Number of Liners: 2, two 60-mil HDPE, total thickness is 120 mils and two geonet layers at 125,000 sf each.

Rule 908.a.

The proposed facility is a non-commercial, centralized E&P waste management facility for the management of E&P waste and will serve only Marathon's operations in Garfield County, Colorado.

Rule 908.b.(1)

This facility will be operated by Marathon. The information required by this rule is as follows:

Operator Name: Marathon Oil Company
Contact Person: Eric Ward

Local Address:	743 Horizon Court, Grand Junction, CO 81506
Phone:	(970) 244-5735
Cell:	(970) 589-5949

Rule 908.b.(2)

Marathon holds 50% surface ownership at this location. Written authorization is required as a component of the local land use approval in Garfield County.

Rule 908.b.(3)

LEGAL DESCRIPTION
SE ¼ SW ¼ Section 32, Township5 South, Range 96 West, 6th PM

Rule 908.b.(4)

Topographic maps of the location and a report detailing the geology and hydrology of the site have been included under a separate tab. The average annual precipitation in the area of the facility is approximately 16 inches (Colorado Climate Center records for Altenbern Ranch station No. 50214). The average annual evaporation rate in the area of the facility is approximately 40 inches (National Weather Service Evaporation Map of the United States).

Rule 908.b.(5).A.

The site plan included in this submittal identifies all of the features of the facility, including fencing, access road improvements and drainage structures. Construction and drainage details are also provided in the grading plans and drainage plans. Drainage details have been prepared by a licensed professional engineer and are in accordance with COGCC requirements for surface flows. The entire plan set signed and sealed by a licensed professional engineer is provided as an attachment to this submittal.

Rule 908.b.(5).B.

A survey plot prepared in accordance with Rule 908.b.(5).B is included with this submittal. The distance at the surface to the nearest section lines are approximately 660 feet from the west section line and approximately 2,115 feet from the south section line.

Rule 908.b.(5).C.

The perimeter of the site will be fenced and site access will be controlled by an existing manned guard shack on Garden Gulch Road. Marathon operates under an approvedWildlife Mitigation Plan and will work with the Colorado Parks and Wildlife (CPW) to amend the plan in order to accommodate the proposed facility.

Rule 908.b.(5).D.

Documentation of communication with Grand Valley Fire Protection District to support Marathon's request for exemption to this rule is attached under a separate tab.

Rule 908.b.(5).E.

The grading and drainage plans demonstrating compliance with COGCC rules are included in this application. A representation of the Garfield County floodplain designations is included under a separate tab. As noted on the map included under the Figures Tab, the area surrounding this facility is an area where no floodplain or floodway has been identified. Based on the elevation difference between the proposed site and area surface water, it is highly unlikely that a flood would impact this facility.

Marathon's Stormwater Management Plan (SWMP) and permit is included under a separate tab.

The site has been designed for a storm event greater than stated in Rule 908.b.(5).E and is consistent with the Garfield County approved design criteria referenced within the report. In addition, the Final Drainage Report is included as an attachment to this document.

Rule 908.b.(6).

The information provided in the waste management profile is as follows:

- A mass-flow balance for this facility representing maximum anticipated monthly volumes for receipt and reuse of materials.
- A process flow diagram illustrating the anticipated sources of wastes, delivery for remediation and potential disposal requirements.
- The data set reflecting sampling and analysis of representative waste.

Rule 908.b.(7).

The site plan for the facility and the grading plan and drainage report provide details of the facility design and engineering. Also included under a separate tab is a process-flow diagram and process description for Marathon's process. The facility has been designed by a professional engineer with features to prevent runoff from impacting the localized surface water features. Marathon's operational policies and emergency management procedures for this facility are designed to minimize risk to the environment and accommodate rapid response in the event of any accident.

Rule 908.b.(7).A. Geological Data

A comprehensive report from the Natural Resources Conservation Service (NRCS) of Colorado is provided in Attachment J and a report on geological hazards is provided in Attachment K. Figure S-1 provides the soils map for this project. A generalized geologic map of the area is provided in Figure G-1.

According to information prepared by the NRCS, the soil in the location of this proposed water impoundment facility has been mapped as Parachute-Irigul complex, (55) and Parachute-Irigul-Rhone association, (56) as seen in Figure S-1. Of the Parachute-Irigul complex (55), the Parachute component makes up 51.4 percent of the map unit. Slopes are 5 to 30 percent. This component is found on mountains. The parent material consists of residuum weathered from shale and siltstone and/or residuum weathered from sandstone and shale. Depth to restrictive paralithic bedrock is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches.

The Irigul component makes up 30 percent of the map unit. Slopes are 5 to 30 percent. This component is on hills. The parent material consists of residuum weathered from sandstone and shale. Depth to root restrictive layer bedrock is 5 to 20 inches. The natural drainage class is well drained.

The Parachute component of the Parachute-Irigul-Rhone association makes up 48.6 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountains. The parent material consists of colluvium derived from sandstone and shale and/or residuum weathered from siltstone. Depth to restrictive paralithic bedrock is 20 to 40 inches. The natural drainage class is well drained.

The Irigul component makes up 30 percent of the map unit. Slopes are 25 to 50 percent. This component is on hills. The parent material consists of residuum weathered from sandstone and shale. Depth to restrictive lithic bedrock is 5 to 20 inches. The natural drainage class is well drained.

Rule 908.b.(7).B. Hydrological Data

The site lies between Little Creek and House Log Gulch. The facility is approximately 1,900 feet from House Log Gulch and 850 feet from Little Creek. A map of surface water features within two (2) miles of the proposed facility is provided in Attachment K, Figure V-1.

There are no water wells within one (1) mile of the site boundary according to the Colorado Division of Water Resources' on-line resources.

The location is not within an identified floodplain and is located at an elevation well above the nearest surface waters. An assessment of potential impacts to wetlands and waters of the United States (US) according to Army Corps of Engineers' (ACoE) standards found that the

proposed project will not have any impacts to wetlands, or adversely affect water quality in any nearby waterways.

The entire proposed facility has been designed with features that significantly reduce the potential for the facility to impact nearby surface and ground water. Marathon does not anticipate impacts to nearby surface and ground water from the facility. Potential impacts are addressed via adherence to the COGCC approved design criteria for an ongoing assessment of impacts and safe operation of the facility.

Rule 908.b.(7).C. Engineer Data

The pond was constructed with 2-60 mil synthetic liners and two geo-nets layers that cover the bottom and interior sides of the pit with the edges secured with at least a thirty-six (36) inch deep anchor trench around the pit perimeter. The trench is designed to secure, and prevent slippage or destruction of, the liner materials. Field seams were installed and tested in accordance with manufacturer specifications and good engineering practices. Test results are maintained electronically and will be provided to the Director upon request.

The synthetic material is impermeable, has high puncture and tear strength, has adequate elongation, and is resistant to deterioration by ultraviolet light, weathering, hydrocarbons, aqueous acids, alkali, fungi or other substances in the produced water.
The impoundment was constructed, installed, and maintained in accordance with the manufacturers' specification. The impoundment was designed with good engineering practices. A leak detection system was also installed to monitor for any leaks.

Construction drawings demonstrating the design components of the impoundment, depth of cut, dimensions, grades, structures and access road are contained in Attachment C - Drainage Report and Plan and Attachment D - Construction Drawings.

Rule 908.b.(8).Operating Plan

An operating plan is provided in Attachment F and an area-wide Emergency Management Plan for the facility is provided in Attachment I.

A copy of Marathon's Storm Water Management Plan (SWMP) and Permit has been attached to this submittal as Attachment G. Final details of the specific storm water best management practices (BMPs) will be included in the SWMP as part of the regular inspection schedule. Diverted water is addressed in the Drainage Plan and via adherence to the SWMP.

Marathon's policy is to maintain accessibility to the facility at all times. Updates to the plan, as recorded, will be provided to the COGCC with a Form 4, Sundry Notice.

Rule 908.b.(9).A. Ground Water Monitoring

There are no water wells within one (1) mile of the site boundary according to the Colorado Division of Water Resources' on-line resources.

Rule 908.b.(9).B. Site-specific Monitoring Wells

The impoundment has been constructed employing a dual liner with a leak detection system that provides for immediate leak detection from the uppermost liner.

Rule 908.b.(10). Surface Water Monitoring

Periodic water sampling will occur as directed by the COGCC.

Historical sampling has been conducted at the following locations:

- MOC 20: Township 6 South, Range 97 West, Section 2
- MOC 21: Township 6 South, Range 97 West, Section 2
- MOC 22: Township 5 South, Range 96 West, Section 32
- MOC 23: Township 5 South, Range 96 West, Section 32

Sample points MOC 20 and 21 are on House Log Gulch and sample points and MOC 22 and 23 are on Little Creek. These locations are mapped in Attachment D1-4 of Attachment C-Final Drainage Report.

These sites were sampled 09/26/2008 prior to construction of the original pad. Results from the baseline tests are included as an attachment.

Rule 908.b.(11). Contingency Plan

The Operating Plan and Emergency Response Plan address all elements required by the COGCC, including contingency planning and are included as Attachment I. Marathon's roles and responsibilities are set forth in the Operating Plan which is included as Attachment F.

Rule 908.c. Permit Approval

No response required.

Rule 908.d. Financial Assurance

An estimate of the cost for proper reclamation, closure and abandonment of the proposed facility is provided in Attachment A. Marathon currently has a $50,000 blanket waste management surety bond (2008-0084) and a $25,000 blanket surface surety bond (2007-0075) with the COGCC.

Rule 908.e. Facility Modifications

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

Rule 908.f. Annual Permit Review

To facilitate the annual review of this facility by the COGCC, Marathon shall submit an annual report summarizing operations, including the types and volumes of waste actually handled at the facility.

Rule 908.g. Closure

A preliminary plan for reclamation and closure of the facility, as well as the estimated cost to close and reclaim the facility is provided in Attachment A.

Rule 908.h. Local Permitting

Marathon will submit an application to Garfield County to obtain local land use approval via the County's Limited Impact Review (LIR) application process. Copies of Garfield County land use approval documents will be provided to the COGCC upon receipt. This encompasses all requirements for local government zoning and construction.

Figures

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 815065 | TEL 970.263.7800 | FAX 970.263.7456

Figures
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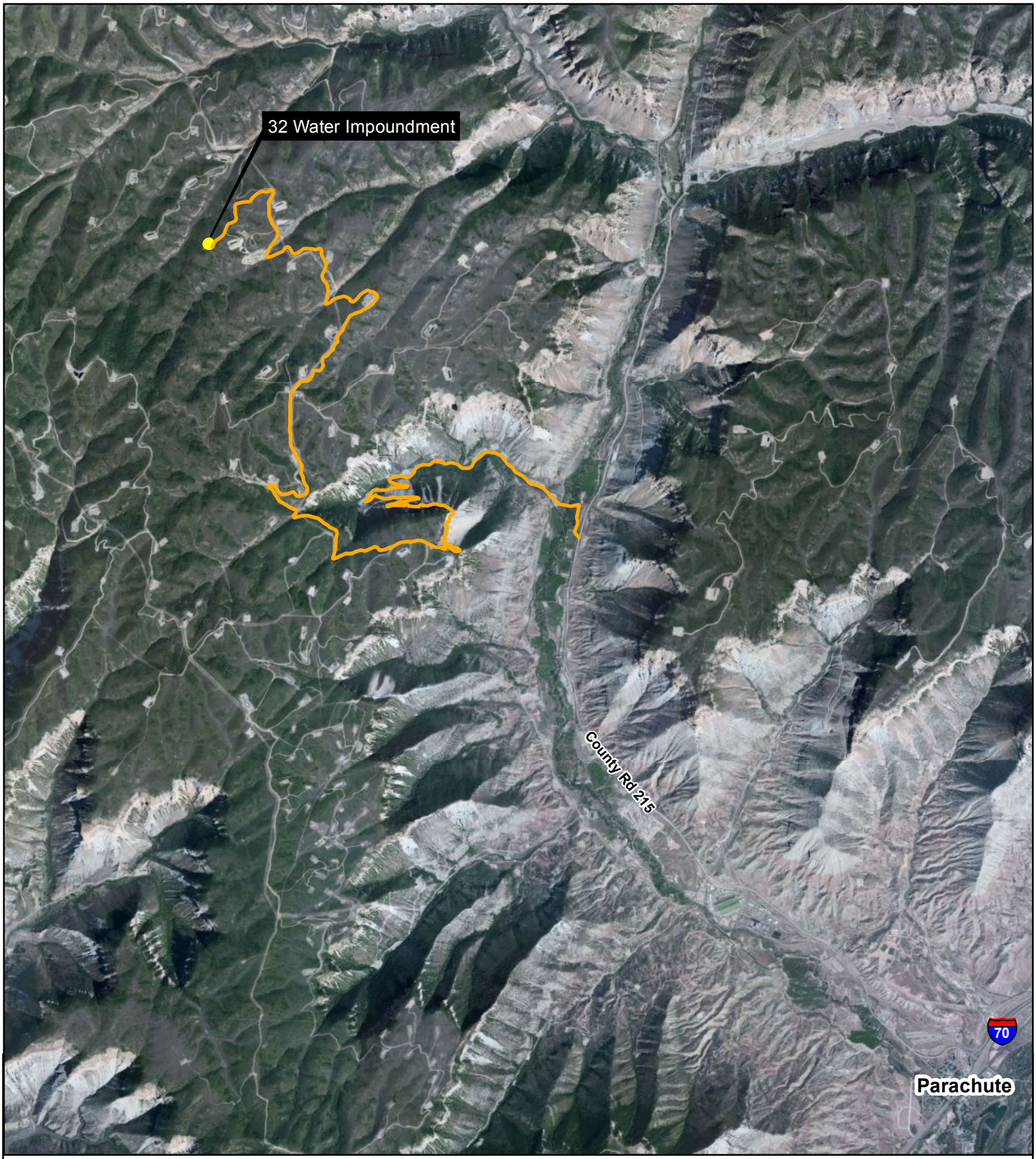


Legend

- 32C Water Impoundment
- Route to Facility
- Highway
- Local Roads

0 0.5 1 2 Miles

N W E S

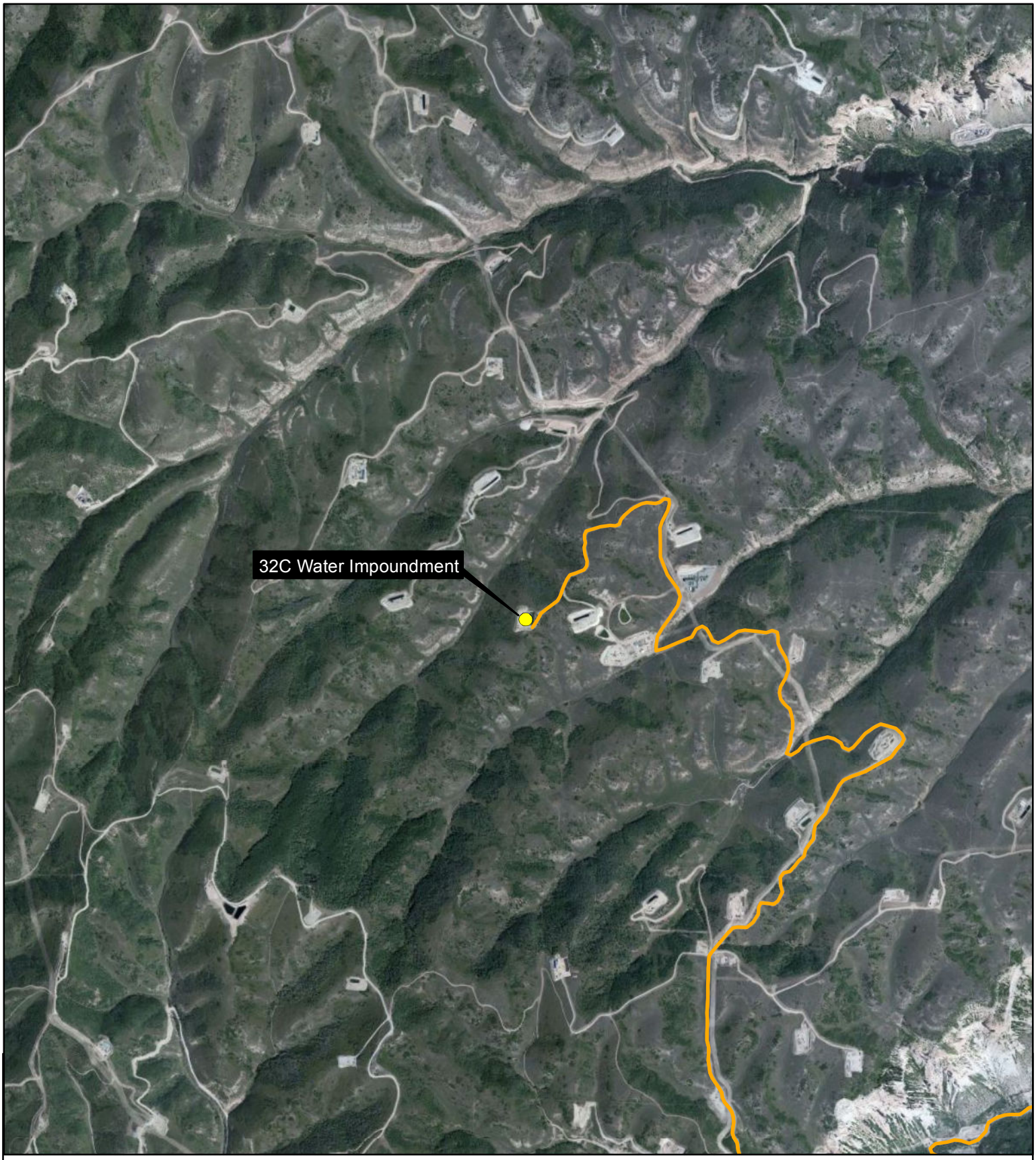
PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	2/5/13

ACTIVITY MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

ACT - 1



Legend

- 32C Water Impoundment
- Route to Facility

0 0.225 0.45 0.9 Miles

N W E S

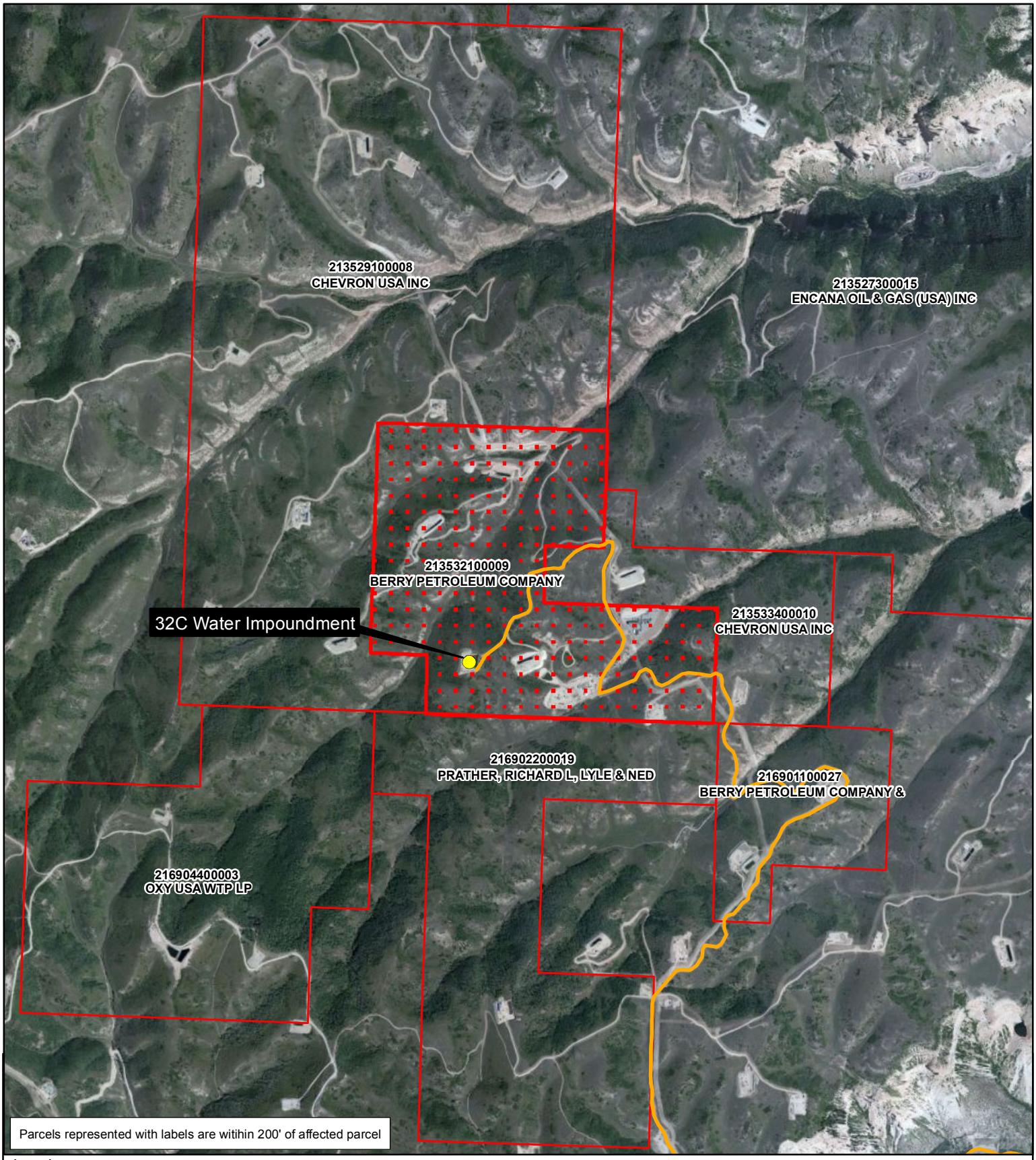
PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	6/17/2013

AERIAL MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

AER - 1



Legend

- 32C Water Impoundment
- Parcel 213532100009 (880 Acres)
- Parcels
- Route to Facility

0 0.225 0.45 0.9 Miles

N W E S

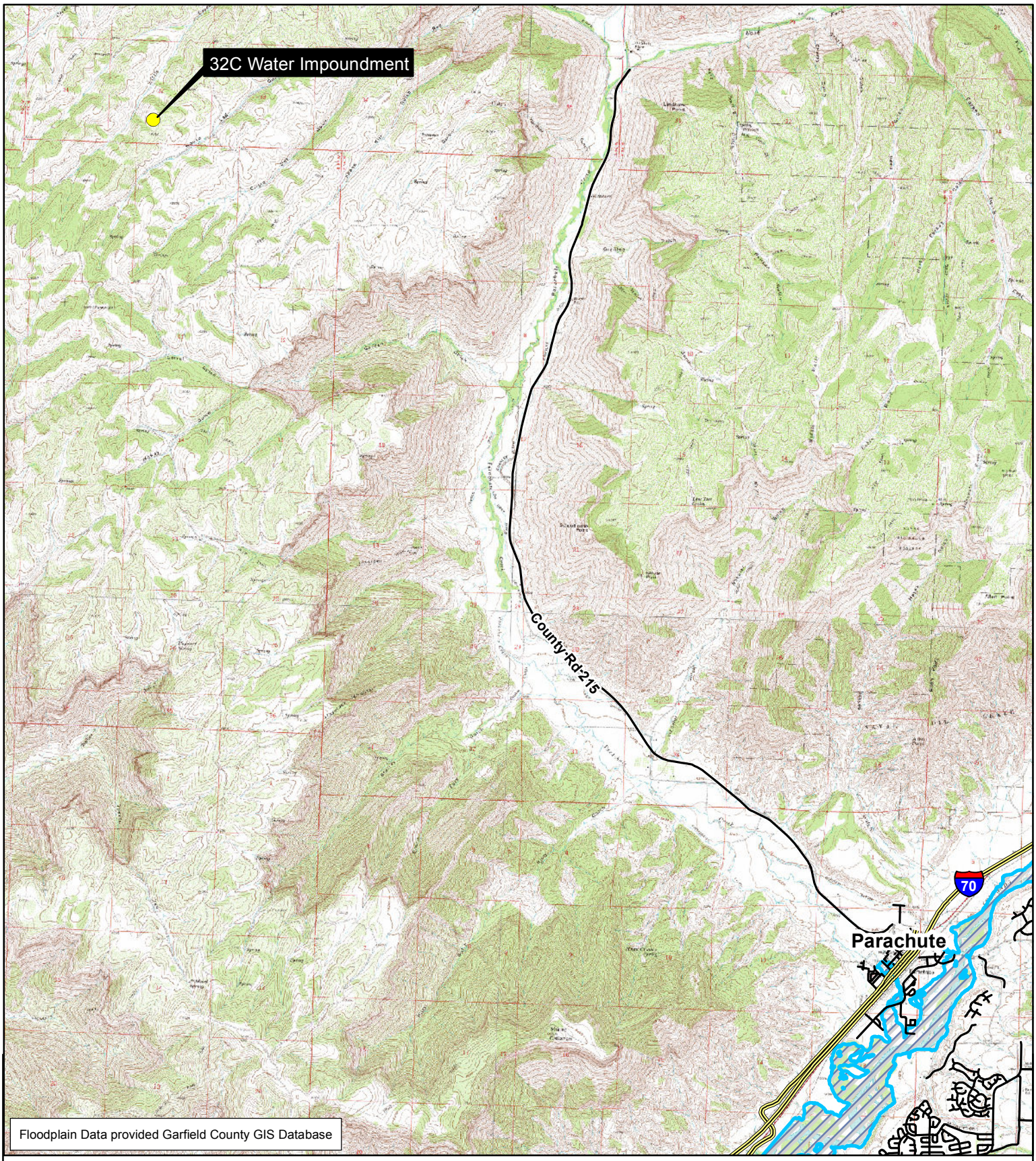
PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	6/17/2013

ADJACENT PARCEL MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

AP - 1



Floodplain Data provided Garfield County GIS Database

Legend

- 32C Water Impoundment
- FloodPlain
- Highway
- Local Roads

0 0.5 1 2 Miles

N W E S

PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	7/18/12

FLOODPLAIN MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

F - 1

Geology Data provided by the USGS Geological Survey

Legend

32C Water Impoundment

Geology Type

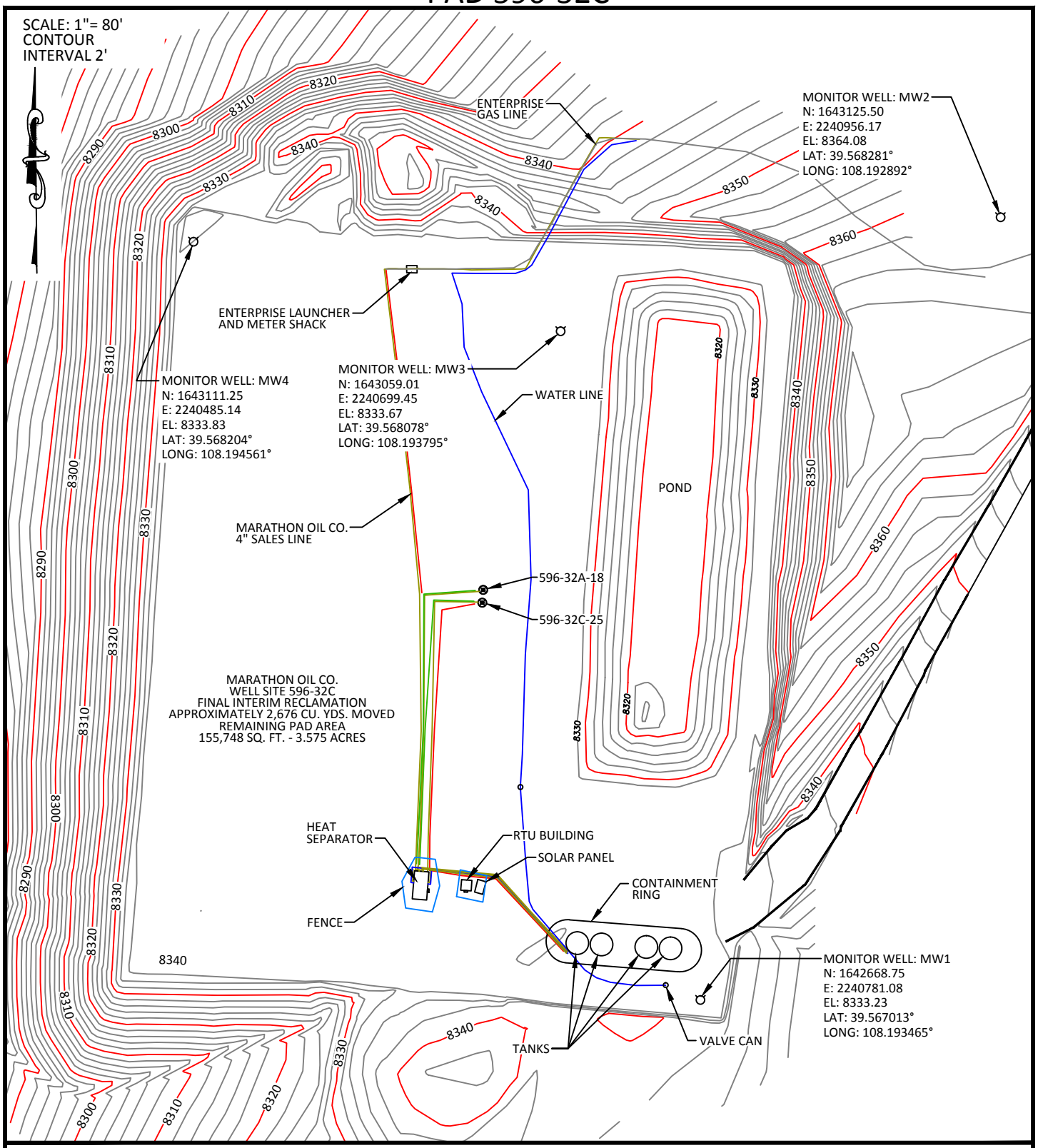
Tu - Unita formation

0 125 250 500 Feet

N W E S

PROJECT NO: 012-1372	GEOLOGY MAP 32C WATER IMPOUNDMENT MARATHON OIL COMPANY GARFIELD COUNTY, COLORADO	OLSSON ASSOCIATES	FIGURE
DRAWN BY: Jenna Muhlbach		760 HORIZON DRIVE; SUITE 102 GRAND JUNCTION, CO 81506 TEL 970.263.7800 FAX 970.263.7456	G - 1
DATE: 7/18/12			

PAD 596-32C



CONFIDENTIALITY NOTES:
The information contained in this plat is legally privileged and confidential information intended only for the use of the recipients. If you are not the intended recipients, you are hereby notified that any use, dissemination, distribution or copying of this information is strictly prohibited.

WILLIAM H. SMITH
& ASSOCIATES P.C.
SURVEYING CONSULTANTS
550 EAST SECOND NORTH
GREEN RIVER, WY
PHONE: 307-875-3638
307-875-3639
www.whsmithpc.com

DRAWN BY: GEB	CHECKED BY: WHD
PROJECT NO: N/A	JOB NO: 26099
REVISIONS:	

NOTES:

COORDINATES SHOWN ARE STATE PLANE COLORADO CENTRAL ZONE NAD83

LATITUDES/LONGITUDES SHOWN ARE GEOGRAPHIC NAD83

LOCATION:

596-32C
WITHIN THE SW/4
SECTION 32,
T 5 S, R 96 W,
6TH PM.
GARFIELD COUNTY,
COLORADO

MARATHON OIL COMPANY

PO BOX 3128, HOUSTON TX, 77253
5555 SAN FELIPE, HOUSTON TX, 77056

MONITOR WELL LOCATIONS

SCALE: 1"= 80'	EXHIBIT "A"
DATE: 2013-06-14	SHEET 1 OF 1

MW-1

NWI data provided by the United States Fish and Wildlife Service

Legend

- 32C Water Impoundment
- Route to Facility

USFWS NWI

- Aquatic Bed
- Emergent
- Forested or Scrub Shrub
- Unconsolidated Bottom/Shore

0 245 490 980 Feet

N W E S

PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	6/17/2013

NATIONAL WETLANDS INVENTORY MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE; SUITE 102
GRAND JUNCTION, CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

NWI - 1

Legend

- 32C Water Impoundment

Soil Type

- 52 - Northwater-Adel complex, 5-50% slopes
- 55 - Parachute-Irigul complex, 5-30% slopes
- 56 - Parachute-Irigul-Rhone association, 25-50% slopes
- 57 - Parachute-Rhone loams, 5-30% slopes
- 63 - Silas loam, 1-12% slopes

0 125 250 500 Feet

N W E S

PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	7/18/12

SOILS MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
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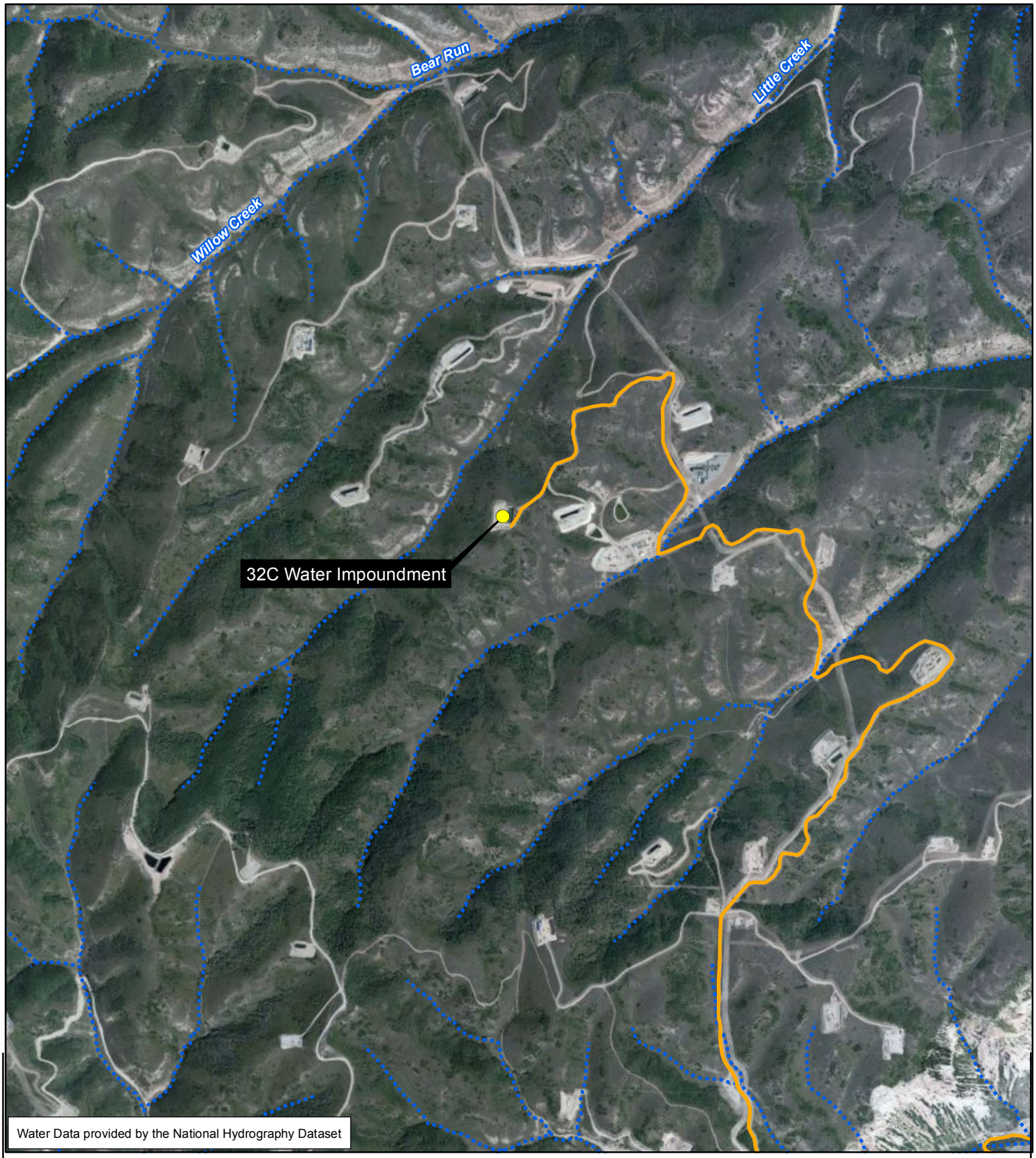
FIGURE

S - 1



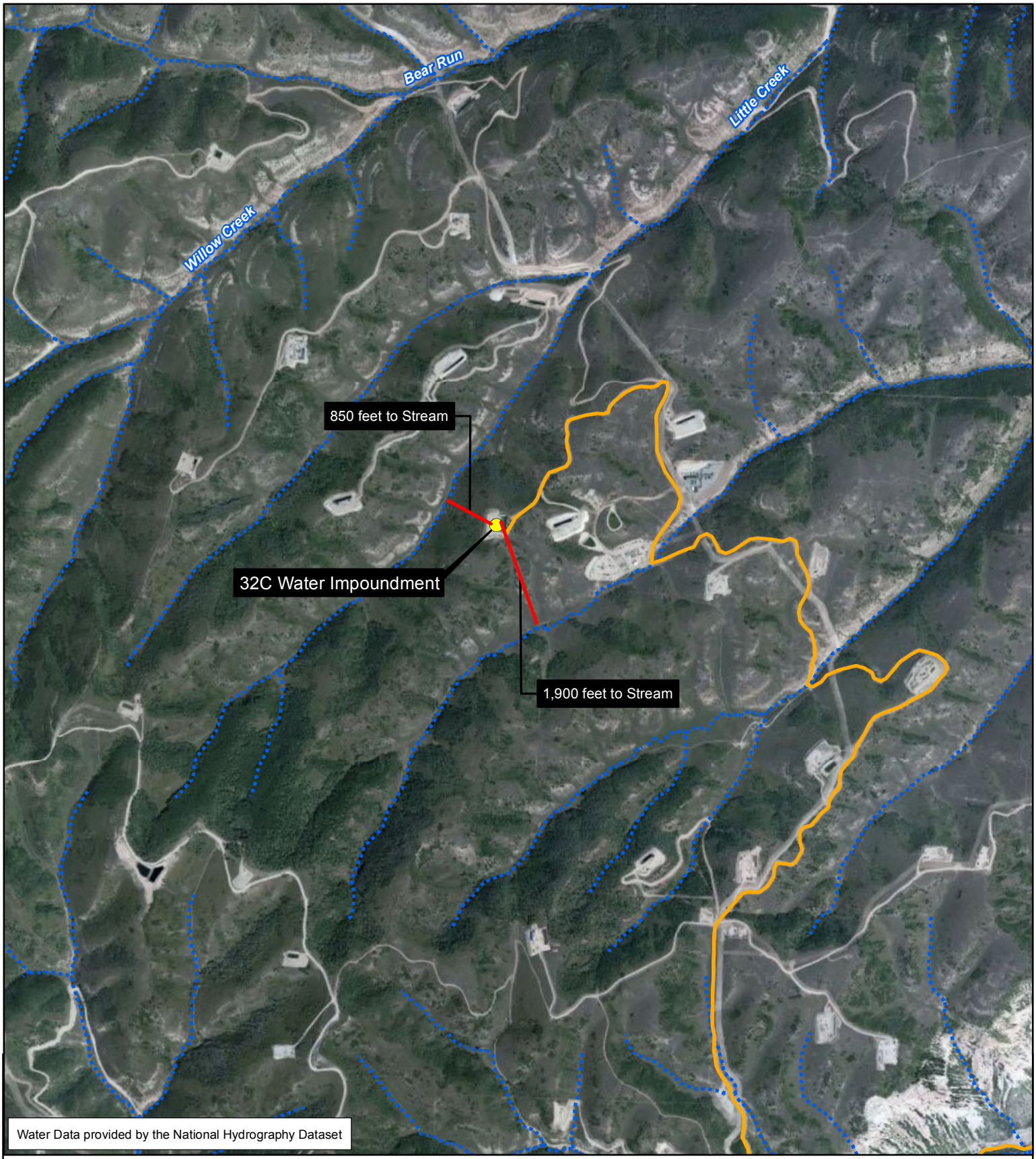
Legend

- 32C Water Impoundment
- Route to Facility
- Perennial Creeks
- Surface Water

0 625 1,250 2,500 Feet

N W E S

PROJECT NO: 012-1372	SURFACE WATER MAP 32C WATER IMPOUNDMENT MARATHON OIL COMPANY GARFIELD COUNTY, COLORADO	OLSSON ASSOCIATES 760 HORIZON DRIVE; SUITE 102 GRAND JUNCTION, CO 81506 TEL 970.263.7800 FAX 970.263.7456	FIGURE
DRAWN BY: Jenna Muhlbach			SW - 1
DATE: 6/17/2013			



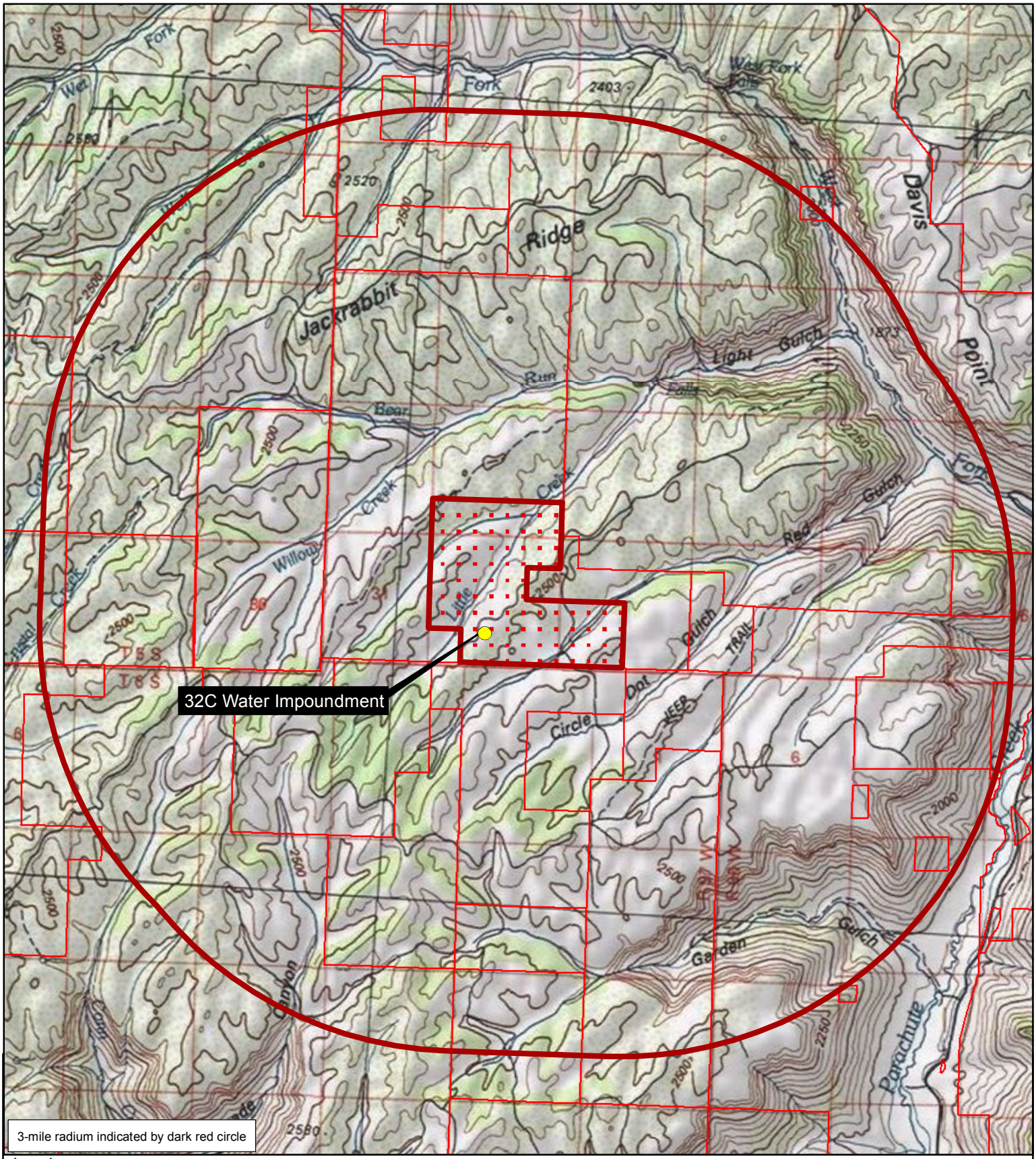
Legend

- 32C Water Impoundment
- Route to Facility
- Surface Water
- Perennial Creeks

0 625 1,250 2,500 Feet

N W E S

PROJECT NO:	012-1372	SURFACE WATER MAP 32C WATER IMPOUNDMENT MARATHON OIL COMPANY GARFIELD COUNTY, COLORADO	OLSSON ASSOCIATES	FIGURE
DRAWN BY:	Jenna Muhlbach		760 HORIZON DRIVE; SUITE 102 GRAND JUNCTION, CO 81506 TEL 970.263.7800 FAX 970.263.7456	SW - 2
DATE:	6/17/2013			



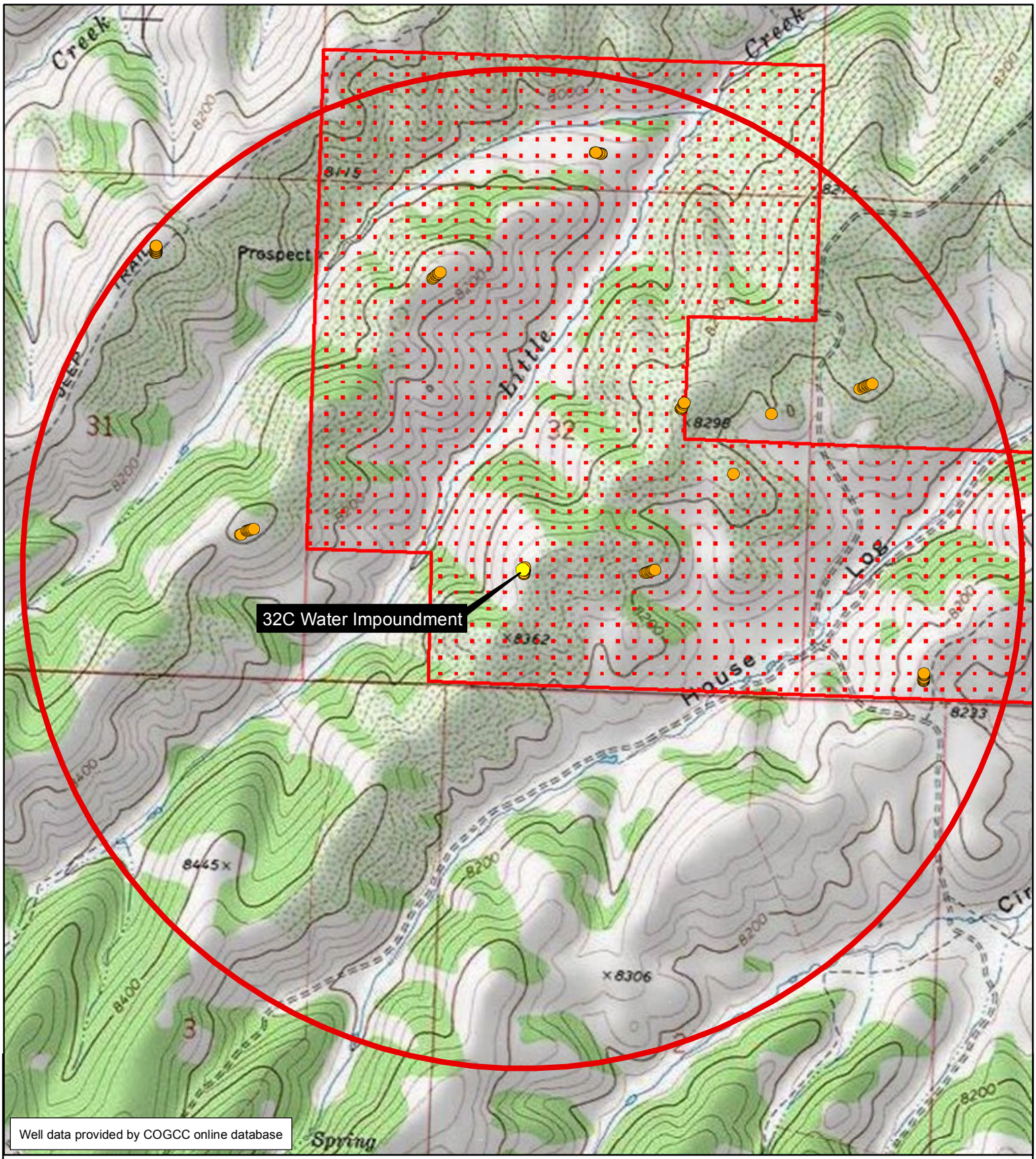
PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	7/18/12

VICINITY MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

V - 1



Legend

- 32C Water Impoundment
- State Registered Natural Gas Wells
- 1 Mile Buffer
- Parcel 213532100009 (880 Acres)

0 0.125 0.25 0.5 Miles

N W E S

PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	6/17/2013

WELLS MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

W - 1

Attachment A
Reclamation Plan and Closure Costs

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

1 Interim Reclamation

The project location is currently in interim reclamation.

2 Pit Closure

The proposed Water Impoundment Facility will be in operation at this location for the productive life of the nearby production wells or until Marathon Oil Company (Marathon) determines that the facility is no longer necessary or until the facility becomes incapable of supporting operations. Marathon anticipates the useful operational life of the proposed facility to be 25 years.

The facility will undergo final reclamation within six months following cessation of permanent operations. Final closure will include removal of all mechanical and electrical equipment, removal and disposal of synthetic liners, filling and grading of the pits, and final reclamation.

Closure Sequence

Following cessation of permanent operations of the facility and upon decommissioning of the pits or impoundments, the facility will be closed and reclaimed as outlined below:

- ☐ Stormwater and erosion control Best Management Practices (BMPs) will be installed prior to closure construction activities (per the NPDES general construction permit) and will remain in place until final stabilization occurs. The site will be monitored until final stabilization as described in Section 1.

- ☐ Water remaining in the pit and transmission piping will be removed and disposed of in accordance with the COGCC 900 Series rules.

- ☐ All equipment, structures, appurtenances and fencing will be disassembled and or demolished and removed from the site.

- ☐ Pit sediment will be removed and stockpiled for drying, testing, characterization and final disposal determination.

- ☐ The containment liners will be removed and recycled or otherwise disposed of at a permitted waste facility.

- ☐ The aggregate surfacing materials from access roads will be removed, stockpiled at an appropriate location, and re-used as surfacing material elsewhere or mixed with fill soil.

- ☐ Compacted soils will be ripped and re-graded to the approximate pre-construction grades.

- ☐ After the pit liners have been removed, the compacted surfaces will be ripped to loosen the soil and to mix subgrade materials. The pit depressions will then be backfilled with stockpiled soil and soil from the earth berms surrounding the pits. The backfill will occur in lifts that allow proper moistening and compaction, up to the pre-excavation grade.

- ☐ Topsoil that was stockpiled from initial excavation will be distributed across the pit area and seeded as described in Section 1.

All transmission piping will be left in place after the life of the facility. Prior to final reclamation the piping will be decommissioned and tested.

Any lubricants or other maintenance chemicals stored onsite will be relocated for other facility use, properly disposed of, or recycled according to federal, state and local regulations.

Equipment and support structures will be hauled offsite for reuse elsewhere, or otherwise properly disposed of according to federal, state and local regulations.

Following removal of the synthetic liner system, the underlying soil will be tested for the presence or absence of regulated contaminants. If testing indicates chemical contamination, the affected soil will be excavated, stockpiled, tested, and either properly disposed of or treated onsite and reused as fill material.

Aggregate surfacing material will be removed and stockpiled for reuse or mixed with fill soil. The earthen containment berms will be bulldozed and stockpiled for use as fill material and the rest of the site will be ripped and de-compacted. Stockpiled and ripped soils will be redistributed over the site during reclamation activities.

Following demolition and de-compaction, the site will be graded to match original pre-construction grades and contours to the extent possible. Topsoil will then be evenly spread over the disturbed area and seeded with a native seed mix for final stabilization. Stormwater and erosion control BMPs will be implemented accordingly to reduce and control the volume of runoff as well as to prevent any sediment transport offsite during reclamation activities. All stormwater and erosion control BMPs will remain in place, as appropriate, until the site reaches final stabilization.

To verify compliance with WQCC standards, following facility closure groundwater samples will be collected from site monitoring wells within one mile of the site. Samples will also be collected from any nearby surface water bodies present at the time of closure.

Per COGCC 900 Rules, a Site Investigation and Remediation Workplan, Form 27, will be provided to the Director for approval at least sixty (60) days prior to closure. If it is determined that soils and/or surface and ground water were detrimentally impacted by the facility, the necessary remediation efforts will be implemented immediately. Implementation details for site remediation and emergency response procedures and contacts are included in the documents accompanying Marathon's Form 28 application submittal including the Operating Plan and Emergency Response Plan.

3 Final Reclamation

Following the removal of all structures, appurtenances, equipment, and materials described above, final reclamation activities will be initiated. All final site reclamation activities will be conducted in accordance with COGCC 1000 Series Rules and Garfield County Standards as well as any other state and local agency requirements. The site will be graded as near as possible to original contours following the ripping and de-compaction and any remaining stockpile will be evenly distributed over the disturbed area. Grading will match pre-construction contours as close as practicable and/or to contours desired for the future land use. The area will be seeded with native or adapted vegetation using an

appropriate distribution method that will provide proper establishment and soil stabilization.

The goal of the final site reclamation is to return the disturbed area to as close to pre-disturbance conditions as practical. Following all site reclamation activities, the site will be monitored for erosion caused by the elements as well as any weeds or uncharacteristic vegetation growth until the site reaches final stabilization levels.

Estimate of Probable Final Closure and Reclamation Cost

A summary of the estimate of probable final closure and reclamation cost is provided below.

Reclamation Cost Estimate

Pond 32C						
Item	***Description***	***Qty***	***Unit of Measure***	***Unit Cost***	***Amount***	***2% inflation adjusted over 20 years***
1	Survey Work - Engineering Designs (includes initial site visits and reclamation plans)	1	LS	$20,000	$20,000	$29,719
2	Consulting - creation of work closure plan, agency documentation	1	LS	$10,000	$10,000	$14,859
3	Mobilization / Demobilization	1	LS	$5,000	$5,000	$7,430
4	Remove and Dispose Pond Fluids	40,607	BBLS	$3.00	$121,821	$181,020
5	Remove and Dispose of Operating Equipment	1	LS	$10,000	$10,000	$14,859
6	Remove and Dispose of Liners	70,940	SF	$.60	$42,564	$63,248
7	Backfill & Compact Pit	1	LS	$85,000	$85,000	$126,306
8	Site Restoration (Grading/Seeding)	1	LS	$90,000	$90,000	$133,735
9	Materials including Soil and Seed	1	LS	$5,000	$5,000	$7,430
10	Sampling	1	LS	$10,000	$10,000	$14,859
11	Project Oversight	1	LS	$25,000	$25,000	$37,149
Estimated Subtotal					***$424,385***	***$630,614***

Notes:

1. Pond disposal assumes 90% of fluids are pumped to the injection well. The remaining 10% is hauled.
2. Pond liners include two 60-mil HDPE and two geonet layers at 125,000 sf each.
3. Restoration only includes the 596-32C pond.

The cost estimate is based on the following data, information, and assumptions:

- ☐ General Approach: The costs were developed based upon estimating the direct cost of labor, equipment, materials, and subcontractors and applied to quantity take-offs. Costs are based on calendar year 2012. Allowances for escalation due to economic factors are applied at two (2) percent per year.

- ☐ Labor Rates: Applicable labor rates are based on the Colorado Wage Decision per the U.S. Department of Labor for "Heavy Construction", effective December 2010. These rates include the base pay and fringe benefits. Allowances were added to the labor rates for FICA/Medicare (7.65%), Workman's Compensation Insurance (12.85%), and contractor's liability insurance (1.5%).

- ☐ Equipment Rates: The equipment rates were developed from Equipment Watch Custom Cost Evaluator and include fuel, lubrications, and non-labor operating costs. Fuel cost is estimated at $3.51 per gallon.

- ☐ Where provided, production rates for pit liner removal, soil backfill, and site restoration are based on the R.S. Means Heavy Construction Cost Data (17^{th} Edition). Pit liner removal is assumed to occur at the same production rate as installation.

- ☐ Mobilization/Demobilization Costs: Mobilization and demobilization travel is assumed to be to and from Denver, Colorado.

- ☐ Disposal Costs: All disposal costs are assumed to include transportation and tipping fees based on a permitted facility near Denver, Colorado.

- ☐ Miscellaneous Unit Costs: Miscellaneous unit costs were obtained from R.S. Means New Mexico Heavy Construction Cost Data.

- ☐ Soil Material Swell: Volumes of bank cut soil were increased by 15 percent to account for bulking or swell.

- ☐ Site Management: Site Management was estimated separately to support construction for the duration of the closure/restoration work. Labor includes a full-time superintendent, construction clerk, field engineer, quality control engineer, laborer, and heavy equipment mechanic. Support equipment includes a four wheel drive crew-cab pickup, water truck, motor grader, and mechanics truck with portable welder. Support facilities include an office trailer, portable toilets, fueling area, and erosion control supplies.

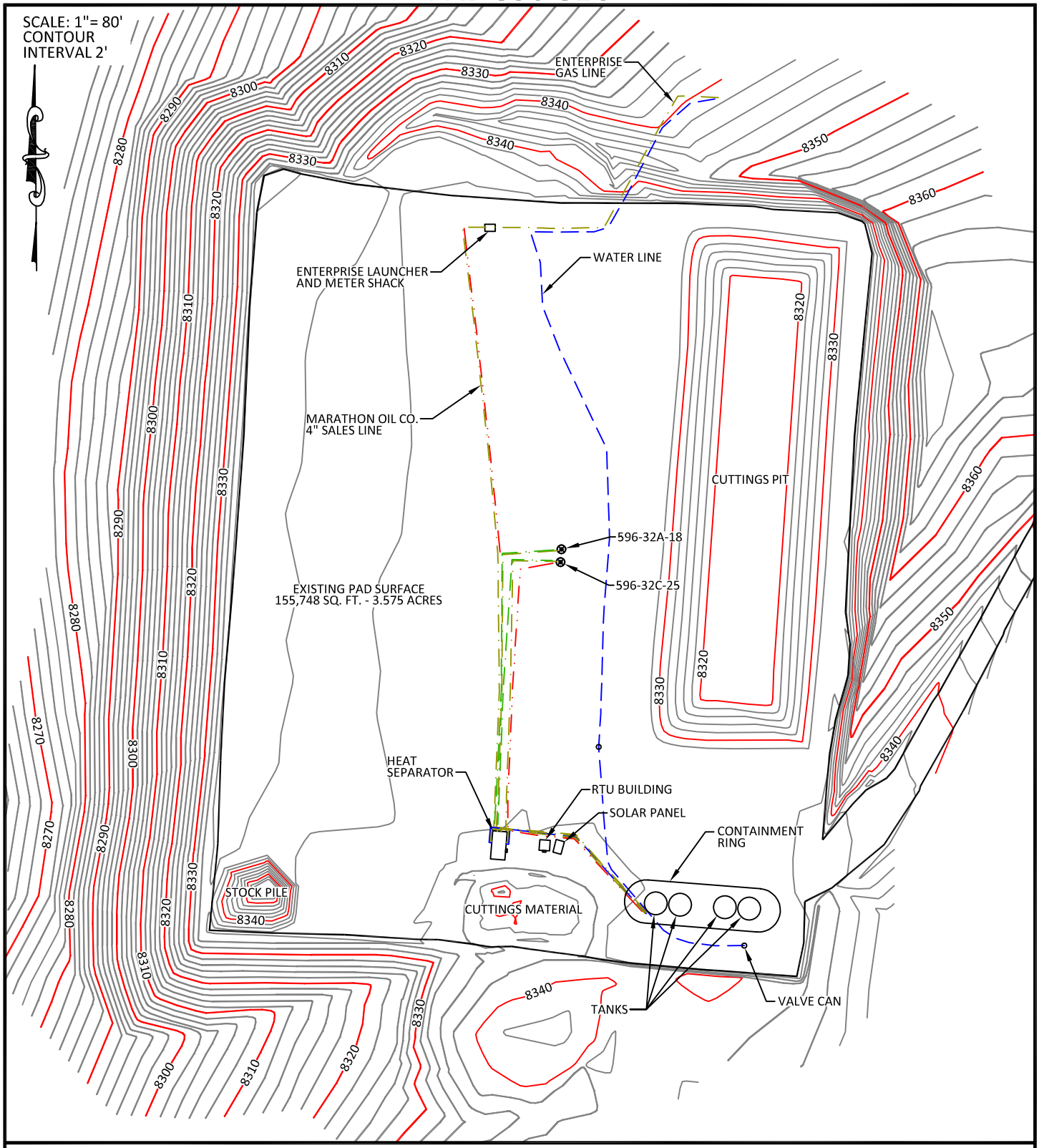
- ☐ Revegetation Unit Costs: The revegetation unit cost is based on quotes in similar estimates provided by Rocky Mountain Reclamation.

- ☐ Indirect Cost Allowances: Indirect cost allowances were applied to the construction contractor's direct costs as follows: Contingency (10.0%), Payment and Performance Bond (1.5%), and Contractor Profit and Overhead (20.0%). Contractor overhead includes home office salaried and clerical personnel, shop and facilities, fees and insurance (except those applicable to labor and equipment), training, and quality assurance/quality control.

- ☐ Administrative and Engineering Cost Allowances: Project Management Fee (5.0%), engineering for final reclamation work plans, design, and preparation of bid documents (15.0%).

- ☐ State and local taxes were excluded.

PAD 596-32C



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WILLIAM H. SMITH & ASSOCIATES P.C.
SURVEYING CONSULTANTS
550 EAST SECOND NORTH
GREEN RIVER, WY
PHONE: 307-875-3638
307-875-3639
www.whsmithpc.com

DRAWN BY: JSJ	CHECKED BY: WHD
PROJECT NO: N/A	JOB NO: 26099
REVISIONS:	

LEGEND

- GAS LINES
- WATER LINES
- CONDENSATE LINES
- GLYCOL LINES
- ELECTRIC LINES

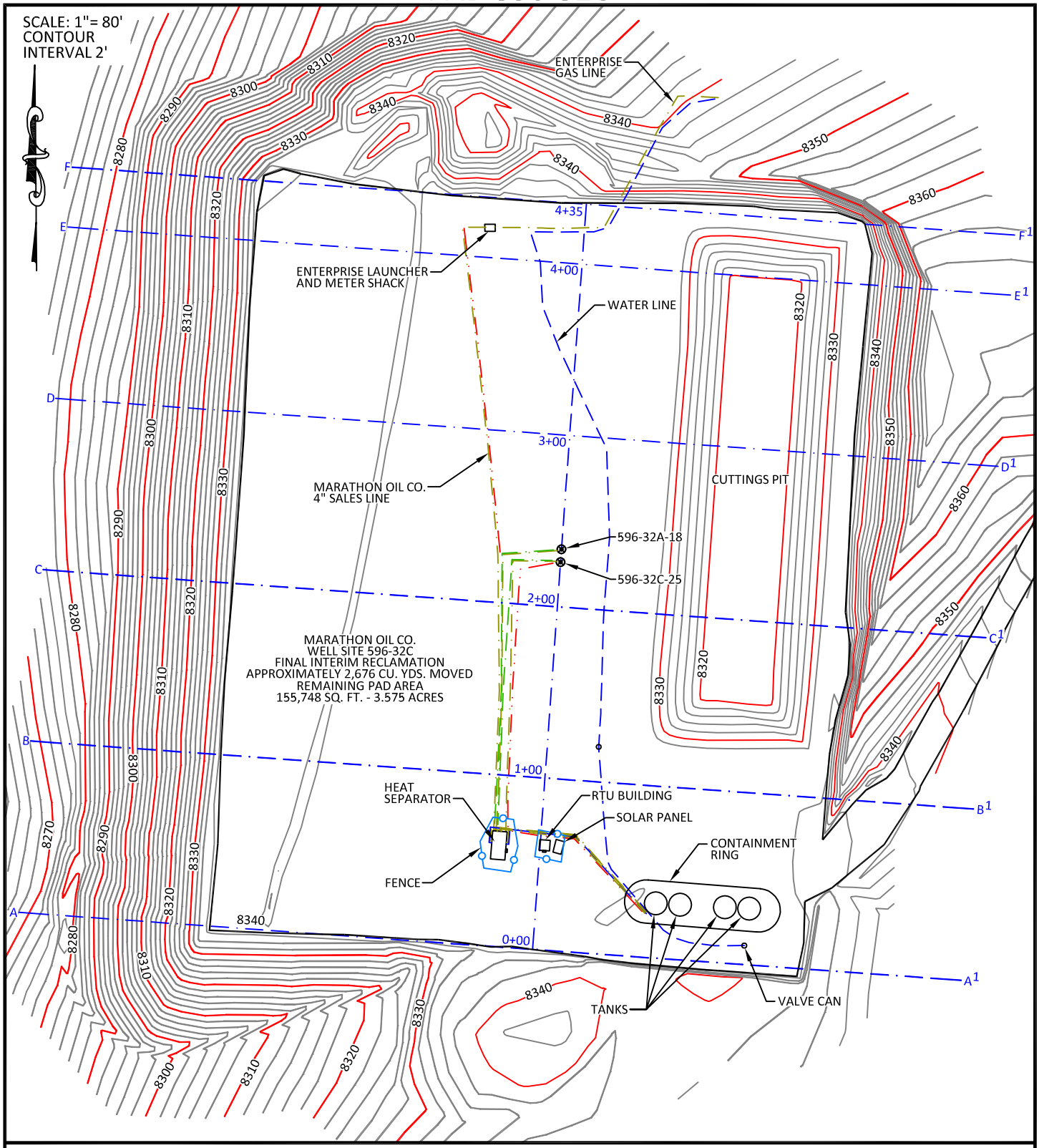
LOCATION:
596-32C
WITHIN THE SW/4
SECTION 32,
T 5 S, R 96 W,
6TH PM.
GARFIELD COUNTY,
COLORADO

MARATHON OIL COMPANY
PO BOX 3128, HOUSTON TX, 77253
5555 SAN FELIPE, HOUSTON TX, 77056

AS-BUILT PAD

SCALE: 1"= 80'	EXHIBIT "A"
DATE: 10/20/2011	SHEET 1 OF 3

PAD 596-32C



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DRAWN BY: JSJ	CHECKED BY: WHD
PROJECT NO: N/A	JOB NO: 26099
REVISIONS:	

DATA

FINAL INTERIM RECLAMATION
APPROXIMATELY 2,676 CU. YDS. MOVED

TOPSOIL USED FOR RECLAMATION
APPROXIMATELY 0 CU. YDS. MOVED

REMAINING PAD AREA
155,748 SQ. FT. - 3.575 ACRES

LOCATION:

596-32C
WITHIN THE SW/4
SECTION 32,
T 5 S, R 96 W,
6TH PM.
GARFIELD COUNTY,
COLORADO

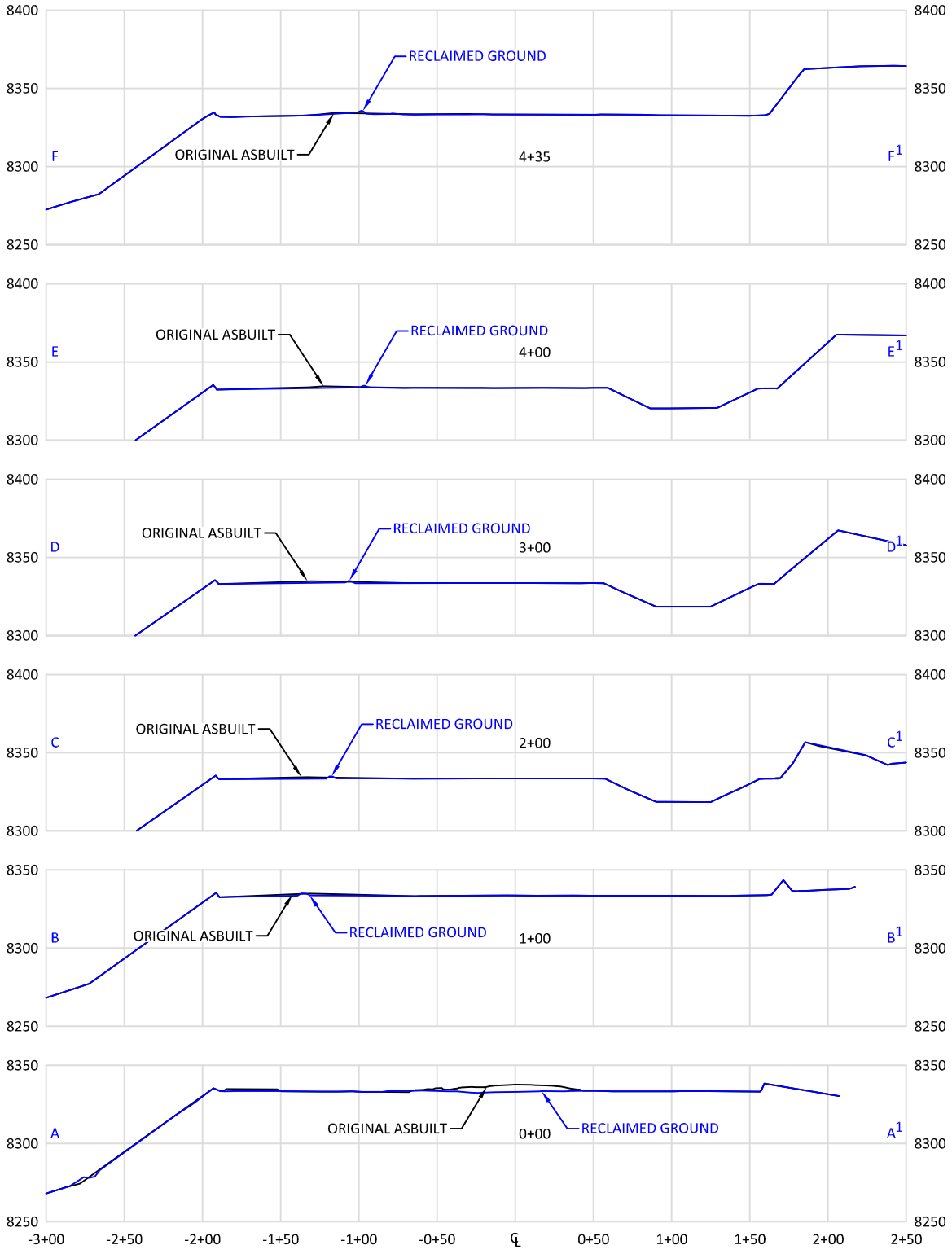
MARATHON OIL COMPANY

PO BOX 3128, HOUSTON TX, 77253
5555 SAN FELIPE, HOUSTON TX, 77056

INTERIM RECLAMATION ASBUILT

SCALE: 1"= 80'	EXHIBIT "A"
DATE: 10/20/2011	SHEET 2 OF 3

PAD 596-32C



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GREEN RIVER, WY
PHONE: 307-875-3638
307-875-3639
www.whsmithpc.com

DRAWN BY: JSJ	CHECKED BY: WHD
PROJECT NO: N/A	JOB NO: 26099
REVISIONS:	

LEGEND

- ORIGINAL ASBUILT
- RECLAIMED GROUND

LOCATION:
596-32C
WITHIN THE SW/4
SECTION 32,
T 5 S, R 96 W,
6TH PM.
GARFIELD COUNTY,
COLORADO

MARATHON OIL COMPANY
PO BOX 3128, HOUSTON TX, 77253
5555 SAN FELIPE, HOUSTON TX, 77056

INTERIM RECLAMATION ASBUILT
CROSS SECTIONS

SCALE: 1"=100'H/100'V	EXHIBIT "A"
DATE: 10/20/2011	SHEET 3 OF 3

Attachment B
Evaporation and Precipitation Data

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

Colorado Climate Trends

Altenbern Ranch

Station and Time Range

Current Station

Altenbern Ranch *Change Station*

Station 50214 | Data from 1947 to 2012 | Get Station Info | See on Map

Data Type and Time Range

Select Data Type

Total Monthly Precipitation

Starting Year *1947* | **Ending Year** *2012*

Click to Set a Custom Time Range

Plot Options

Select Data Frequency

Yearly Average (Jan - Dec) Update Plot

Show months with up to 9 days missing? Debug Mode

View this with the Old Plotter

Raw Data Options

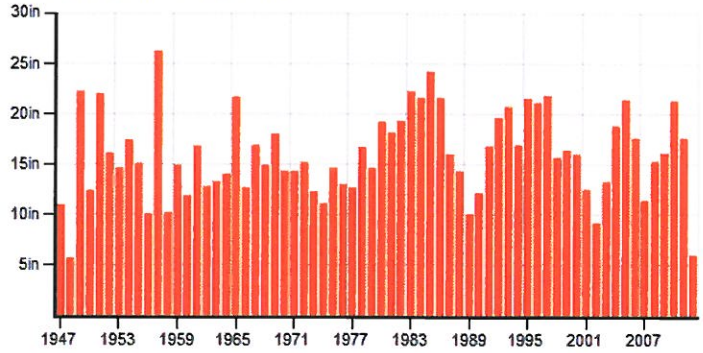
Select Data Format

Show Formatted List & Summary Get Raw Data

Plot

Total Annual Precipitation • 1947-2012

Altenbern Ranch • Station 50214



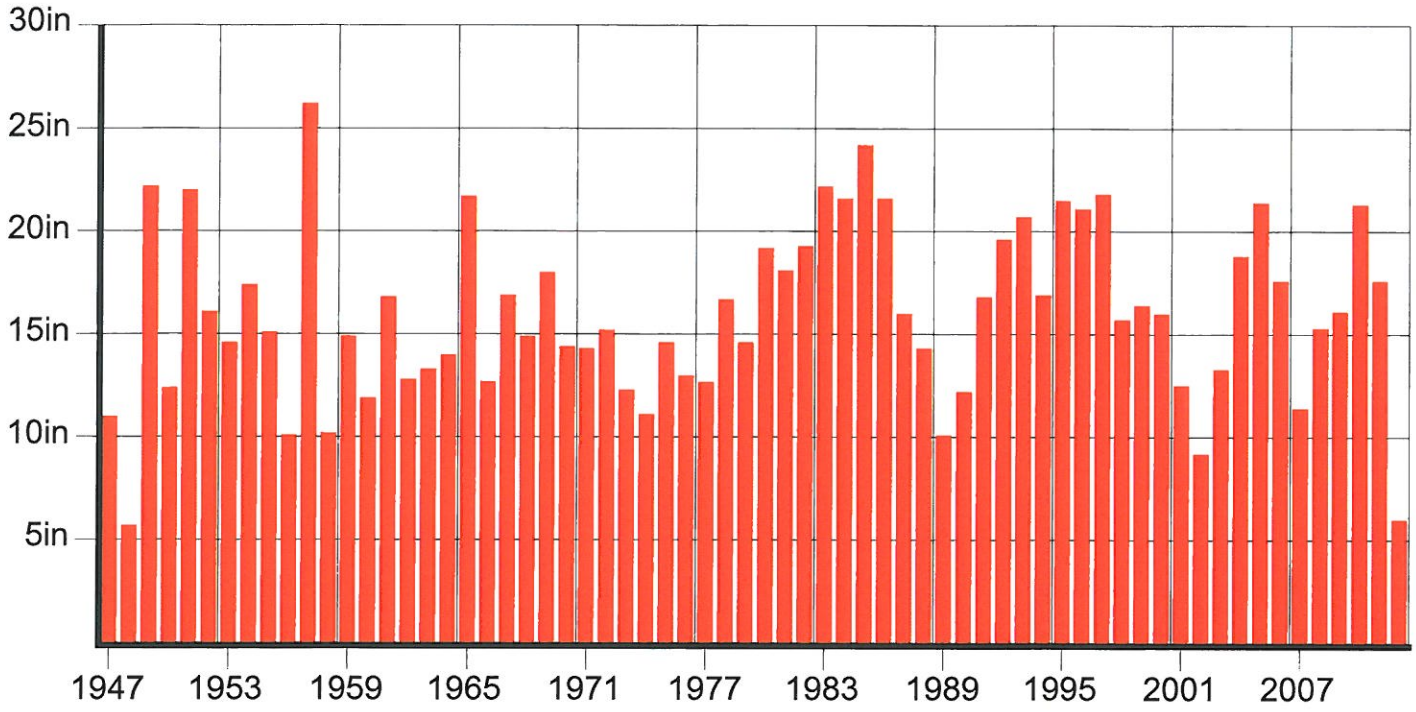
Source: Colorado Climate Center, Fort Collins, Colorado

Image Options

» Export and Download Chart as JPEG

» Print Chart

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



Source: Colorado Climate Center, Fort Collins, Colorado

>

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total monthly precipitation.													
Ave	1.29	1.23	1.42	1.45	1.51	0.95	1.24	1.61	1.56	1.63	1.33	1.25	16.44
Max	4.04	3.86	3.55	4.16	4.22	3.60	3.20	4.00	5.09	4.96	4.59	4.81	26.23
Year	1980	1962	1978	1999	1992	1984	1986	1957	1997	2006	1985	2010	1957
Min	0.00	0.00	0.07	0.20	0.00	0.00	0.15	0.09	0.00	0.00	0.03	0.14	9.15
Year	1972+	1972	1955	1981	1974	2002+	1993	1950	1956	1964+	1976	1976	2002
Count	64	64	64	64	63	64	64	66	65	64	63	64	59

>

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

Total monthly precipitation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1947	M	M	M	M	M	M	99	255	125	235	177	211	
1948	M	M	M	M	M	M	M	89	21	168	92	200	
1949	270	67	177	117	304	203	167	50	237	274	74	282	22.22
1950	282	102	24	131	71	1	143	9	219	28	106	128	12.44
1951	102	119	78	280	189	86	100	376	19	245	128	480	22.02
1952	282	90	303	63	78	122	106	393	26	0	55	89	16.07
1953	152	26	215	115	165	57	129	206	6	169	177	43	14.60
1954	216	119	211	104	62	59	128	182	265	165	137	89	17.37
1955	186	192	7	66	160	62	116	259	58	45	224	137	15.12
1956	227	140	16	112	72	22	111	113	0	98	19I	84	10.14
1957	354	168	189	264	215	212	155	400	32	305	236	93	26.23
1958	29	170	204	90	48	0	24	32	241	23	124	36	10.21
1959	99	206	53	105	41	168	53	275	190	113	52	139	14.94
1960	103	183	161	114	52	53	32	73	108	102	132	79	11.92
1961	0	37	190	117	175	13	122	216	474	133	124	77	16.78
1962	204	386	62	92	80	49	26	66	156	45	62	53	12.81
1963	152	96	119	162	10	99	72	330	123	55	96	20	13.34
1964	110	16	142	165	93	96	138	162	80	0	147	251	14.00
1965	109	46	126	271	214	177	273	263	276	40	188	191	21.74
1966	39	129	74	60	119	26	94	115	29	133	76	377	12.71
1967	116	20	77	94	200	258	254	232	110	85	63	182	16.91
1968	51	141	86	163	136	47	150	369	23	148	75	100	14.89
1969	401	113	25	62	57	345	56	165	145	276	92	63	18.00
1970	61	53	204	156	13	128	139	101	157	125	215	89	14.41
1971	50	33	32	105	158	4	77	224	182	309	36	221	14.31
1972	0	0	9	70	142	311	48	64	166	401	111	199	15.21
1973	70	74	167	94	124	179	153	28	72	31	114	119	12.25
1974	206	19	133	89	0	84	87	54	136	122	94	81	11.05
1975	84	110	284	193	218	65	129	58	89	78	88	67	14.63
1976	39	315	138	105	142	97	183	89	81	95	3	14	13.01
1977	82	27	130	47	133	4	104	287	102	133	107	118	12.74
1978	216	203	355	208	63	10	27	18	57	12	312	185	16.66
1979	122	169	314	53	362	23	32	151	6	79	132	17	14.60
1980	404	340	231	86	318	1	98	99	48	194	74	22	19.15
1981	70	48	163	20	331	92	203	169	88	418	100	112	18.14
1982	171	37	174	63	111	34	95	119	436	190	384	112	19.26
1983	56	132	156	221	326	275	175	56	150	204	229	238	22.18
1984	68	20	176	194	129	360	154	142	111	429	74	304	21.61
1985	101	62	294	281	191	85	294	19	273	271	459	87	24.17
1986	49	162	196	188	157	13	320	317	382	197	142	34	21.57
1987	119	55	153	64	182	124	167	236	36	143	171	151	16.01
1988	132	34	115	186	118	100	106	145	144	19	189	137	14.25
1989	74	190	106	54	43	33	44	152	118	81	85	25	10.05
1990	46	137	106	186	33	18	157	140	129	106	92	65	12.15
1991	70	76	280	123	56	84	229	149	232	198	124	63	16.84
1992	48	145I	168	120	422	37	301	80	69	260	144	167	19.61
1993	276	268	318	202	393	43	15	95	62	268	86	47	20.73
1994	24	162	60	300	101	43	28	203	260	187	196	126	16.90
1995	117	150	193	142	414	178	221	265	257	62	64	84	21.47
1996	155	345	86	184	102	164	177	46	215	276	232	129	21.11
1997	260	49	21	280	228	56	72	238	509	294	119	56	21.82
1998	117	219	182	161	45	189	134	36	136	202	93	59	15.73
1999	73	81	27	416	245	80	174	215	206	30	45	47	16.39
2000	103	193	186	78	125	116	53	195	172	159	121	97	15.98
2001	37	82	116	185	233	T	69	256	48	157	M	70	
2002	33	26	58	83	22	T	29	70	225	206	108	55	9.15
2003	37	89	120	92	247	91	58	86	172	6	244	90	13.32
2004	69	161	12	298	71	36	195	78	357	332	167	106	18.82
2005	346	208	190	129	M	310	33	270	245	230	82	94	
2006	103	16	299	149	21	29	M	242	238	496	123	43	
2007	47	131	80	142	88	35	120	234	261	M	M	M	
2008	234	148	59	106	188	43	117	123	94	121	144	153	15.30
2009	157	122	72I	156	214	204	193	14	115I	84	53	221	16.05
2010	147	131	112	211	188	81	84	206	116	192	179	481	21.28
2011	23	117	181	182	251	65	177	164	219	176	176	29	17.60
2012	87	139	65	99	10	1	117	84	M	M	M	M	
Ave	1.29	1.23	1.42	1.45	1.51	0.95	1.24	1.61	1.56	1.63	1.33	1.25	16.44
Max	4.04	3.86	3.55	4.16	4.22	3.60	3.20	4.00	5.09	4.96	4.59	4.81	26.23
Year	1980	1962	1978	1999	1992	1984	1986	1957	1997	2006	1985	2010	1957
Min	0.00	0.00	0.07	0.20	0.00	0.00	0.15	0.09	0.00	0.00	0.03	0.14	9.15

Year	1972+	1972	1955	1981	1974	2002+	1993	1950	1956	1964+	1976	1976	2002
Count	64	64	64	64	63	64	64	66	65	64	63	64	59

MAP 1.

MAY-OCTOBER

CLASS A PAN EVAPORATION

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS

6 inches – < 60 inches

10 inches – > 60 inches

Interval irregular where crowded

----- Areas of limited data

-·-·- Additional information for areas of shallow gradient above 60 inches

EASTERN STATES INTERVALS

4 inches – standard interval

——— 2 inch interval used for areas of shallow gradient

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NATIONAL WEATHER SERVICE

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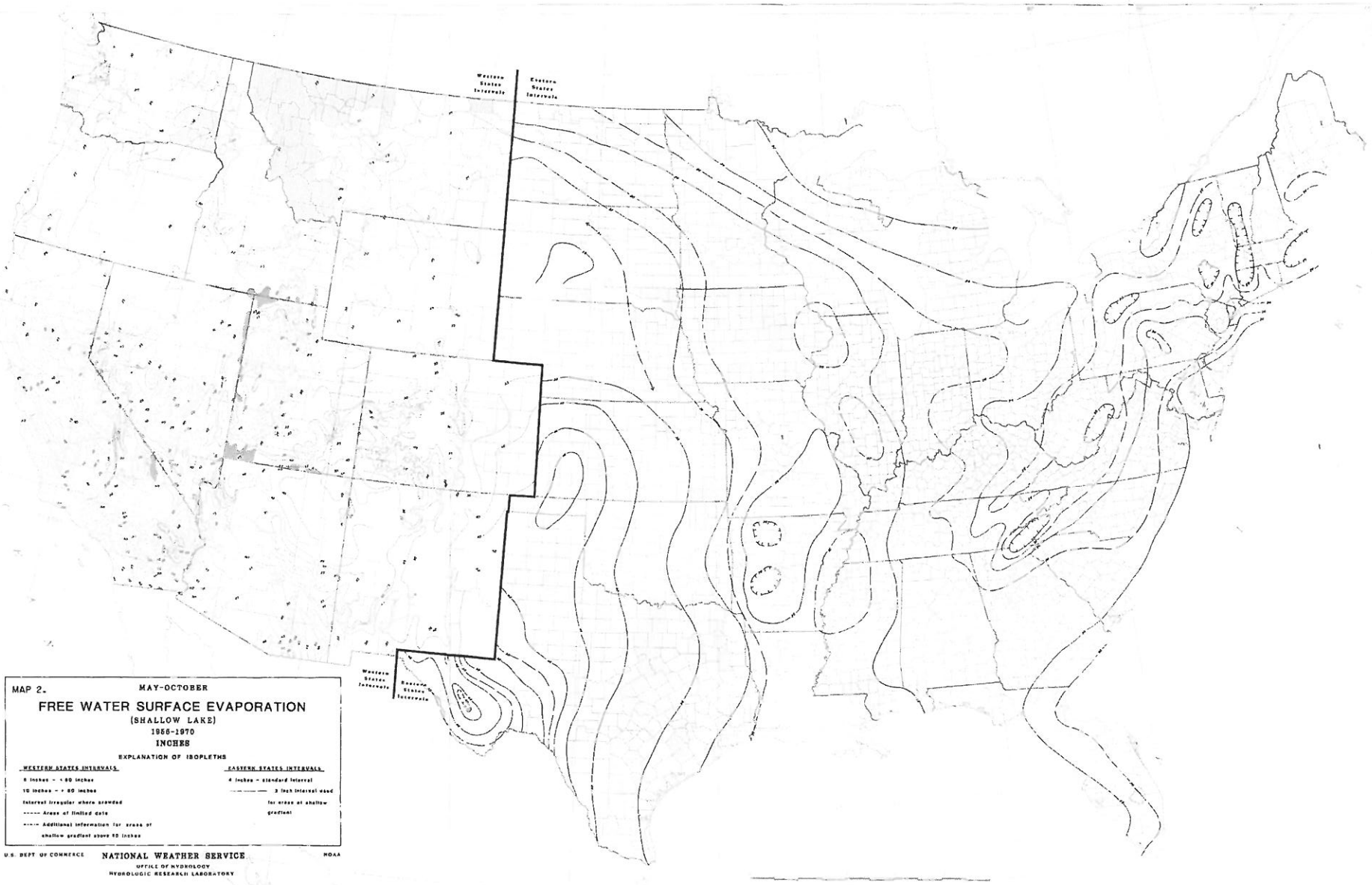
HYDROLOGIC RESEARCH LABORATORY

NOAA



MAP 2.

MAY-OCTOBER

FREE WATER SURFACE EVAPORATION

(SHALLOW LAKE)

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS	EASTERN STATES INTERVALS
5 inches – < 80 inches	4 inches – standard interval
10 inches – > 80 inches	———— 2 inch interval used for areas of shallow gradient
Interval irregular where crowded	
----- Areas of limited data	
----- Additional information for areas of shallow gradient above 80 inches	

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MAP 3. ANNUAL

FREE WATER SURFACE EVAPORATION

(SHALLOW LAKE)

1956-1970

INCHES

EXPLANATION OF ISOPLETHS

WESTERN STATES INTERVALS

6 inches - < 80 inches

10 inches - + 80 inches

Interval irregular where crowded

Areas of limited data

Additional information for areas of shallow gradient above 80 inches

EASTERN STATES INTERVALS

4 inches - standard interval

2 inch interval used for areas of shallow gradient

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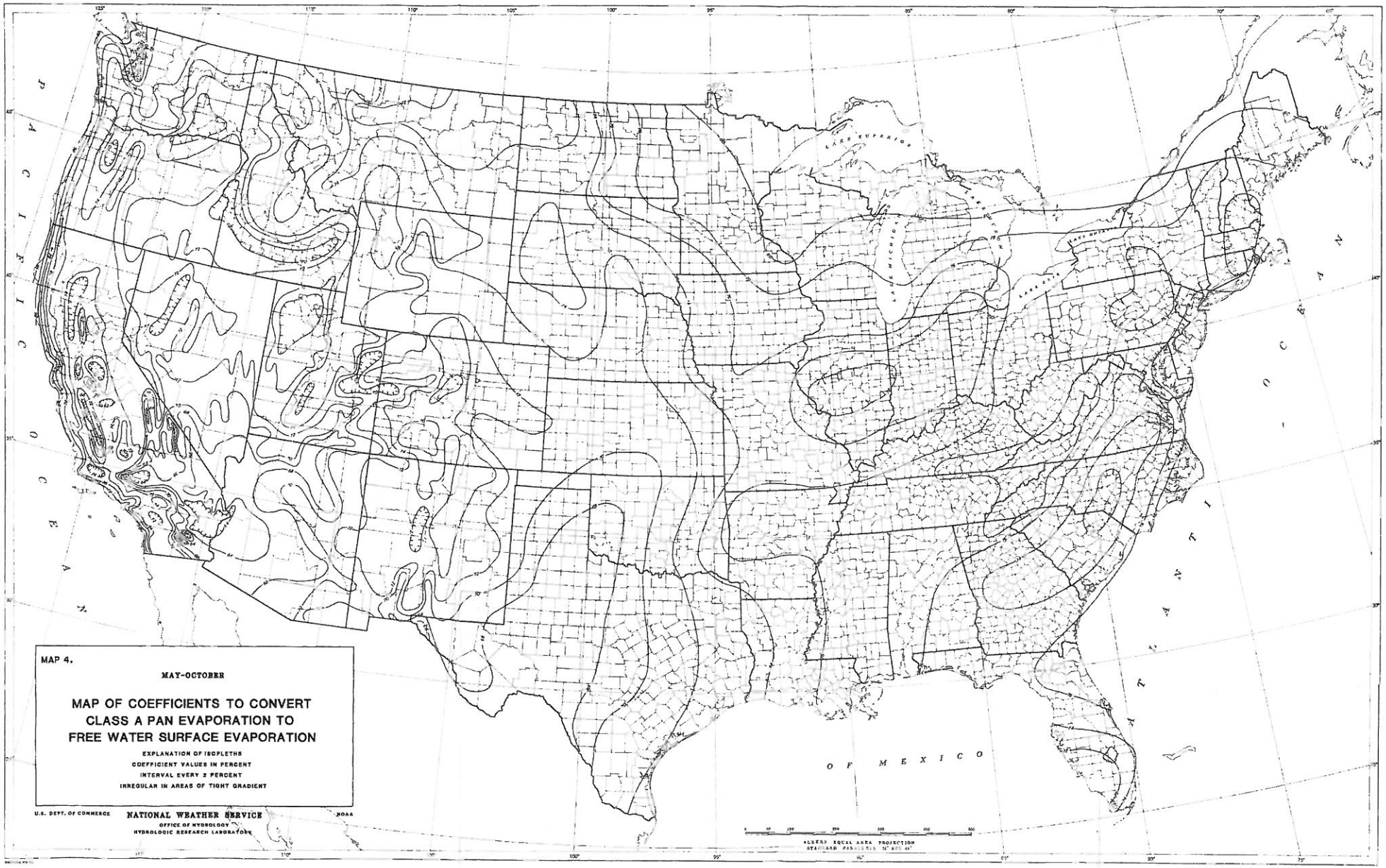
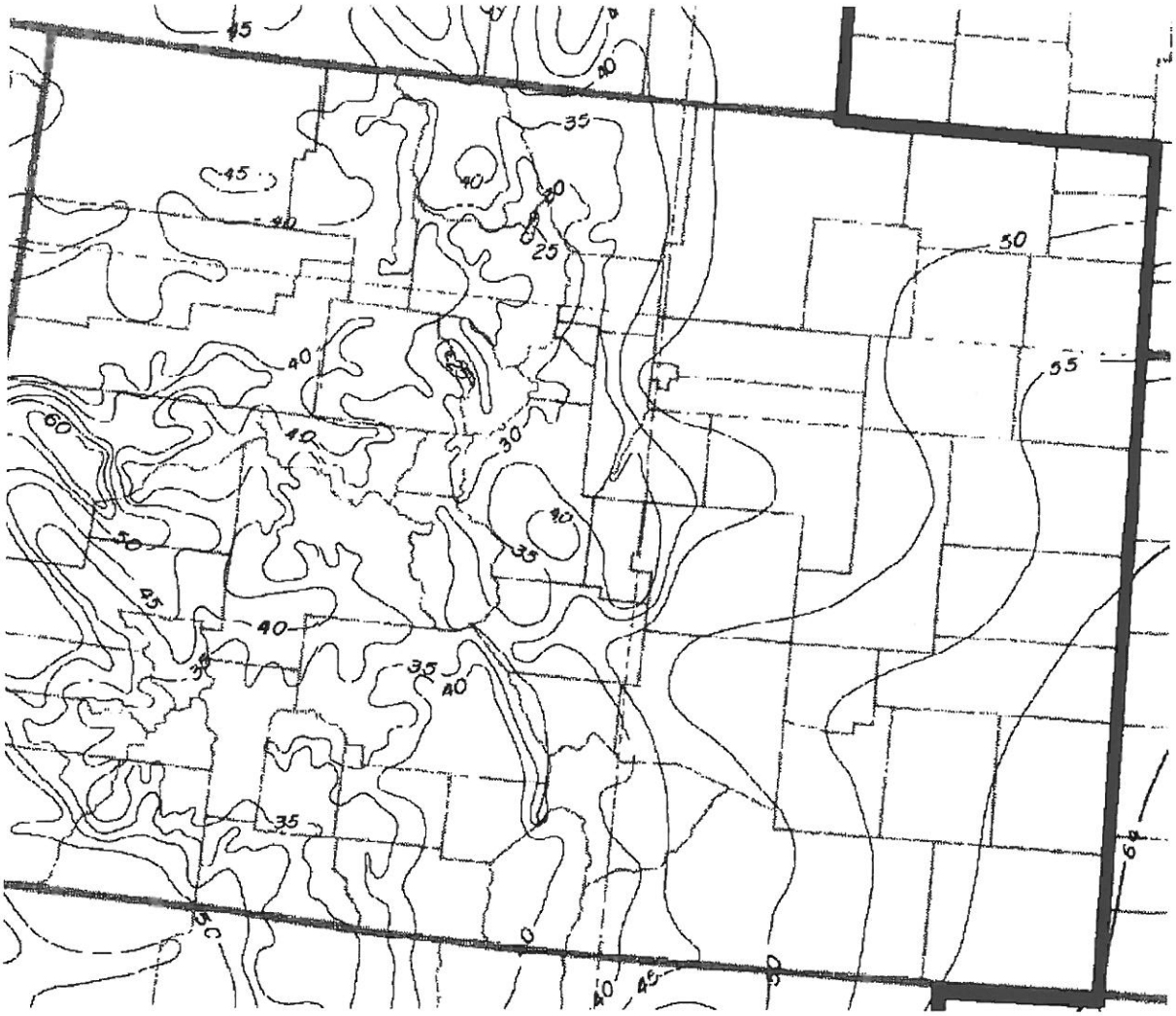
HYDROLOGIC RESEARCH LABORATORY


MAP 4.
MAY-OCTOBER
MAP OF COEFFICIENTS TO CONVERT
CLASS A PAN EVAPORATION TO
FREE WATER SURFACE EVAPORATION
EXPLANATION OF ISOPLETHS
COEFFICIENT VALUES IN PERCENT
INTERVAL EVERY 2 PERCENT
IRREGULAR IN AREAS OF TIGHT GRADIENT
U.S. DEPT. OF COMMERCE
NATIONAL WEATHER SERVICE
OFFICE OF HYDROLOGY
HYDROLOGIC RESEARCH LABORATORY
NOAA
ALBERS EQUAL AREA PROJECTION
LAKE SUPERIOR
LAKE MICHIGAN
LAKE ERIE
LAKE ONTARIO
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO

Monthly Pan Evaporation Rates



Excerpted from the *Class A Evaporation Map prepared by the National Weather Service (NOAA Technical Report NWS 33.*

COLORADO

MONTHLY AVERAGE PAN EVAPORATION (INCHES)

	PERIOD OF RECORD	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
AKRON 4 E	1918-2005	0.00	0.00	0.00	7.30	9.29	11.43	13.26	11.16	9.09	6.16	0.00	0.00	67.69
ALAMOSA WSO AP	1948-2005	0.00	0.00	0.00	7.06	9.01	10.08	9.16	7.81	6.40	4.39	0.00	0.00	53.91
ARBOLES	1957-1963	0.00	0.00	0.00	5.41	7.95	9.56	9.78	8.61	6.52	0.00	0.00	0.00	47.83
BONNY LAKE	1949-2005	0.00	0.00	0.00	7.26	8.69	10.86	11.78	10.61	8.12	6.12	4.57	0.00	68.01
CLIMAX	1949-2005	0.00	0.00	0.00	0.00	0.00	5.36	5.32	4.44	3.41	0.00	0.00	0.00	18.53
CONEJOS 3 NNW	1948-1960	0.00	0.00	0.00	6.30	7.14	7.67	7.41	6.87	7.19	5.74	0.00	0.00	48.32
ESTES PARK	1948-1994	0.00	0.00	0.00	5.78	5.26	7.09	7.13	6.15	5.04	4.04	0.00	0.00	40.49
FORT COLLINS	1900-2005	0.00	0.00	2.50	4.52	5.42	6.32	6.92	6.07	4.74	3.07	1.48	0.00	41.04
GRAND JUNCTION WALKER	1900-2005	0.00	0.00	4.67	8.53	12.18	15.96	16.53	14.02	10.98	7.05	2.42	0.00	92.34
GRAND JUNCTION 6 ESE	1962-2005	0.00	0.00	0.00	6.60	9.29	11.77	12.01	10.24	7.48	4.65	2.09	0.00	64.13
GRAND LAKE 6 SSW	1948-2005	0.00	0.00	0.00	0.00	4.82	7.75	7.81	6.79	5.24	3.10	0.00	0.00	35.51
GREEN MOUNTAIN DAM	1948-2005	0.00	0.00	0.00	0.00	4.96	6.56	6.93	5.90	4.65	2.90	0.00	0.00	31.90
JOHN MARTIN DAM	1941-2005	0.00	0.00	6.40	8.04	9.67	11.30	12.31	10.28	7.82	5.61	2.78	0.00	74.21
LAKE GEORGE 8 SW	1948-2005	0.00	0.00	0.00	0.00	5.15	8.26	7.39	6.02	5.72	0.00	0.00	0.00	32.54
MEREDITH	1963-2005	0.00	0.00	0.00	0.00	7.69	8.26	8.34	6.96	5.25	3.21	0.00	0.00	39.71
MONTROSE 1	1948-1982	1.68	1.49	3.34	5.69	7.49	9.47	9.04	7.39	5.54	3.45	1.61	1.26	57.45
PLATORO	1949-1991	0.00	0.00	0.00	0.00	5.86	8.10	6.57	5.24	5.52	3.33	0.00	0.00	34.62
PUEBLO WSO AP	1954-2005	0.00	0.00	0.00	8.71	9.50	11.51	12.14	10.41	8.17	6.14	0.00	0.00	66.58
PUEBLO CITY RESERVOIR	1948-1971	0.00	5.13	5.86	6.85	8.81	10.09	10.60	8.85	7.43	5.30	2.99	2.71	74.62
PUEBLO RESERVOIR	1975-2005	0.00	0.00	0.00	7.18	9.34	10.87	11.58	9.92	7.90	5.88	0.00	0.00	62.67
PUEBLO 6 SSW	1971-1985	0.00	0.00	4.82	7.47	8.57	10.65	11.30	9.40	7.13	5.53	0.00	0.00	64.87
SAN LUIS LAKES 3W	1948-1955	0.00	0.00	4.50	6.07	8.51	9.88	8.49	7.77	6.57	4.53	0.00	0.00	56.32
SPRINGFIELD 7 WSW	1956-2002	0.00	0.00	0.00	7.85	9.73	11.44	12.69	11.28	8.53	6.29	4.57	0.00	72.38
SUGARLOAF RESERVOIR	1948-2005	0.00	0.00	0.00	0.00	0.00	7.03	6.15	4.97	4.15	2.93	0.00	0.00	25.23
TRINIDAD LAKE	1989-2005	0.00	0.00	0.00	6.75	9.04	10.55	9.88	8.27	7.65	6.17	3.92	2.21	64.44
TWIN LAKES RESERVOIR	1949-2005	0.00	0.00	0.00	0.00	6.93	8.65	7.92	6.79	5.33	3.96	0.00	0.00	39.58
VALLECITO DAM	1948-2005	0.00	0.00	1.91	3.82	5.29	6.22	6.09	5.31	4.39	3.04	1.60	0.00	37.67
WAGON WHEEL GAP 3 N	1948-1972	0.00	0.00	0.00	0.00	6.69	7.90	7.15	5.81	5.30	2.61	0.00	0.00	35.46
WALSH 1 W	1951-2005	0.00	0.00	0.00	0.00	10.78	12.35	12.76	11.63	9.42	6.88	0.00	0.00	63.82
WIGGINS 7 SW	1960-1971	0.00	0.00	0.00	6.82	8.50	8.42	9.97	8.09	5.87	4.22	2.23	0.00	54.12

Source: http://www.wrcc.dri.edu/htmlfiles/westevap.final.html

Attachment C
Drainage Report and Grading Plan

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

FINAL DRAINAGE REPORT

MARATHON OIL COMPANY WATER IMPOUNDMENT
GARFIELD COUNTY, COLORADO

PREPARED FOR:
MARATHON OIL COMPANY
743 HORIZON CT., STE 220
GRAND JUNCTION, CO
PH: (970) 244-5743
CONTACT: ERIC WARD

PREPARED BY:
OLSSON ASSOCIATES
826 21 ½ ROAD
GRAND JUNCTION, CO 81505
PH: (970) 263-7800
CONTACT: CRAIG RICHARDSON
WYATT E. POPP, PE, LEED AP

JUNE 28, 2013

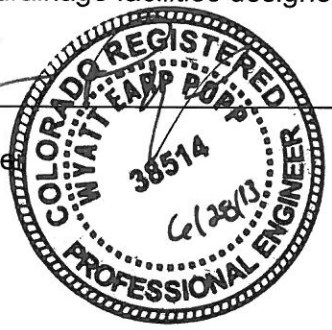
OLSSON ASSOCIATES
PROJECT NO. 012-1372

OLSSON ASSOCIATES

ENGINEER'S STATEMENT

I hereby certify that this *Final Drainage Report* for the design of Marathon Oil Company Water Impoundment was prepared by me, or under my direct supervision, in accordance with the sound engineering practices for the owners thereof. I understand that Garfield County does not and will not assume liability for drainage facilities designed by others.

Wyatt E. Popp, PE
Registered Professional Engineer
State of Colorado No. 38514



6/28/13
Date

OWNER'S STATEMENT

I, _____, hereby certify that the drainage facilities for Marathon Oil Company Water Impoundment shall be constructed according to the design presented in this report. I understand that Garfield County does not and will not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that Garfield County reviews drainage plans but cannot, on behalf of _____, guarantee that final drainage design review will absolve _____ and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Final Plat and/or Final Development Plan does not imply approval of my engineer's drainage design.

_____
Owner/Developer

_____
Authorized Signature Date

TABLE OF CONTENTS

I. INTRODUCTION

A. Background

This Final Drainage Report has been prepared by Olsson Associates for Marathon Oil Company's existing water impoundment pond, located at Pad 596-32C (the SITE). This report evaluates the SITE's existing drainage patterns, analyzes the change in stormwater quantity/quality associated with existing development, and provides design to alleviate the impacts of increased stormwater runoff due to the existing development.

B. Project Location

The SITE is located in the SE ¼ of the SW ¼ of Section 32, Township 5 South, Range 96 West of the Sixth Principal Meridian, County of Garfield, State of Colorado. The SITE is approximately 2,140 feet from the western section line and 1,095 feet from the southern section line measured at ninety degrees to the western and southern edges of the pad, respectively. The SITE is approximately 11.0 miles northwest of the town of Parachute and 4.4 miles from County Road 215. Refer to Figure 1 for project location.

Figure 1: Vicinity Map

C. Property Description

The SITE is jointly owned by Marathon Oil Company and Berry Petroleum, but Marathon Oil Company reserves full rights for one hundred percent usage of the facility. The SITE consists of an existing 0.7 acre water impoundment pond that was previously graded into mountainous terrain that is located on an existing approximate 3.5 acre pad site.

The SITE owner plans to permit the SITE for a permanent water impoundment facility. The topography is generally flat and drainage from the SITE travels to the southwest corner where a shallow depression is located. According to the NRCS Web Soil Survey, soils in the area of the SITE consist of Parachute-Irigul complex and Parachute-Irigul-Rhone association, which are both classified as hydrologic soil group Type B. A soil map from NRCS is included in Appendix A.

Previous Investigations

A Form 15 report was prepared for the existing SITE. The form is included in Appendix B.

II. DRAINAGE SYSTEM DESCRIPTION

A. Existing and Proposed Drainage Conditions

The existing water impoundment pond is self-contained with a 1-foot to 1.5-foot berm around the perimeter. Of the remaining pad area, the majority eventually drains to Little Creek and a portion of the southeast corner eventually drains to House Log Gulch. Refer to the General Location Map in Appendix A for the SITE location relative to major tributary drainageways.

The existing SITE consists of a pad graded into mountainous terrain. The existing SITE was graded such that the west side of the SITE was filled and the east side of the SITE, including the water impoundment pond, was cut into the existing slope. The SITE is generally flat and does not drain; therefore, it was assumed that negligible flow will reach the existing water impoundment pond berm on the west and south sides. A small area to the north and east of the existing water impoundment pond will reach the existing water impoundment berm. The proposed permitting changes of the existing water impoundment pond will not affect the hydrology of the SITE; therefore, the existing peak flow rates match the proposed peak flow rates.

Two basins were used to model the SITE as it relates to the existing water impoundment pond. The area for the water impoundment pond will be excluded in the overall discharge analysis.

Basin NE is the area to the north and east of the existing water impoundment pond that will flow directly to the berm around the water impoundment pond.

Basin SW is the area to the south and west of the existing water impoundment pond that is generally flat. Runoff drains to a shallow depression in the southwest corner of the SITE. A fairly flat slope was used to estimate the peak flows; however, in reality, negligible flows will

reach the berm around the existing water impoundment pond.
Peak flow rates are listed in Table 1, and calculations of each flow rate are presented in Appendix C.

Table 1: SITE Peak Runoff (Existing and Proposed)

Design Point	10-YR Peak Flow (cfs)	100-YR Peak Flow (cfs)
NE	0.18	0.33
SW	1.32	2.40

B. Offsite Tributary Area

The SITE will not be adversely affected by stormwater from adjacent land, since the water impoundment pond is self contained by berms without an outlet. For the purposes of this study, all adjacent land was assumed to remain undeveloped in the foreseeable future.

Run-off from the SITE was considered only for the water impoundment area, since the rest of the SITE will remain in its existing condition. Because the water impoundment is self-contained, there will be no additional run-off from the SITE.

C. Master Drainage Plan

To our knowledge, no master drainage studies have analyzed the SITE.

D. Drainage Facility Maintenance

The owner shall be responsible for maintaining all on-site drainage facilities. In addition, the water impoundment pond should be examined after any significant rainfall event to ensure proper functionality and maintain the required freeboard.

III. DRAINAGE ANALYSIS AND DESIGN CRITERIA

A. Regulations

This report has been prepared in accordance with common engineering practices and the Urban Drainage and Flood Control District's Urban Storm Drainage Criteria Manual.

B. Development Criteria

There are no known constraints placed on the SITE due to floodplain studies, master studies or adjacent property drainage studies. The SITE will not receive any tributary flows from upstream land or adjacent development.

C. Hydrologic Criteria

Hydrologic calculations have been prepared in accordance with common engineering practices. Refer to Appendix C for all hydrologic calculations.

D. Hydraulic Criteria

Hydraulic calculations have been prepared in accordance with common engineering practices and the Urban Drainage and Flood Control District's Urban Storm Drainage Criteria Manual.

IV. POST-CONSTRUCTION STORMWATER MANAGEMENT

A. Stormwater Quality Control Measures

Stormwater quality control measures will not be needed because developed run-off rates are equivalent to existing condition run-off rates with no change in impervious area.

V. CONCLUSIONS

A. Compliance with Manual

This report has been prepared in accordance with common engineering practices and the Urban Drainage and Flood Control District's Urban Storm Drainage Criteria Manual.

B. Compliance with Colorado Oil and Gas Conservation Commission Criteria

100-Year Run-on Diversions

The small peak flows that reach the existing water impoundment pond do not warrant construction of formal swales around the water impoundment pond. The100-year peak flows that reach the berm around the existing water impoundment will not overtop the existing 1-foot to 1.5-foot berm that is located around the perimeter of the water impoundment pond.

The north and east sides of the water impoundment pond have an approximate 10-foot buffer from the berm to the toe of slope. The perimeter berm and existing slope already form an informal trapezoidal channel. In addition, the existing bird netting extends all the way to the toe of slope, making it very difficult to construct any improvements on these two sides.

The south and west sides of the water impoundment pond have an approximate130-foot and 165-foot flat area, respectively, which provides inadvertent detention. There are many utilities located in the flat areas, making pad grading difficult. If any improvements are completed in the future, it is recommended that fine grading be completed to drain the pad to the north and to the south to avoid ponded water on the pad site. Because the area is so flat, negligible water will reach the existing water impoundment pond, making construction of a formal swale unnecessary.

25-Year Run-off Control

The existing water impoundment pond is self contained by berms without an outlet; therefore, no run-off is present.

Fire Access

Fire access can only be achieved on two sides of the existing water impoundment pond due to the location of the water impoundment pond relative to the steep side slopes. A variance from criteria is requested for this criteria. The entire water impoundment pond can be accessed from the available sides. In addition, fires can be addressed from above. The fire access on the south and west sides of the water impoundment pond shall be a graveled surface.

Fencing and Bird Netting

The existing water impoundment pond is already contained by fence and bird netting, as shown in Photos 1 and 2. No additional fencing is necessary.

Photo 1

Photo 2

Lining

It appears that the existing water impoundment pond is lined with two high density polyethylene (HDPE) liners, both 60 mil thick, and has a leak detection system installed. The liner thicknesses, leak detection system, and anchor trench dimensions shall be field verified and adjusted as necessary. Water impoundment pond calculations are included in Appendix D.

C. Design Effectiveness

Proper implementation of the proposed measures outlined in this report will alleviate the direct impacts of stormwater run-off on adjacent, downstream lands. The quantity of stormwater released from the SITE will be equivalent to existing conditions.

A registered licensed engineer in the state of Colorado should be consulted for the preparation of construction plans related to the recommendations outlined within this report.

D. Areas in Flood Hazard Zone

The SITE is within a FEMA-designated Zone D, areas of undetermined flood hazards. Refer to the FIRM Panel in Appendix A for the SITE location relative to FEMA designated flood plains.

VI. REFERENCES

1) Stormwater Management Manual, City of Grand Junction and Mesa County
2) Urban Drainage and Flood Control District Urban Storm Drainage and Criteria Manual, Vols. 1-3

APPENDIX A: MAPS AND EXHIBITS

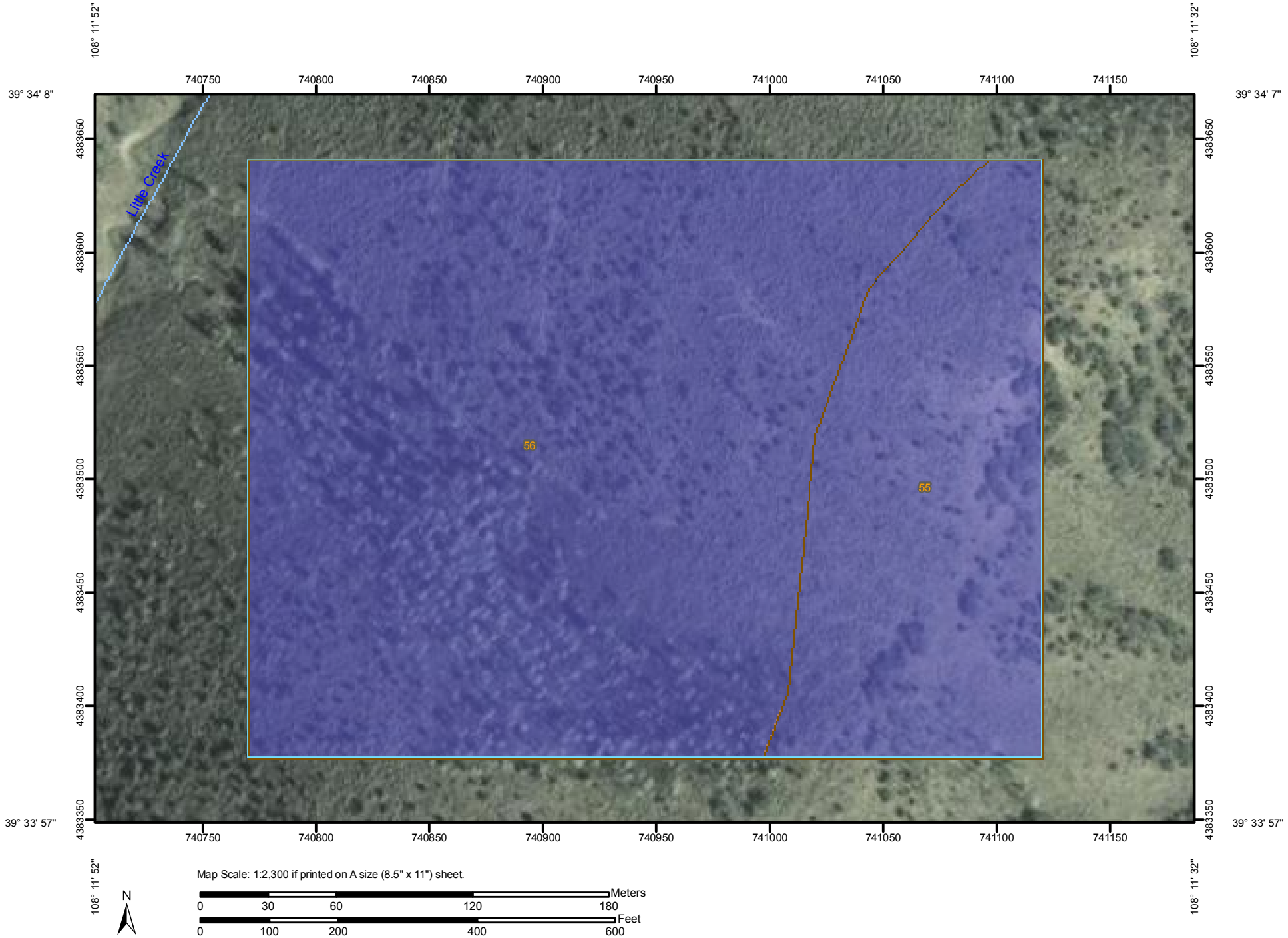
APPENDIX A TABLE OF CONTENTS

Hydrologic Soil Group (HSG) Information - HSG map, legend, and description. HSG information is used in the hydrologic calculations

General Location Map - Project location shown on topographic map

FIRM Panel - Project location shown on FIRM panel to demonstrate no floodplains are impacted

Hydrologic Soil Group—Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
(596-32C)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:2,300 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	B	6.0	26.3%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	B	16.8	73.7%
Totals for Area of Interest			**22.7**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

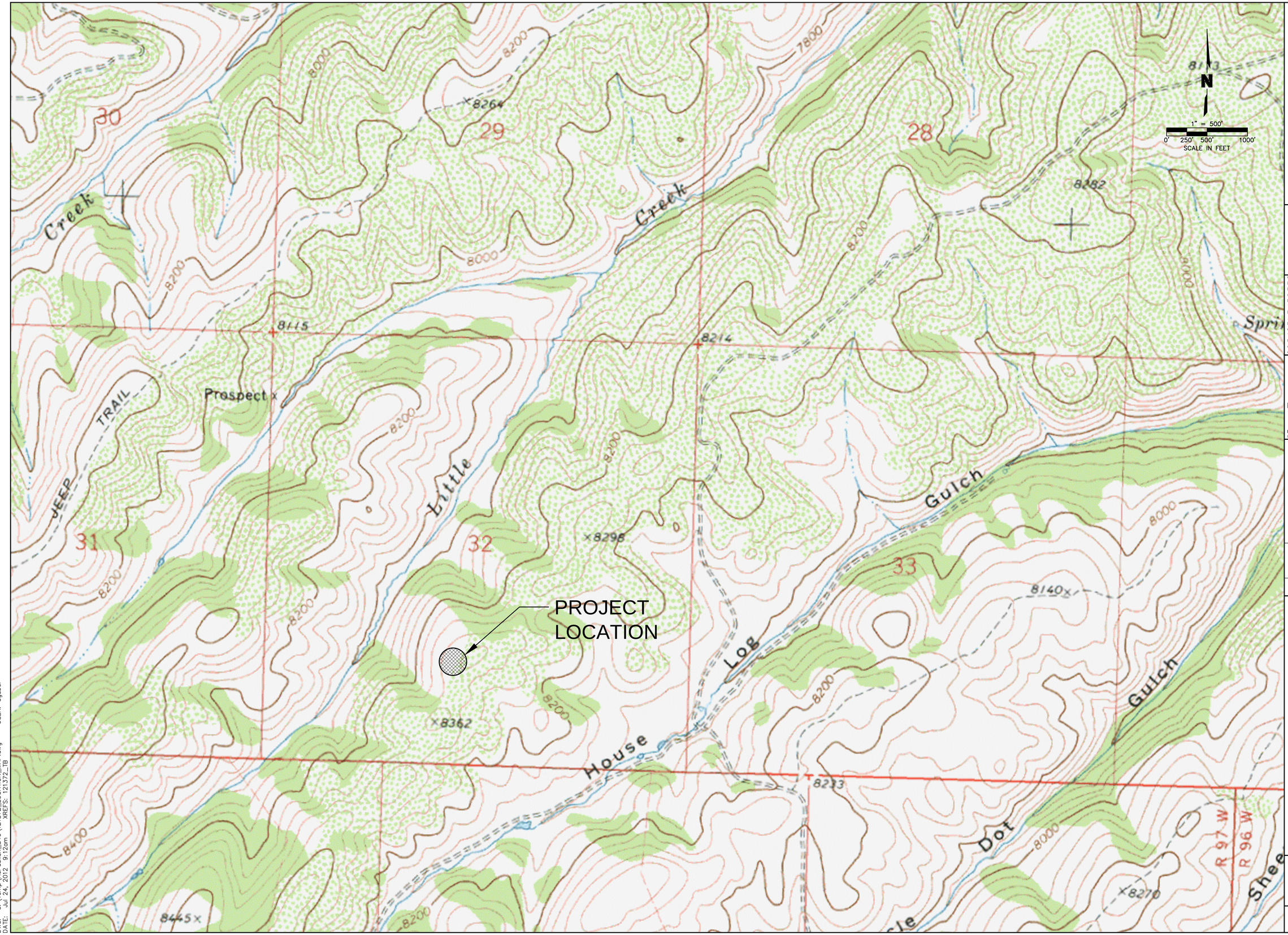
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher



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COLORADO REGISTERED PROFESSIONAL ENGINEER
38514

OLSSON ASSOCIATES ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL OR VERTICAL). THE EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS HOWEVER THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

811 Know what's below. Call before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

GENERAL LOCATION MAP

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

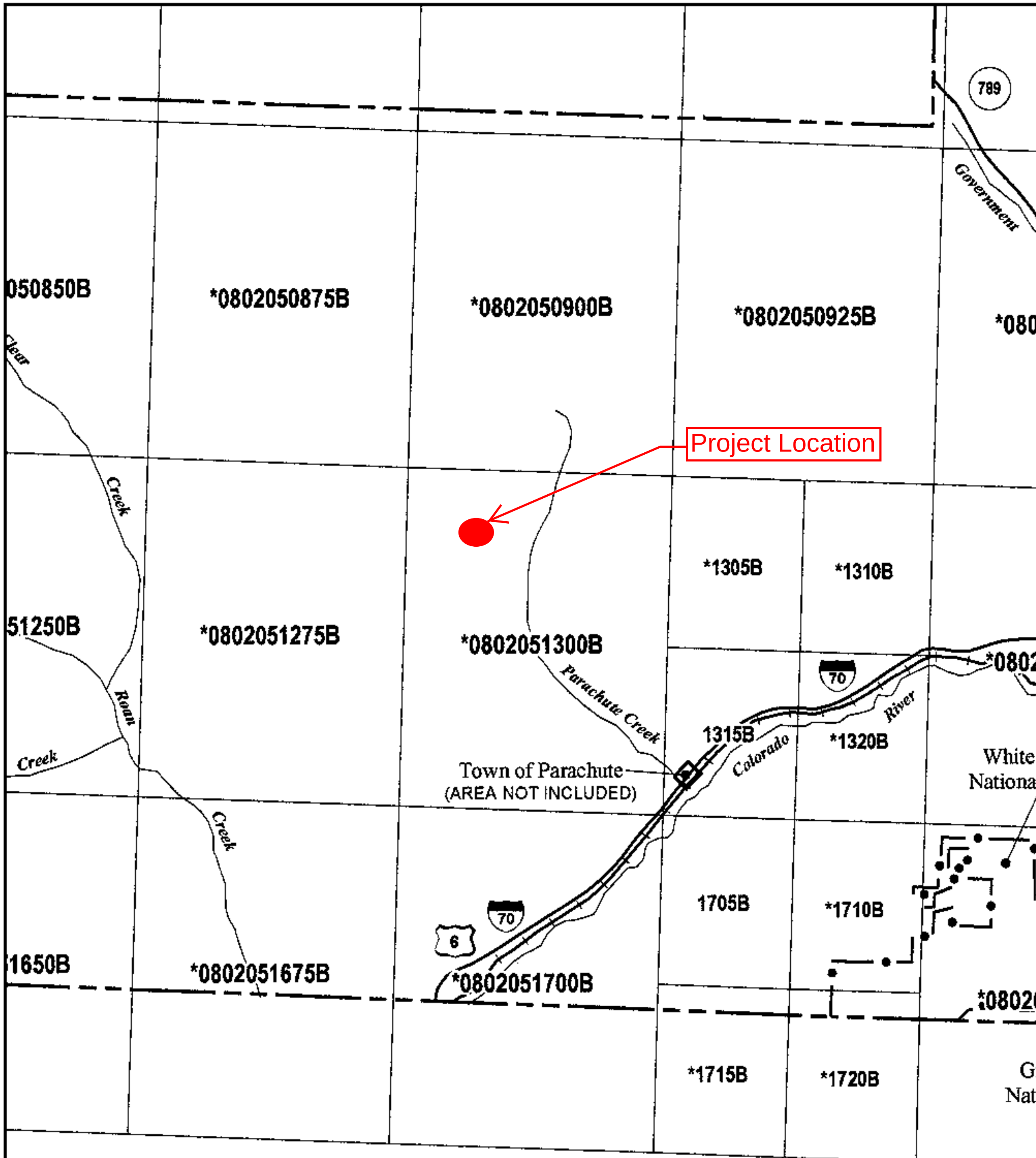
GARFIELD COUNTY, COLORADO

2012

drawn by:	AMG
checked by:	WEP
approved by:	WEP
QA/QC by:	WEP
project no.:	012-1372
drawing no.:	121372_LOCATION_MAP.dwg
date:	07.24.2012

SHEET
1 of 1

DWG: C:\Temp\AcPublish_840\121372_LOCATION_MAP.dwg USER: qgabor
DATE: Jul 24, 2012 9:12am XREFS: 121372_TB



*PANEL NOT PRINTED - ALL ZONE D
**PANEL NOT PRINTED - ALL ZONE X
***PANEL NOT PRINTED - THIS AREA IS SHOWN ON ANOT
0802051885B IS SHOWN ON 080

MAP INDEX

FIRM
FLOOD INSURANCE RATE MAP

GARFIELD COUNTY, COLORADO
(UNINCORPORATED AREAS)

MAP INDEX

PANELS PRINTED: 955, 964, 965, 1015, 1043, 1045, 1091, 1092, 1111, 1315, 1351, 1352, 1353, 1354, 1431, 1432, 1434, 1445, 1453, 1465, 1470, 1705, 1855, 1856, 1857, 1858, 1859, 1870, 1880

MAP NUMBER
080205IND0A

MAP REVISED
AUGUST 2, 2006

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX B: COGCC APPROVED FORM 15

APPENDIX B TABLE OF CONTENTS

FORM 15 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

EARTHEN PIT REPORT/PERMIT

This form is to be used for both reporting and permitting pits. Rule 903 describes when a Permit with prior approval, or a Report within 30 days, is required for pits. Submit required attachments and forms.

Complete the Attachment Checklist

	Oper	OGCC
Detailed Site Plan	X	
Topo Map w/ Pit Location	X	
Water Analysis (Form 25)	X	
Source Wells (Form 26)	X	
Pit Design/Plan & Cross Sect	X	
Design Calculations	X	
Sensitive Area Determ.	X	
Mud Program		
Form 2A	X	

FORM SUBMITTED FOR:

☐ Pit Report ☒ Pit Permit

OGCC Operator Number: 53650
Name of Operator: Marathon Oil Company
Address: 743 Horizon Court, Suite 220
City: Grand Junction State: CO Zip: 81506

Contact Name and Telephone:
Chris Hudson
No: 970-640-4823
Fax: 970-245-6287

API Number (of associated well): _____ OGCC Facility ID (of other associated facility): _____
Pit Location (QtrQtr, Sec, Twp, Rng, Meridian): SW 1/4 Sec 32, T5S, R96W, 6th P.M.
Latitude: 39.56780° Longitude: 108.19393° County: Garfield
Pit Use: ☐ Production ☐ Drilling (Attach mud program) ☒ Special Purpose (Describe Use): Temporary Water Storage
Pit Type: ☒ Lined ☐ Unlined Surface Discharge Permit: ☐ Yes ☐ No
Offsite disposal of pit contents: ☐ Injection ☐ Commercial Pit/Facility Name: N/A Pit/Facility No: N/A
Attach Form 26 to identify Source Wells and Form 25 to provide Produced Water Analysis results.

Existing Site Conditions

Is the location in a "Sensitive Area?" ☐ Yes ☒ No **Attach data used for determination.**
Distance (in feet) to nearest surface water: ~1320 ft ground water: ~319 ft water wells: ~6100 ft

LAND USE (or attach copy of Form 2A if previously submitted for associated well) Select one which best describes land use:

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

SOILS (or attach copy of Form 2A if previously submitted for associated well)

Soil map units form USNRCS survey: Sheet No: _____ Soil Complex/Series No: _____
Soils Series Name: _____ Horizon thickness (in inches): A: ; B: ; C:
Soils Series Name: _____ Horizon thickness (in inches): A: ; B: ; C:
Attach detailed site plan and topo map with pit location.

Pit Design and Construction

Size of pit (feet): Length: 301' Width: 85' Depth: 15'
Calculated pit volume (bbls): 40,607 max Daily inflow rate (bbls/day): 44 bbl/day annual ave
Daily disposal rates (attach calculations): Evaporation: N/A bbls/day Percolation: N/A bbls/day
Type of liner material: Reinforced Polyethylene (RPE) or similar Thickness: bottom 24 mils, top 36 mils or greater
Attach description of proposed design and construction (include sketches and calculations).
Method of treatment of produced water prior to discharge into pit (separator, heater treater, other): Separation, see Process Flow Diagram
Is pit fenced? ☒ Yes ☐ No Is pit netted? ☐ Yes ☒ No

hereby certify that the statements made in this form are, to the best of my knowledge, true, correct, and complete.
Print Name: Chris Hudson Signed: _____
Title: Facilities Engineer Date: _____

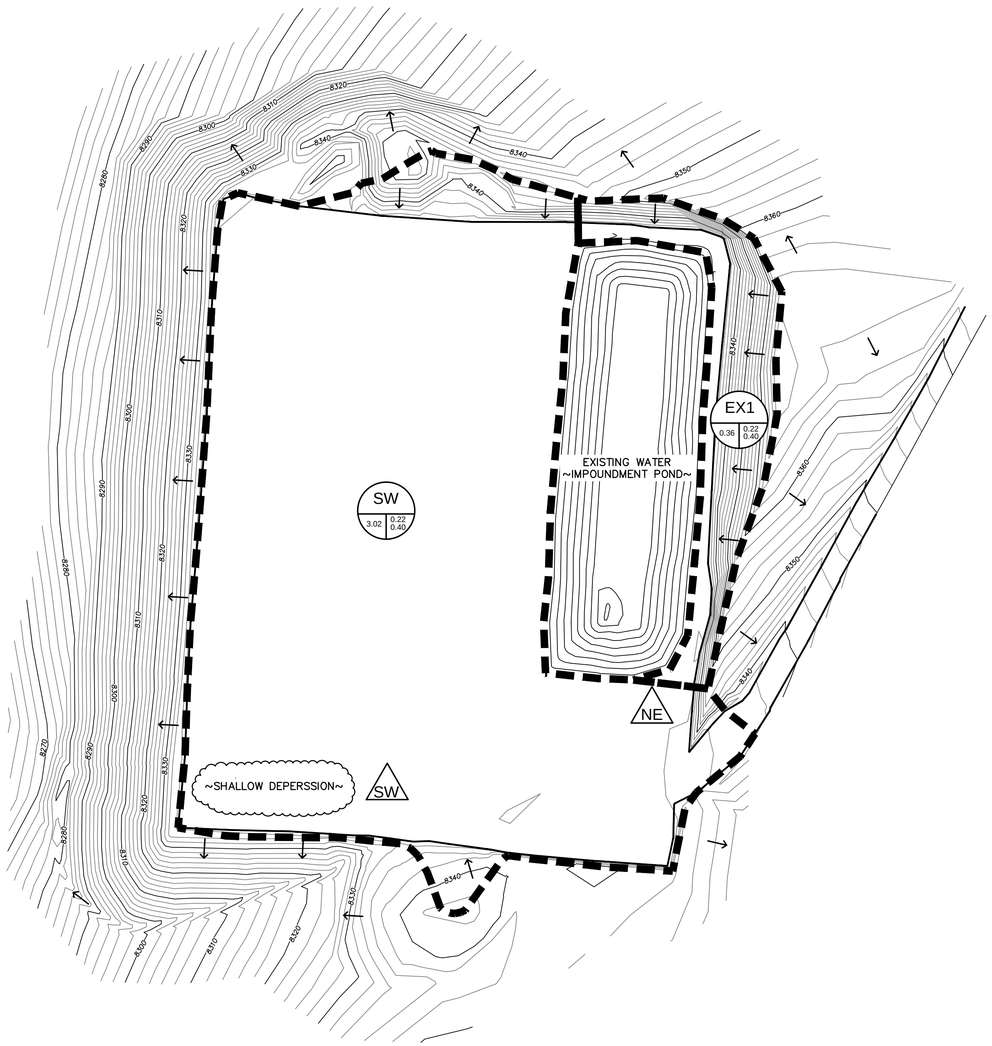
GCC Approved: _____ Title: _____ Date: _____

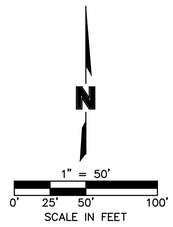
ONDITIONS OF APPROVAL, IF ANY:

FACILITY NUMBER: 421284

APPENDIX C: HYDROLOGIC CALCULATIONS

APPENDIX C TABLE OF CONTENTS





EXISTING/PROPOSED DRAINAGE CONDITIONS

LEGEND

- BASIN BOUNDARY
- BASIN DESIGNATION (BD)
- 10 YR RUNOFF COEFF. (X)
- 100 YR RUNOFF COEFF. (Y)
- BASIN AREA IN ACRES (Z)
- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR (8340)
- DRAINAGE FLOW DIRECTION
- DESIGN POINT (NE)

NOTES

1. NO BUILDING, STRUCTURE OR FILL WILL BE PLACED IN THE WATER IMPOUNDMENT AREA AND NO CHANGES OR ALTERATIONS AFFECTING THE HYDRAULIC CHARACTERISTICS OF THE WATER IMPOUNDMENT AREA WILL BE MADE WITHOUT THE APPROVAL OF THE COUNTY.
2. MAINTENANCE AND OPERATION OF THE WATER IMPOUNDMENT AREA IS THE RESPONSIBILITY OF THE PROPERTY OWNER. IF OWNER FAILS IN THIS RESPONSIBILITY, THE COUNTY HAS THE RIGHT TO ENTER THE PROPERTY, MAINTAIN THE WATER IMPOUNDMENT AREA, AND BE REIMBURSED FOR COSTS INCURRED.
3. ALL DRAINAGE APPURTENANCES AND BASIN BOUNDARIES SHALL BE VERIFIED. AS-BUILT DRAWINGS SHALL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY FOR ANY STRUCTURE WITHIN THE DEVELOPMENT.
4. PERMISSION TO REPRODUCE THESE PLANS IS HEREBY GIVEN TO GARFIELD COUNTY FOR COUNTY PURPOSES ASSOCIATED WITH PLAN REVIEW, APPROVAL, PERMITTING, INSPECTION AND CONSTRUCTION OF WORK.

EXISTING/PROPOSED DRAINAGE BASIN SUMMARY

DESIGN PT.	BASIN I.D.	AREA (AC)	DISCHARGE 10-YR (CFS)	DISCHARGE 100-YR (CFS)
NE	NE	0.36	0.18	0.33
SW	SW	3.02	1.32	2.40

THE WATER IMPOUNDMENT POND IS SELF CONTAINING AND WILL NOT HAVE AN OUTLET INTO THE EXISTING TERRAIN.

OLSSON ASSOCIATES
4690 Table Mountain Drive, Suite 200
Golden, CO 80403
TEL 303.237.2072
FAX 303.237.2659
www.oaconsulting.com

COLORADO REGISTERED PROFESSIONAL ENGINEER
38514

OLSSON ASSOCIATES ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL OR VERTICAL). THE EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS HOWEVER THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

811 Know what's below. Call before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

REVISIONS

REV. NO.	DATE	REVISIONS DESCRIPTION
1	DATE	REV1 DESCRIPT
2	DATE	REV2 DESCRIPT
3	DATE	REV3 DESCRIPT
4	DATE	REV4 DESCRIPT
5	DATE	REV5 DESCRIPT
6	DATE	REV6 DESCRIPT
7	DATE	REV7 DESCRIPT
8	DATE	REV8 DESCRIPT

DRAINAGE BASIN PLAN

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2012

drawn by: AMG
checked by: WEP
approved by: WEP
QA/QC by: WEP
project no.: 012-1372
drawing no.: 121372_DRNG_REV
date: 11.28.2012

SHEET 1 of 1

DWG: F:\Projects\012-1372_WTRS\Final_Plans\09_121372_DRNG_REV.dwg USER: agabor
DATE: Nov 28, 2012 1:59pm XREFS: 121372_TB PAD 596-32C FLOWLINE DIAGRAM (ASBUILT RECLAIMED UPDATE)

COMPOSITE 'C' FACTORS

LOCATION: Garfield County, CO | Final Drainage Study | BY: AMG | DATE: 11/28/2012

BASIN DESIGNATION				UNDEVELOPED				DEVELOPED				COMPOSITE C FACTOR				% IMPERVIOUS
	UNDEV	GRAVEL	TOTAL	2YR	5 YR	10-YR	100 YR	2YR	5 YR	10-YR	100 YR	2YR	5 YR	10-YR	100 YR	
Imperviousness =				2				10								
NE	0.000	0.355	0.36	0.03	0.09	0.17	0.36	0.06	0.14	0.22	0.40	0.06	0.14	0.22	0.40	10.00
SW	0.000	3.019	3.02	0.03	0.09	0.17	0.36	0.06	0.14	0.22	0.40	0.06	0.14	0.22	0.40	10.00

COMPOSITE I, %	TOTAL A, ac (SITE)
10.00	3.37

STANDARD FORM SF-2
TIME OF CONCENTRATION

REMARKS

LOCATION: Garfield County, CO | **Final Drainage Study** | **BY: AMG** | **11/28/2012**

FORMULAS:

*** Ti = 1.8*(1.1-C5)L^0.5/S^1/3**

**** V=Cv*S^0.5, Bare: Cv=10, Grass: Cv=15, Swale: Cv=20**

SUB-BASIN DATA			INIT./OVERLAND TIME (Ti)			TRAVEL TIME (Tt)										TOTAL	FINAL Tc
DESIGNATION	C_5	AREA (AC)	LENGTH (FT)	SLOPE %	Ti (Min.)*	BARE/ GRASS/ SWALE	LENGTH (FT)	SLOPE (FT/FT)	VEL. (FPS)**	Tt(Min.)	BARE/ GRASS/ SWALE	LENGTH (FT)	SLOPE (FT/FT)	VEL. (FPS)**	Tt(Min.)	Ti+Tt(Min.)	(minutes)
NE	0.14	0.36	1	84.71	0.39	BARE	16	0.8471	9.20	0.03	BARE	430	0.0010	0.32	22.66	23.09	23.09
SW	0.14	3.02	1	0.00	17.28	BARE	244	0.0010	0.32	12.86						30.14	30.14

Generally flat

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE, STANDARD FORM SF-3)

DESIGN STORM: 10-YEAR RUNOFF

Calc. by: AMG
Chk'd by: WEP
Date: 11/28/2012

Marathon Oil Company - 596-32C

DESIGN POINT	DIRECT RUNOFF							REMARKS
	BASIN	AREA (AC)	COEFF. (C)	Tc	C*A	I (in./ hr.)	Q (cfs)	
NE	NE	0.36	0.22	23.09	0.08	2.31	0.18	
SW	SW	3.02	0.22	30.14	0.66	1.98	1.32	

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE, STANDARD FORM SF-3)

DESIGN STORM: 100-YEAR RUNOFF

Calc. by: AMG
Chk'd by: WEP
Date: 11/28/2012

Marathon Oil Company - 596-32C

DESIGN POINT	DIRECT RUNOFF							REMARKS
	BASIN	AREA (AC)	COEFF. (C)	Tc	C*A	I (in./ hr.)	Q (cfs)	
NE	NE	0.36	0.40	23.09	0.14	2.31	0.33	
SW	SW	3.02	0.40	30.14	1.21	1.98	2.40	

APPENDIX D: WATER IMPOUNDMENT POND CALCULATIONS

APPENDIX D TABLE OF CONTENTS

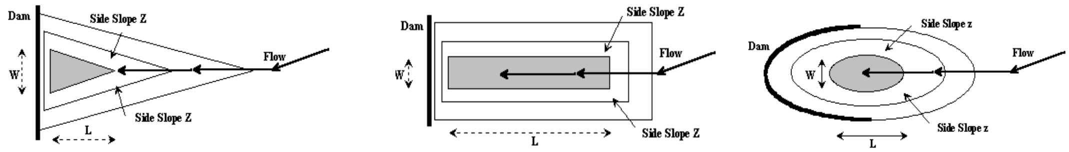
Existing Water Impoundment Pond Stage-Storage Worksheet - Stage-storage calculations of the existing water impoundment pond used to demonstrate the existing volume.

Liner Worksheet - Liner system design calculations showing the trench dimensions.

Colorado Lining International Information - Product data sheet, liner layout plan, installation reports for Marathon 596-32C. Information was included to demonstrate the as-built condition of the liner system in the water impoundment pond.

STAGE-STORAGE SIZING FOR POLYGONAL, ELLIPTICAL, OR IRREGULAR PONDS

Project: 596-32C Water Impoundment - Marathon Oil Company
Basin ID: Existing Water Impoundment Pond



Design Information (Input):

Width of Pond Bottom, W =		ft
Length of Pond Bottom, L =		ft
Dam Side-slope (H:V), Z_d =		ft/ft

Check Pond Shape

Right Triangle		OR…
Isosceles Triangle		OR…
Rectangle		OR…
Circle / Ellipse		OR…
Irregular		(Use Overide values in cells G32:G52)

Stage-Storage Relationship:

	MINOR	MAJOR	
Storage Requirement from Sheet 'Modified FAA':			acre-ft.
Storage Requirement from Sheet 'Hydrograph':			acre-ft.
Storage Requirement from Sheet 'Full-Spectrum':			acre-ft.

Labels for WQCV, Minor, & Major Storage Stages (input)	Stage ft (input)	Side Slope (H:V) ft/ft Below El.	Pond Width at Stage ft (output)	Pond Length at Stage ft (output)	Surface Area at Stage ft^2 (output)	Surface Area at Stage ft^2 User Overide	Volume Below Stage ft^3 (output)	Surface Area at Stage acres (output)	Volume Below Stage acre-ft (output)	Target Volumes for WQCV, Minor, & Major Storage Volumes (for goal seek)
	8315.68	(input)				0		0.000	0.000	
	8316.00		0.00	0.00		28	5	0.001	0.000	
	8318.00		0.00	0.00		392	425	0.009	0.010	
	8320.00		0.00	0.00		9,227	10,045	0.212	0.231	
	8322.00		0.00	0.00		11,968	31,241	0.275	0.717	
	8324.00		0.00	0.00		14,872	58,081	0.341	1.333	
	8326.00		0.00	0.00		17,852	90,805	0.410	2.085	
	8328.00		0.00	0.00		21,040	129,697	0.483	2.977	
	8330.00		0.00	0.00		24,269	175,005	0.557	4.018	
	8331.58		0.00	0.00		26,855	215,393	0.617	4.945	2' Freeboard
	8332.00		0.00	0.00		27,542	226,816	0.632	5.207	
	8333.58		0.00	0.00		30,134	272,380	0.692	6.253	
							#N/A		#N/A	
							#N/A		#N/A	
							#N/A		#N/A	
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							#N/A		#N/A	

DESIGN CALCULATION No.: 001

Client:	Marathon 596-32C	Project:	
Area:		Subject:	Pond Liner
Proj. No.:		Page:	1 Of: 3
Sub No.:		Prep:	AMG Date: 11/28/2012
Ref. Dwg No.:		Check:	Date:

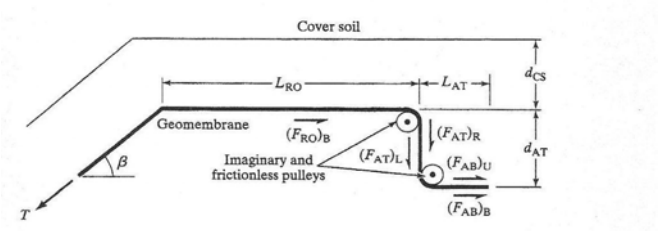
Objective:

Determine optimal design for anchor trench and calculate dimensions for run out, anchor trench depth, and depth of cover soil.

References:

1. The text books referenced for these calculations are *Geotechnical Aspects of Landfill Design and Construction* by Qian, Koerner and Gray and "Designing with Geosynthetics" Fifth Edition by Robert M. Koerner.
2. Since site-specific data was not available, the value for the friction angle between geomembrane and soil/geomembrane has been estimated from literature guidance from *Waste Containment Systems, Waste Stabilization, and Landfills* , Sharma/Lewis 1994 and a study done by Martin et. al. [Martin, J.P., Koerner R.M., and Whitey, J.E., "Experimental Friction Evaluation of Slippage between Geomembranes, Geotextiles and Soils, "*Proceedings of the International Conference on Geomembranes* , IFAI, 1984, pp. 191-196]. Conservative values from the ranges provided in the afore mentioned literature was used for these calculations.
3. The unit weight of Shale has been considered 120 psf based on the Geotechnical Investigation conducted by Olsson Associates, reported on December 15, 2010 in the Report of Geotechnical Exploration, Taylor Compressor Station, Mesa County, Colorado.
4. The Ultimate Tensile Strength for 60 mil HDPE has been taken from values provided by the manufacturer, which are attached herewith as Table 1.

Anchor Trench Diagram:



Definitions:

β	=	slope anlge
d_{CS}	=	depth of cover soil
d_{AT}	=	depth of anchor trench
L_{AT}	=	cross sectional length of anchor trench
δ_f	=	friction angle between geomembrane and overlying material
δ_c	=	friction angle between geomembrane and underlying material
L_{RO}	=	length of runout that is covered with soil
K_o	=	coefficient of at-rest earth pressure
φ	=	internal friction angle of soil
γ_s	=	soil unit weight

Refer to the attached article for definitions of other abbreviations used in these calculations.

Formula Input Data Conversion:

Primary Geomembrane: 60 mil HDPE

		English Input
β	=	26.565 degrees
d_{CS}	=	1 ft
d_{AT}	=	3 ft
L_{AT}	=	3 ft
δ_f	=	21 degrees
δ_c	=	17 degrees
L_{RO}	=	3 ft
K_o	=	0.56
φ	=	26 degrees
γ_s	=	120 lb/ft3

Secondary Geomembrane: 60 mil HDPE

		English Input
β	=	26.565 degrees
d_{CS}	=	1 ft
d_{AT}	=	3 ft
L_{AT}	=	3 ft
δ_f	=	17 degrees
δ_c	=	17 degrees
L_{RO}	=	3 ft
K_o	=	0.56
φ	=	26 degrees
γ_s	=	120 lb/ft3

All other values are calculated per Pages 2 and 3

Primary Geomembrane: 60 mil HDPE

	Equations		**Resolution of Values**	
Eq1	$T\cos\beta = (F_{RO})_B+(F_{AB})_U+(F_{AB})_B+[(F_{AT})_L+(F_{AT})_R]$			
			11/28/2012	
Eq2	$(F_{AB})_B = \gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_c$	=	440.25	lb/ft^3
Eq3	$(F_{AB})_U = \gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_f$	=	552.76	lb/ft^3
Eq4	$(F_{AT})_L = K_o\gamma_s(d_{CS}+0.5d_{AT})d_{AT}\tan\delta_c$	=	154.54	lb/ft^3
Eq5	$(F_{AT})_R = K_o\gamma_s(d_{CS}+0.5d_{AT})d_{AT}\tan\delta_f$	=	345.48	lb/ft^3
	$K_o = 1-\sin\varphi$	=	0.56	
Eq6	$(F_{RO})_B = \gamma_s d_{CS}L_{RO}\tan\delta_c+T\sin\beta\tan\delta_c$			
	where: $\gamma_s d_{CS}L_{RO}\tan\delta_c$	=	110.06	

Solving for T:

$$T = \frac{(\gamma_s d_{CS}L_{RO}\tan\delta_c) + [\gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_c] + [\gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_f] + [K_o\gamma_s(d_{CS}+0.5d_{AT})\tan\delta_c] + [K_o\gamma_s(d_{CS}+0.5d_{AT})\tan\delta_f]}{\cos\beta-\sin\beta\tan\delta c}$$

where: $\cos\beta-\sin\beta\tan\delta c$ = 0.76

then:

T = 2115.73 lbf

Tult for 60 mil = 1512 lbf/ft per manufacturer's data

Strength Ratio for 60 mil = 1.40 *Goal: >1 and <1.5*

Secondary Geomembrane: 60 mil HDPE

Equations **Resolution of Values** 11/28/2012

Eq1 $T\cos\beta = (F_{RO})_B+(F_{AB})_U+(F_{AB})_B+[(F_{AT})_L+(F_{AT})_R]$

Eq2 $(F_{AB})_B = \gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_c$ = 440.25 lb/ft^3

Eq3 $(F_{AB})_U = \gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_f$ = 440.25 lb/ft^3

Eq4 $(F_{AT})_L = K_o\gamma_s(d_{CS}+0.5d_{AT})d_{AT}\tan\delta_c$ = 154.54 lb/ft^3

Eq5 $(F_{AT})_R = K_o\gamma_s(d_{CS}+0.5d_{AT})d_{AT}\tan\delta_f$ = 275.16 lb/ft^3

$K_o = 1-\sin\varphi$ = 0.56

Eq6 $(F_{RO})_B = \gamma_s d_{CS}L_{RO}\tan\delta_c+T\sin\beta\tan\delta_c$

where: $\gamma_s d_{CS}L_{RO}\tan\delta_c$ = 110.06

Solving for T:

$$T = \frac{(\gamma_s d_{CS}L_{RO}\tan\delta_c) + [\gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_c] + [\gamma_s(d_{CS}+d_{AT})L_{AT}\tan\delta_f] + [K_o\gamma_s(d_{CS}+0.5d_{AT})\tan\delta_c] + [K_o\gamma_s(d_{CS}+0.5d_{AT})\tan\delta_f]}{\cos\beta-\sin\beta\tan\delta c}$$

where: $\cos\beta-\sin\beta\tan\delta c$ = 0.76

then:

T = 1874.44 lbf

Tult for 60 mil = 1512 lbf/ft per manufacturer's data (27 mil)

Strength Ratio for 60 mil = 1.24 *Goal: >1 and <1.5*

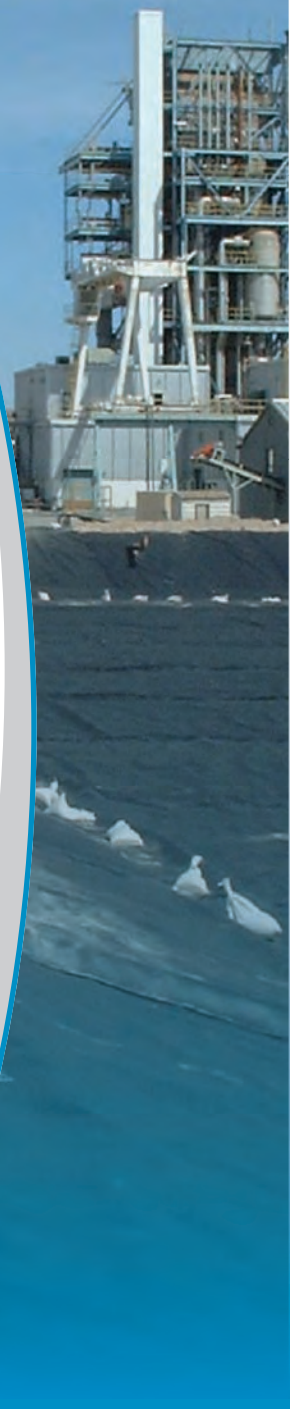
COLORADO LINING INTERNATIONAL

CO: 800.524.8672
TX: 888.546.4641
www.coloradolining.com

HDPE - HIGH DENSITY POLYETHYLENE

Polyethylene is the most commonly used liner in the industry due to its high strength, good chemical resistance, and proven track record. Polyethylene must be installed by certified technicians, but still manages to be a cost effective alternative.

Colorado Lining International is a certified installer of Polyethylene products. We maintain year roundfield crews capable of installing your next job. We want to work with you to make your job a success.



Product Features:

- Chemical Resistance
- Durable
- Cost Effective
- UV Stable
- Wide Product Range:
  - SMOOTH
  - TEXTURED
  - CONDUCTIVE
  - COLORS AVAILABLE
- Available In 20, 30, 40, 60, 80, & 100 Mils

Uses & Applications:

- Landfills
- Wastewater Treatment Plants
- Animal Waste Lagoons
- Golf Course Ponds
- Gas Collection Covers
- Pond & Lake Liners
- Irrigation Reservoirs

- ***Project Photo: Nevada Power in Las Vegas, NV***
- ***Overflow Pond Lining***
- ***43,875 SF 40 Mil HDPE***

COLORADO LINING INTERNATIONAL

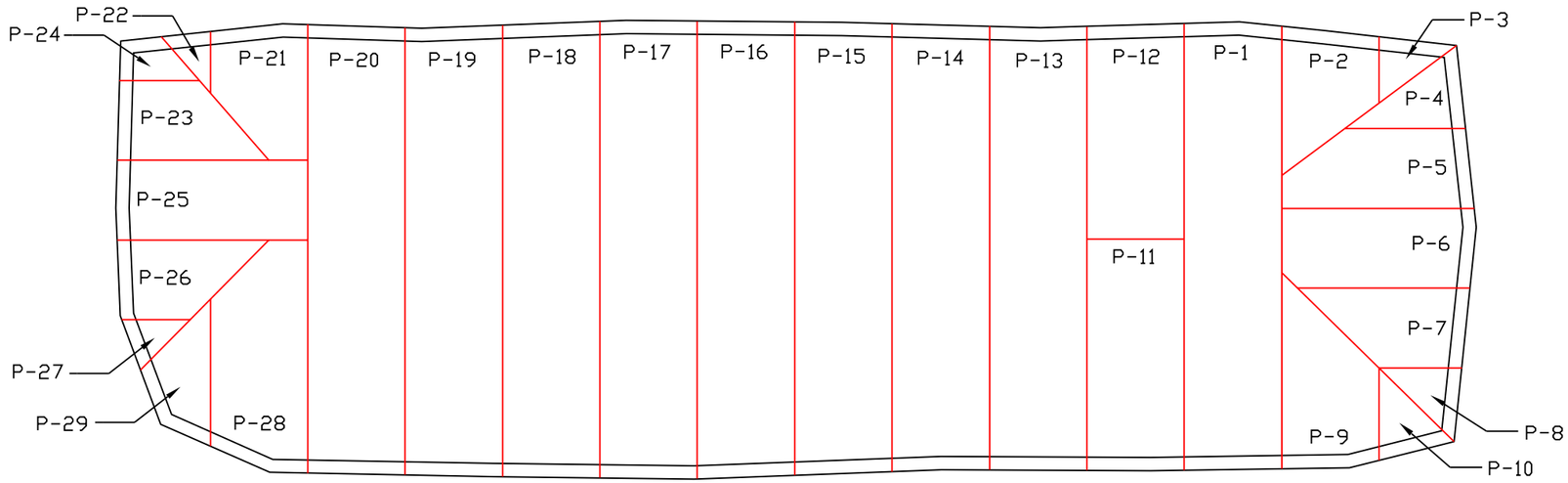
HDPE
Product Data Sheet

Table 1(a) – High Density Polyethylene (HDPE) Geomembrane -Smooth

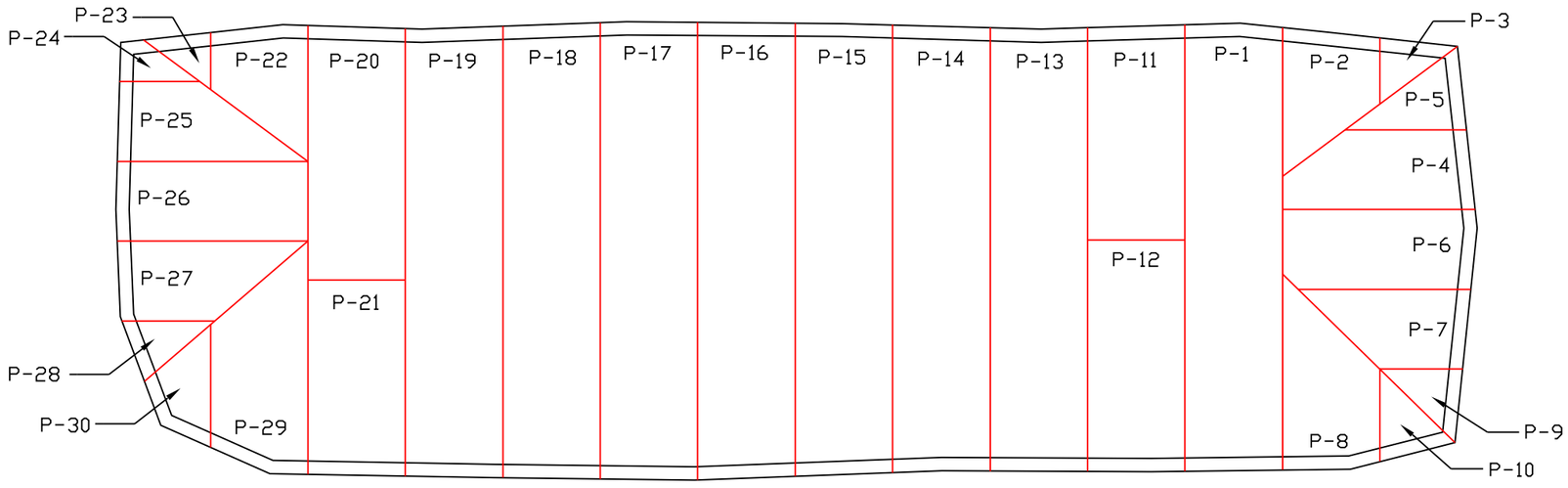
Properties	Test Method	Test Value							Testing Frequency (minimum)
		30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness (min. ave.)	D5199	nom.	Nom.	Nom.	Nom.	Nom.	Nom.	Nom.	Per roll
• lowest individual of 10 values		-10%	-10%	-10%	-10%	-10%	-10%	-10%	
Density mg/l (min.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	200,00 lb
Tensile Properties *(1)* (min. ave.)	D 6693 Type IV								20,000 lb
• yield strength		63 lb/in.	84 lb/in.	105 lb/in.	126 lb/in.	168 lb/in.	210 lb/in.	252 lb/in.	
• break strength		114 lb/in.	152 lb/in.	190 lb/in.	228 lb/in.	304 lb/in.	380 lb/in.	456 lb/in.	
• yield elongation		12%	12%	12%	12%	12%	12%	12%	
• break elongation		700%	700%	700%	700%	700%	700%	700%	
Tear Resistance (min. ave.)	D 1004	21 lb	28 lb	35 lb	42 lb	56 lb	70 lb	84 lb	45,000 lb
Puncture Resistance (min. ave.)	D 4833	54 lb	72 lb	90 lb	108 lb	144 lb	180 lb	216 lb	45,000 lb
Stress Crack Resistance *(2)*	D5397 (App.)	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	per GRI-GM10
Carbon Black Content (range)	D 1603 *(3)*	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	20,000 lb
Carbon Black Dispersion	D 5596	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) *(5)*									200,000 lb
(a) Standard OIT	D 3895	100 min.	100 min.	100 min.	100 min.	100 min.	100 min.	100 min.	
— or —									
(b) High Pressure OIT	D 5885	400 min.	400 min.	400 min.	400 min.	400 min.	400 min.	400 min.	
Oven Aging at 85°C *(5), (6)*	D 5721								
(a) Standard OIT (min. ave.) - % retained after 90 days	D 3895	55%	55%	55%	55%	55%	55%	55%	per each formulation
— or —									
(b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5885	80%	80%	80%	80%	80%	80%	80%	
UV Resistance *(7)*	GM 11								
(a) Standard OIT (min. ave.)	D 3895	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	per each formulation
— or —									
(b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)*	D 5885	50%	50%	50%	50%	50%	50%	50%	

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 in.
(2) The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(3) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D 1603 (tube furnace) can be established.
(4) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(6) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(7) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(8) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.

HDPE Smooth Layout



HDPE Textured Layout



Notes :

Submitted By: COLORADO LINING INTERNATIONAL	Marathon Oil 596-32C 60mil HDPE / HDT As-Built	
	DATE: September 10, 2010	Contractor: Marathon Oil — REV 1
	Scale:	Drawn By: Y.Davis — Drawing Name: Marathon Oil As-Built

COLORADO LINING
INTERNATIONAL

Installation Reports

for

Marathon 596-32C

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/26/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
						/				
						/				
						/				
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						/				
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DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We went to the safety meeting. Then we went out and filled some sand bags and moved some rolls around.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/27/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
						/				
						/				
						/				
						/				
						/				
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						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed about 4 rolls of Geocomposite before it started raining. Spent about 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/28/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/28/10	1:30	85	800		11.0	130/133		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	128/129		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	128/137		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/	154	R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/	155	R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	128/124		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	131/115		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	129/130		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	/	158	J.L	1630	Pass
7/28/10	1:30	85	800		11.0	/	160	J.L	1630	Pass
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed about 8 rolls of Geocomposite and one roll of HDPE. Spent 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/29/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** _____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/29/10	9:25		800		10.5	123/127		J.L	1630	Pass
7/29/10	9:25		800		10.5	127/119		J.L	1630	Pass
7/29/10	9:25		800		10.5	112/128		J.L	1630	Pass
7/29/10	9:25		800		10.5	/	159	J.L	1630	Pass
7/29/10	9:25		800		10.5	/	158	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	Raining		

Comments: We headed toward the site but the road was down. It took about 2 hours before we got to the job site because of the rain from the day before. We didn't get all the liner in because it was raining on and off all day. Spent 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/30/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** ____x____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/30/10	8:00	70	475	425		88/		B.V	1606	Pass
7/30/10	8:00	70	475	425		/85		B.V	1606	Pass
7/30/10	8:00	70	475	425		89/		B.V	1606	Pass
7/30/10	8:00	70	475	425		/	145	B.V	1606	Pass
7/30/10	8:00	70	475	425		/	142	B.V	1606	Pass
7/30/10	8:10	70	800		10	135/130		J.L	1630	Pass
7/30/10	8:10	70	800		10	127/131		J.L	1630	Pass
7/30/10	8:10	70	800		10	131/129		J.L	1630	Pass
7/30/10	8:10	70	800		10	/	180	J.L	1630	Pass
7/30/10	8:10	70	800		10	/	184	J.L	1630	Pass
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed the rest of the liner. We started to test and patch all the seams. Spent ½ an hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/31/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** ____x____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/31/10	8:00	70	800		10	127/133		J.L	1630	Pass
7/31/10	8:00	70	800		10	138/125		J.L	1630	Pass
7/31/10	8:00	70	800		10	131/139		J.L	1630	Pass
7/31/10	8:00	70	800		10	/	169	J.L	1630	Pass
7/31/10	8:00	70	800		10	/	159	J.L	1630	Pass
						/				
7/31/10	8;00	70	475	425		102/		R.C	1606	Pass
7/31/10	8;00	70	475	425		102/		R.C	1606	Pass
7/31/10	8;00	70	475	425		/97		R.C	1606	Pass
7/31/10	8;00	70	475	425		/	165	R.C	1606	Pass
7/31/10	8;00	70	475	425		/	171	R.C	1606	Pass
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We completed the testing and patching and installed all of the net. Monday we will start on the HDT.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/2/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _x___**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/2/10	8:00		850		9.5	129/133		J.L	1630	Pass
8/2/10	8:00		850		9.5	138/125		J.L	1630	Pass
8/2/10	8:00		850		9.5	131/139		J.L	1630	Pass
8/2/10	8:00		850		9.5	/	169	J.L	1630	Pass
8/2/10	8:00		850		9.5	/	159	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed the 2 pipes and filled in the sump. Then we installed about 2 rolls before it started to rain.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/3/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/3/10	8:30		850		9.0	140/132		J.L	1630	Pass
8/3/10	8:30		850		9.0	138/134		J.L	1630	Pass
8/3/10	8:30		850		9.0	135/138		J.L	1630	Pass
8/3/10	8:30		850		9.0	/	170	J.L	1630	Pass
8/3/10	8:30		850		9.0	/	165	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We arrived on site and had to pump water. Then we installed all of the HDT .

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/4/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld __x__**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/4/10	8:00		450	425		106/		J.C	1606	Pass
8/4/10	8:00		450	425		/110		J.C	1606	Pass
8/4/10	8:00		450	425		108/		J.C	1606	Pass
8/4/10	8:00		450	425		/	126	J.C	1606	Pass
8/4/10	8:00		450	425		/	128	J.C	1606	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We started testing and patching. We got all of the air testing done but only completed the floor patching because it started to rain.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/5/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/5/10	8:00		450	425		132/		J.L	1606	Pass
8/5/10	8:00		450	425		134/		J.L	1606	Pass
8/5/10	8:00		450	425		131/		J.L	1606	Pass
8/5/10	8:00		450	425		/	152	J.L	1606	Pass
8/5/10	8:00		450	425		/	155	J.L	1606	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We completed all of the patching and got the 2 pipe boots done.

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
7/30/10	2:00	2:05	1	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:00	2:05	2	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	3	44'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:00	2:05	4	60'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	5	44'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	6	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:30	2:35	7	20'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:35	2:40	8	56'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:42	2:47	9	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:42	2:47	10	22'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:00	3:05	11	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:10	3:15	12	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:25	3:30	13	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:25	3:30	14	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:32	3:37	15	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:46	3:51	16	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:50	3:55	17	126'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:15	4:20	18	124'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:25	4:30	19	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:35	4:40	20	22'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:40	4:45	21	125'	X				Pass	Jaime L	1630	10.5	800
AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test													

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	AC	AL	VB	ST	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
7/30/10	4:50	4:55	22	54'	X				Pass	Jaime L	1630	10	800
7/30/10	4:50	4:55	23	39'	X				Pass	Jaime L	1630	10	800
7/30/10	5:00	5:05	24	25'	X				Pass	Jaime L	1630	10	800
7/30/10	5:00	5:05	25	79'	X				Pass	Jaime L	1630	10	800
7/30/10	5:10	5:15	26	58'	X				Pass	Jaime L	1630	10	800
7/30/10	5:12	5:17	27	56'	X				Pass	Jaime L	1630	10	800
7/30/10	5:20	5:25	28	22'	X				Pass	Jaime L	1630	10	800
7/30/10	5:20	5:25	29	41'	X				Pass	Jaime L	1630	10	800
7/30/10	5:25	5:30	30	74'	X				Pass	Jaime L	1630	10	800
7/31/10			31t						pass	Jaime L	1630	10	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

CLI / ClearWater
1062 Singing Hills Road Parker, Colorado 80138 / 1-800-524-8672 / 303-841-2022 / Fax 303-841-5780 / www.coloradolining.com

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
8/4/10	8:10	8:15	1	24'	X				Pass	Jaime L	1630	7	850
8/4/10	8:10	8:15	2	34'	X				Pass	Jaime L	1630	7	850
8/4/10	8:10	8:15	3	48'	X				Pass	Jaime L	1630	7	850
8/4/10	8:20	8:25	4	48'	X				Pass	Jaime L	1630	7	850
8/4/10	8:22	8:27	5	46'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	6	17'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	7	20'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	8	62'	X				Pass	Jaime L	1630	7	850
8/4/10	9:12	9:17	9	63'	X				Pass	Jaime L	1630	7	850
8/4/10	9:05	9:10	10	117'	X				Pass	Jaime L	1630	7	850
8/4/10	9:45	9:50	11	22'	X				Pass	Jaime L	1630	7	850
8/4/10	10:00	10:05	12	118'	X				Pass	Jaime L	1630	7	850
8/4/10	10:00	10:05	13	120'	X				Pass	Jaime L	1630	7	850
8/4/10	10:25	10:30	14	120'	X				Pass	Jaime L	1630	7	850
8/4/10	10:35	10:45	15	120'	X				Pass	Jaime L	1630	7	850
8/4/10	11:00	11:05	16	122'	X				Pass	Jaime L	1630	7	850
8/4/10	11:15	11:20	17	122'	X				Pass	Jaime L	1630	7	850
8/4/10	11:30	11:35	18	125'	X				Pass	Jaime L	1630	7	850
8/4/10	11:45	11:50	19	125'	X				Pass	Jaime L	1630	7	850
8/4/10	11:45	11:50	20	125'	X				Pass	Jaime L	1630	7	850
8/4/10	12:00	12:05	21	40'	X				Pass	Jaime L	1630	7	850
AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test													

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
8/4/10	12:05	12:10	22	26'	X				Pass	Jaime L	1630	7	850
8/4/10	12:05	12:10	23	54'	X				Pass	Jaime L	1630	7	850
8/4/10	12:10	12:35	24	63'	X				Pass	Jaime L	1630	7	850
8/4/10	12:30	12:35	25	45'	X				Pass	Jaime L	1630	7	850
8/4/10	12:30	12:35	26	38'	X				Pass	Jaime L	1630	7	850
8/4/10	12:35	12:40	27	69'	X				Pass	Jaime L	1630	7	850
8/4/10	12:40	12:45	28	66'	X				Pass	Jaime L	1630	7	850
8/5/10	8:00	8:05	29	125'	X				Pass	Jaime L	1630	7	850

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

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COLORADO LINING INTERNATIONAL

Field Seam Destructive Test

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 Mil HDPE

Destruct No.	Date of Test	Welder No.	Welder Temp.	Welder Speed	Seam No.	Time of Test	Welder's Name	Peel Value Inside/Outside	Sheer Value	(Pass/Fail)
1	7/31/10	1630	800	10	13	1:00	Jaime L	104/122	157	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	110/120	156	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	110/119	146	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	112/123	158	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	109/120	142	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	114/118	148	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	119/115	145	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	114/112	152	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	112/111	155	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	120/111	154	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	119/120	152	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	115/116	154	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	115/121	155	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	118/120	152	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	11/6/118	158	Pass

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COLORADO LINING INTERNATIONAL

Field Seam Destructive Test

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 Mil HDPET

Destruct No.	Date of Test	Welder No.	Welder Temp.	Welder Speed	Seam No.	Time of Test	Welder's Name	Peel Value Inside/Outside	Sheer Value	(Pass/Fail)
1	8/4/10	1630	850	7	10	10:00	Jaime L	135/132	141	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	138/131	145	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	136/134	146	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	132/138	147	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	133/134	143	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	142/138	150	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	138/140	151	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	136/142	153	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	138/141	154	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	137/139	152	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	130/133	138	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	134/131	140	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	130/134	135	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	129/133	138	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	132/134	139	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	130/139	145	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	140/129	149	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	137/128	152	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	138/132	150	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	130/137	150	Pass

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COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPE**

Panel No.	Roll Number	Date	Material Type	Width	Length
1	Client provided material	7/28/2010	60 Mil HDPE	22'	126'
2	"	7/28/2010	60 Mil HDPE	22'	44'
3	"	7/28/2010	60 Mil HDPE	22'	24'
4	"	7/28/2010	60 Mil HDPE	22'	44'
5	"	7/28/2010	60 Mil HDPE	22'	24'
6	"	7/28/2010	60 Mil HDPE	22'	44'
7	"	7/28/2010	60 Mil HDPE	22'	44'
8	"	7/28/2010	60 Mil HDPE	22'	41'
9	"	7/28/2010	60 Mil HDPE	22'	24'
10	"	7/28/2010	60 Mil HDPE	22'	20'
11	"	7/29/2010	60 Mil HDPE	22'	49'
12	"	7/29/2010	60 Mil HDPE	22'	78'
13	"	7/29/2010	60 Mil HDPE	22'	126'
14	"	7/29/2010	60 Mil HDPE	22'	126'
15	"	7/29/2010	60 Mil HDPE	22'	126'
16	"	7/29/2010	60 Mil HDPE	22'	126'
17	"	7/29/2010	60 Mil HDPE	22'	126'
18	"	7/29/2010	60 Mil HDPE	22'	126'
19	"	7/29/2010	60 Mil HDPE	22'	126'
20	"	7/30/2010	60 Mil HDPE	22'	78'
21	"	7/30/2010	60 Mil HDPE	22'	49'
22	"	7/30/2010	60 Mil HDPE	22'	54'
23	"	7/30/2010	60 Mil HDPE	22'	39'
24	"	7/30/2010	60 Mil HDPE	22'	25'
25	"	7/30/2010	60 Mil HDPE	22'	58'

COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPET**

Panel No.	Roll Number	Date	Material Type	Width	Length
1	104143108	8/2/10	60 Mil HDPET	22	118'
2	104143108	8/2/10	60 Mil HDPET	22	48'
3	104143108	8/2/10	60 Mil HDPET	22	24'
4	104143108	8/2/10	60 Mil HDPET	22	34'
5	104143108	8/2/10	60 Mil HDPET	22	48'
6	104143108	8/2/10	60 Mil HDPET	22	49'
7	104143108	8/2/10	60 Mil HDPET	22	47'
8	104143108	8/2/10	60 Mil HDPET	22	17'
9	104143108	8/2/10	60 Mil HDPET	22	38'
10	104143108	8/2/10	60 Mil HDPET	22	20'
11	104143108	8/2/10	60 Mil HDPET	22	69'
12	103176821	8/2/10	60 Mil HDPET	22	48'
13	103176821	8/3/10	60 Mil HDPET	22	123'
14	103176821	8/3/10	60 Mil HDPET	22	123'
15	103176821	8/3/10	60 Mil HDPET	22	124'
16	103176821	8/3/10	60 Mil HDPET	22	125'
17	108151138	8/3/10	60 Mil HDPET	22	126'
18	108151138	8/3/10	60 Mil HDPET	22	126'
19	108151138	8/3/10	60 Mil HDPET	22	127'
20	108151138	8/3/10	60 Mil HDPET	22	127'
21	104143105	8/3/10	60 Mil HDPET	22	53'
22	104143105	8/3/10	60 Mil HDPET	22	40'
23	104143105	8/3/10	60 Mil HDPET	22	55'
24	104143105	8/3/10	60 Mil HDPET	22	27'
25	104143105	8/3/10	60 Mil HDPET	22	65'

COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPET**

Panel No.	Roll Number	Date	Material Type	Width	Length
26	104143105	8/3/10	60 Mil HDPET	22'	45'
27	104143105	8/3/10	60 Mil HDPET	22'	25'
28	104143105	8/3/10	60 Mil HDPET	22'	51'
29	104143105	8/3/10	60 Mil HDPET	22'	38'

COLORADO LINING INTERNATIONAL

Sub grade Acceptance

Date:_____

Project:	**Marathon 596-32C**
Owner:	**Marathon Oil**
Engineer:	
Contractor:	**Marathon Oil**
Installation Supervisor:	**Mark Lucero**
Material:	**60 mil HDPE**

Is surface acceptable for placement of geomembranes? Yes X No___

Comments _____

Date: 8-5-10

Accepted By Representative of Owner/Owner (Signature) Gary Starks

I certify that I am a representative with the authority to provide this acceptance and recognize that if this is not a true statement that I will be held personally responsible for the integrity of the inspection.

Print Name/Title: Moc. rep Gary Starks

Company: _____

Witnessed By Representative of CLC (Signature) _____

Print Name/Title Mark Lucero

This document only applies to the acceptability of the surface conditions for the installation of the geosynthetic products. Colorado Lining Construction (CLC) does not accept responsibility for anchor trench elevation or design, elevation points for construction, sub-grade compaction, moisture content of neither the sub-grade nor the surface maintenance during deployment. The structural integrity of the sub-grade and maintenance of these conditions are the responsibility of the owner, engineer or contractor. Furthermore, any incidental damage to the liner or seams (e.g. groundwater, gases, cover soil placement and sub-grade movement) during or after the installation is not covered by any warranty expressed or implied and the design, engineering and construction are the responsibility of the owner, engineer and/or contractor.

CORPORATE OFFICE
1062 Singing Hills Road Parker, Colorado 80138 800 524 8672 303 841 2022 Fax 303 841 5780 www.coloradolining.com

COLORADO LINING INTERNATIONAL

Geomembrane Installation Approval

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 mil HDPE**

The Geomembrane on this project has been installed, inspected and tested in accordance with Industry Standards and Manufacturer recommendations.

Date: 8-5-10

Accepted By: (Signature) Gary Stks

Print Name/Title: Mgr. Rep. Gary Stanks

Company: _____

Comments: _____

All warranties to begin on the date of completion.
Warranties to be issued upon receipt of final payment

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Attachment D
Construction Drawings

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

WATER IMPOUNDMENT 596-32C
MARATHON OIL COMPANY
CONSTRUCTION DOCUMENTS
LOCATED IN SECTION 32, TOWNSHIP 5 SOUTH, RANGE 96 WEST OF THE 6TH PRINCIPAL MERIDIAN
GARFIELD COUNTY, STATE OF COLORADO

NOTE:
THE WATER IMPOUNDMENT POND IS AN EXISTING FACILITY AND THEREFORE THE FOLLOWING GENERAL, GRADING, GEOTECHNICAL STUDY, DEWATERING PERMITS, AND EROSION & SEDIMENT CONTROL NOTES DO NOT APPLY. IF ANY OPTIONAL WORK, SUCH AS THE FENCE RELOCATION OR LINER TRENCH SYSTEM, IS DONE ON THE SITE, THEN THE FOLLOWING NOTES SHALL APPLY.

GENERAL NOTES

1. ALL WORK WITHIN PUBLIC RIGHTS-OF-WAY AND/OR EASEMENT AND ALL ON-SITE UTILITY WORK SHALL CONFORM TO THE TECHNICAL SPECIFICATIONS AND DESIGN CRITERIA FOR PUBLIC IMPROVEMENT PROJECTS OF GARFIELD COUNTY AND THE GRANTOR OF THE EASEMENT.
2. ALL MATERIALS AND WORKMANSHIP SHALL BE IN CONFORMANCE WITH THE LATEST STANDARDS AND SPECIFICATIONS OF THE APPROPRIATE GOVERNING AGENCY. THE CONTRACTOR SHALL HAVE IN HIS POSSESSION AT ALL TIMES (1) SIGNED COPY OF THE PLANS, STANDARDS, AND SPECIFICATIONS AS APPROVED BY THE APPROPRIATE GOVERNING AGENCY. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FOR ANY VARIANCE TO THE ABOVE DOCUMENTS.
3. THE CONTRACTOR SHALL OBTAIN, AT HIS OWN EXPENSE, ALL APPLICABLE CODES, LICENSES, STANDARDS, PERMITS, BONDS, ETC. WHICH ARE NECESSARY TO PERFORM THE PROPOSED WORK.
4. THE EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND MAY NOT INCLUDE ALL LINES PRESENT. THE CONTRACTOR WILL BE RESPONSIBLE FOR CALLING THE UTILITY NOTIFICATION CENTER OF COLORADO AT 811 AND COORDINATING FIELD LOCATIONS OF EXISTING UNDERGROUND UTILITIES PRIOR TO BEGINNING GRADING AND UTILITY WORK.
5. LOCATIONS AND ELEVATIONS OF EXISTING IMPROVEMENTS TO BE MET (OR AVOIDED) BY WORK TO BE DONE SHALL BE CONFIRMED BY THE CONTRACTOR THROUGH FIELD EXPLORATIONS PRIOR TO CONSTRUCTION. CONTRACTOR SHALL REPORT TO THE ENGINEER ANY DISCREPANCIES BETWEEN HIS MEASUREMENTS AND THESE PLANS.
6. ANY CONSTRUCTION DEBRIS OR MUD DROPPED INTO MANHOLES, INLETS, PIPES OR TRACKED ONTO EXISTING ROADWAYS SHALL BE REMOVED IMMEDIATELY BY THE CONTRACTOR. THE CONTRACTOR SHALL REPAIR ANY EXCAVATIONS OR PAVEMENT FAILURES CAUSED BY HIS CONSTRUCTION. THE CONTRACTOR SHALL PROPERLY BARRICADE THE CONSTRUCTION SITE UNTIL CONSTRUCTION IS COMPLETE.
7. PRIOR TO BEGINNING THE WORK, THE CONTRACTOR SHALL OBTAIN ANY WRITTEN AGREEMENTS FOR INGRESS AND EGRESS TO THE WORK FORM ADJACENT PRIVATE PROPERTY OWNERS. ACCESS TO ANY ADJACENT PRIVATE PROPERTY SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS NOT OBTAINED BY THE OWNER OR OWNER'S REPRESENTATIVES AND PAY ALL FEES AS REQUIRED BY THE CONSTRUCTION COVERED IN THESE PLANS.
9. EXCEPT FOR MATERIALS DESIGNED TO BE RELOCATED ON THIS PLAN, ALL OTHER CONSTRUCTION MATERIALS SHALL BE NEW.
10. NO WORK SHALL BE BACKFILLED (INCLUDING BEDDING MATERIAL ABOVE THE SPRING LINE OF THE PIPE) UNTIL THE CONSTRUCTION HAS BEEN INSPECTED AND APPROVED FOR BACKFILLING BY THE APPROPRIATE GOVERNING AGENCY.
11. ALL WORK AND MATERIALS WILL BE SUBJECT TO INSPECTION AND APPROVAL BY THE OWNER OR THE OWNERS REPRESENTATIVE.
12. SHOP DRAWINGS AND MATERIAL SPECIFICATIONS SHALL BE SUBMITTED TO OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PLACEMENT OF MATERIAL.
13. ALL WORK SHALL CONFORM TO ALL LOCAL, STATE, AND FEDERAL APPLICABLE LAWS AND REGULATIONS.
14. ALL ESTIMATES OF QUANTITIES ARE FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR AND SUBCONTRACTORS SHALL BE RESPONSIBLE FOR DETERMINING ALL QUANTITIES. CONTRACTOR SHALL PROVIDE ALL WORK AND MATERIALS AS SHOWN ON THESE PLANS.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR JOB SITE SAFETY OF HIS OWN PERSONNEL, ALL VISITORS TO THE SITE, AND THE GENERAL PUBLIC INCLUDING, BUT NOT LIMITED TO, TRENCH EXCAVATION AND SHORINGS, TRAFFIC CONTROL, AND SECURITY NOT LIMITED TO NORMAL WORKING HOURS.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ALL EXISTING FEATURES TO REMAIN THAT ARE DAMAGED DURING CONSTRUCTION ACTIVITIES TO EQUAL OR BETTER CONDITION, AT HIS OWN EXPENSE.
17. CONTRACTOR SHALL COORDINATE THE INSTALLATION OF ALL SITE IMPROVEMENTS (INCLUDING BUT NOT LIMITED TO: UTILITIES, STRUCTURES, PAVING, LANDSCAPING, ETC.) SUCH THAT NO DAMAGE IS DONE TO SITE IMPROVEMENTS (I.E.: SAWCUTTING NEW PAVEMENT). SITE IMPROVEMENTS DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER.
18. IF, DURING THE CONSTRUCTION PROCESS, CONDITIONS ARE ENCOUNTERED WHICH COULD INDICATE THAT A PRIOR UNIDENTIFIED SITUATION IS PRESENT, THE CONTRACTOR SHALL CONTACT THE ENGINEER IMMEDIATELY.
19. THE CONTRACTOR SHALL REMOVE ALL DEBRIS RESULTING FROM WORK UNDER THIS CONTRACT TO AN APPROVED DUMP SITE.
20. DIMENSIONS SHOWN ON THE PLANS ARE TO FACE OF CURB LINE IN CURBED AREA AND EXTERIOR FACE OF BUILDING, AND TO CENTERLINE OF UTILITIES, UNLESS OTHERWISE SPECIFIED.
21. USE ONLY DIMENSIONS PROVIDED ON THESE PLANS. DO NOT SCALE DRAWINGS. INFORM ENGINEER OF ANY DISCREPANCIES AND/OR MISSING INFORMATION.
22. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ACCESS TO ADJACENT PARCELS DURING ALL HOURS OF OPERATION FOR THE BUSINESSES LOCATED ON THOSE PARCELS.
23. CONTRACTOR TO OBTAIN TEMPORARY POWER, TELEPHONE AND WATER FOR THE SITE.
24. CONTRACTOR MUST COORDINATE CONSTRUCTION WITH OWNER/ADJACENT PROPERTY OWNER'S CONSTRUCTION MANAGER.
25. THE CONTRACTOR SHALL OBTAIN A COPY OF THE STANDARD SPECIFICATIONS AND DETAILS OF ALL AGENCIES EXERCISING JURISDICTION OVER THIS PROJECT. A COPY OF THESE SPECIFICATIONS AND DETAILS SHALL BE MAINTAINED ON THE JOBSITE AT ALL TIMES. A COPY OF ALL APPLICABLE STANDARD DETAILS AND SPECIFICATIONS ARE INCORPORATED HEREIN BY REFERENCE.
26. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING ADJACENT COUNTY ROADS FREE AND CLEAN OF ALL DEBRIS AND DIRT FROM THE JOB SITE.

VICINITY MAP
SCALE: 1"=2000'

GRADING

1. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF ALL PROPERTY CORNERS. ANY PROPERTY CORNERS DISTURBED OR DAMAGED BY GRADING ACTIVITIES SHALL BE RESET BY A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF COLORADO, AT THE CONTRACTORS EXPENSE.
2. THE CONTOUR LINES SHOWN ARE TO FINISH GRADE FOR SURFACE OF ROADWAY, SURFACE OF POND, ETC. ALL SPOT ELEVATIONS SHOWN ARE TO FLOWLINE UNLESS OTHERWISE INDICATED. REFER TO TYPICAL SECTIONS FOR MULCH, SOD, PAVING, SLAB AND AGGREGATE BASE THICKNESS TO DEDUCT FOR GRADING LINE ELEVATIONS.
3. THE CONTRACTOR SHALL FINISH GRADE SLOPES AS SHOWN NO STEEPER THAN ONE FOOT VERTICAL IN THREE FEET HORIZONTAL.
4. THE CONTRACTOR SHALL CLEAN OUT ALL EXISTING AND PROPOSED INLETS, PIPES AND MANHOLES OF DEBRIS AND SEDIMENT AT COMPLETION OF SITEWORK. THIS WORK SHALL BE DONE TO THE SATISFACTION OF THE OWNER.
5. CONTRACTOR SHALL COORDINATE TESTING ACTIVITIES WITH THE GEOTECHNICAL ENGINEER.
6. ALL GRADING, COMPACTION, AND PAVEMENT CONSTRUCTION WILL BE IN ACCORDANCE WITH RECOMMENDATIONS FROM THE GEOTECHNICAL INVESTIGATION.

GEOTECHNICAL STUDY NOTE

CONTRACTOR TO OBTAIN AND READ THE GEOTECHNICAL ENGINEERING STUDY (PROVIDED BY OWNER). IN CASE OF ANY CONFLICT WITH THESE PLANS AND SITEWORK SPECIFICATIONS REGARDING PAVING AND EARTHWORK, THE GEOTECHNICAL REPORT WILL GOVERN. ALL PAVING AND EARTHWORK SHALL CONFORM TO THE RECOMMENDATIONS OF THE REPORT.

DEWATERING PERMITS

1. CONTRACTOR TO OBTAIN DEWATERING PERMIT FROM CDPHE PRIOR TO COMMENCING WORK. DISCHARGES SHALL BE MONITORED ACCORDING TO THE CONDITIONS OF THE CDPHE PERMIT.

SHEET INDEX

CONTACT LIST:

OWNER:
MARATHON OIL COMPANY
743 HORIZON COURT, SUITE 220
GRAND JUNCTION, CO 81506
PHONE: (970) 244-5735
CONTACT: ERIC WARD

SURVEYOR:
WILLIAM H. SMITH & ASSOCIATES P.C.
550 EAST SECOND NORTH
GREEN RIVER, WY
PHONE: (307) 875-3638
FAX: (307) 875-3639

ENGINEER:
OLSSON ASSOCIATES
760 HORIZON DRIVE, SUITE 102
GRAND JUNCTION, CO 81506
PHONE: (970) 263-7800
CONTACT: WYATT POPP, PE

EROSION & SEDIMENT CONTROL

1. THIS PROJECT REQUIRES A PERMIT FOR STORMWATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITY FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT. CONTRACTOR TO COMMENCE WORK ON THIS SITE ONLY AFTER AN ACTIVE PERMIT NUMBER HAS BEEN OBTAINED FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT.
2. THE CONTRACTOR SHALL INSTALL EROSION/SEDIMENTATION CONTROLS PRIOR TO ANY SITE PREPARATION WORK (E.G., CLEARING, GRUBBING, OR EXCAVATION).
3. THE PLACEMENT OF EROSION/SEDIMENTATION CONTROLS SHALL BE IN ACCORDANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN PREPARED FOR THE PROJECT.
4. CONTRACTOR TO ADJUST EROSION CONTROL MEASURES AS NEEDED FOR VARIOUS PHASES OF WORK.
5. CONTRACTOR TO ENSURE THAT NO DIRT AND SEDIMENT IS TRACKED ONTO ADJACENT ROADWAYS AND WATERWAYS.
6. A GROUNDWATER DISCHARGE PERMIT IS REQUIRED FROM THE STATE ENGINEER'S OFFICE, PRIOR TO PUMPING IT OUT.
7. GROUNDWATER SHALL BE SAMPLED AND SENT TO AN APPROVED LABORATORY FOR TESTING PRIOR TO BEING DISCHARGED. TESTING SHALL BE IN ACCORDANCE WITH PERMIT FOR STORMWATER DISCHARGE.
8. APPROVED EROSION AND SEDIMENT CONTROL "BEST MANAGEMENT PRACTICES" (BMPS) SHALL BE MAINTAINED AND KEPT IN GOOD REPAIR FOR THE DURATION OF THIS PROJECT. AT A MINIMUM, THE CONTRACTOR SHALL INSPECT ALL BMPS EVERY 14 DAYS, AND AFTER ALL SIGNIFICANT PRECIPITATION EVENTS I.E. RAINFALL, SNOWMELT. ALL NECESSARY MAINTENANCE AND REPAIR ACTIVITIES SHALL BE COMPLETED WITHIN TWENTY-FOUR (24) HOURS AFTER DIRECTION BY THE INSPECTOR. ACCUMULATED SEDIMENT AND CONSTRUCTION DEBRIS SHALL BE REMOVED WEEKLY FROM ALL BMPS, OR AT ANY TIME THAT SEDIMENT OR CONSTRUCTION DEBRIS ADVERSELY IMPACTS THE FUNCTIONING OF THE BMPS.
9. TOPSOIL SHALL BE STOCKPILED WITHIN LIMITS OF CONSTRUCTION FOR USE ON AREAS TO BE RE-VEGETATED. ANY AND ALL STOCKPILES SHALL BE PLACED IN AN APPROVED LOCATION AND PROTECTED FROM EROSIVE ELEMENTS USING MEASURES SPECIFIED IN THE EROSION CONTROL PLAN.
10. SOILS THAT WILL BE STOCKPILED FOR MORE THAN THIRTY (30) DAYS SHALL BE MULCHED AND SEEDED WITH A TEMPORARY OR PERMANENT GRASS COVER WITHIN FOURTEEN (14) DAYS OF STOCKPILE CONSTRUCTION.
11. ANY SETTLEMENT OR SOIL ACCUMULATIONS BEYOND THE LIMITS OF CONSTRUCTION DUE TO GRADING OR EROSION SHALL BE REPAIRED IMMEDIATELY BY THE CONTRACTOR. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR REMEDIATION OF ANY ADVERSE IMPACTS TO ADJACENT WATERWAYS, WETLANDS, PROPERTIES, ETC. RESULTING FROM WORK DONE AS PART OF THIS PROJECT.
12. A WATER SOURCE MUST BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.
13. THE CONTRACTOR MUST KEEP ALL POLLUTANTS, INCLUDING SEDIMENT, CONSTRUCTION DEBRIS, AND TRENCH BACKFILL MATERIALS FROM ENTERING THE STORM SEWER SYSTEM.
14. ALL SPILLS INCLUDING, BUT NOT LIMITED TO, PETROLEUM PRODUCTS, SOLVENTS, AND CEMENT SHALL BE CLEANED UP IMMEDIATELY. MESA COUNTY ENGINEERING DIVISION SHALL BE NOTIFIED IMMEDIATELY.
15. THE CONTRACTOR SHALL ENSURE THAT ALL LOADS OF CUT AND FILL MATERIAL IMPORTED TO OR EXPORTED FROM THE SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF THE MATERIAL DURING TRANSPORT ON PUBLIC RIGHT-OF-WAY.
16. THE CONTRACTOR SHALL ENSURE THAT ALL MATERIAL EXPORTED FROM THE SITE, IS DISPOSED OF AT A SITE PERMITTED TO ACCEPT SUCH MATERIAL.
17. THE USE OF REBAR, STEEL STAKES OR STEEL FENCE POSTS FOR STAKING DOWN STRAW OR HAY BALES, OR TO SUPPORT SILT FENCING USED AS AN EROSION CONTROL MEASURE, IS PROHIBITED.
18. THE CLEANING OF CONCRETE DELIVERY TRUCK CHUTES IS RESTRICTED TO APPROVED LOCATIONS ON THE JOB SITE. THE DISCHARGE OF WATER CONTAINING WASTE CEMENT TO THE STORM SEWER SYSTEM IS PROHIBITED. ALL CONCRETE WASTE SHALL BE PROPERLY CLEANED UP AND DISPOSED OF AT AN APPROPRIATE LOCATION.
19. PRIOR TO ACTUAL CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING UTILITIES. FOR INFORMATION, CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 811.
20. CONTRACTOR TO FILE "NOTICE OF TERMINATION" WITH CDPHE ONCE PROJECT IS COMPLETE AND ALL DISTURBED AREAS HAVE BEEN STABILIZED INCLUDING TEMPORARY BMPS REMOVED.

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38514
6/28/13

REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

COVER SHEET

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by: AMG
checked by: WEP
approved by: WEP
QA/QC by: WEP
project no.: 012-1372
drawing no.: 01_121372_TTL.dwg
date: 06/28/2013

SHEET
1 of 9

DWG: F:\Projects\012-1372_WTRS\Final_Plans\01_121372_TTL.dwg USER: dfox
DATE: Jun 28, 2013 10:49am XREFS: 121372_TB

NOTES:

1. WATER IMPOUNDMENT PONDS A, C, D, AND F ARE CURRENTLY PENDING COGCC F28 APPROVAL.

2. ONLY WATER IMPOUNDMENT POND 32C IS WITHIN THE SCOPE OF THIS F28 APPLICATION.

N

1" = 300'

0' 150' 300' 600'

SCALE IN FEET

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CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

REV. NO.	DATE	REVISIONS DESCRIPTION
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LOCATION MAP

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by: AMG
checked by: WEP
approved by: WEP
QA/QC by: WEP
project no.: 012-1372
drawing no.: 02_121372_LMAP.dwg
date: 06/28/2013

SHEET
2 of 9

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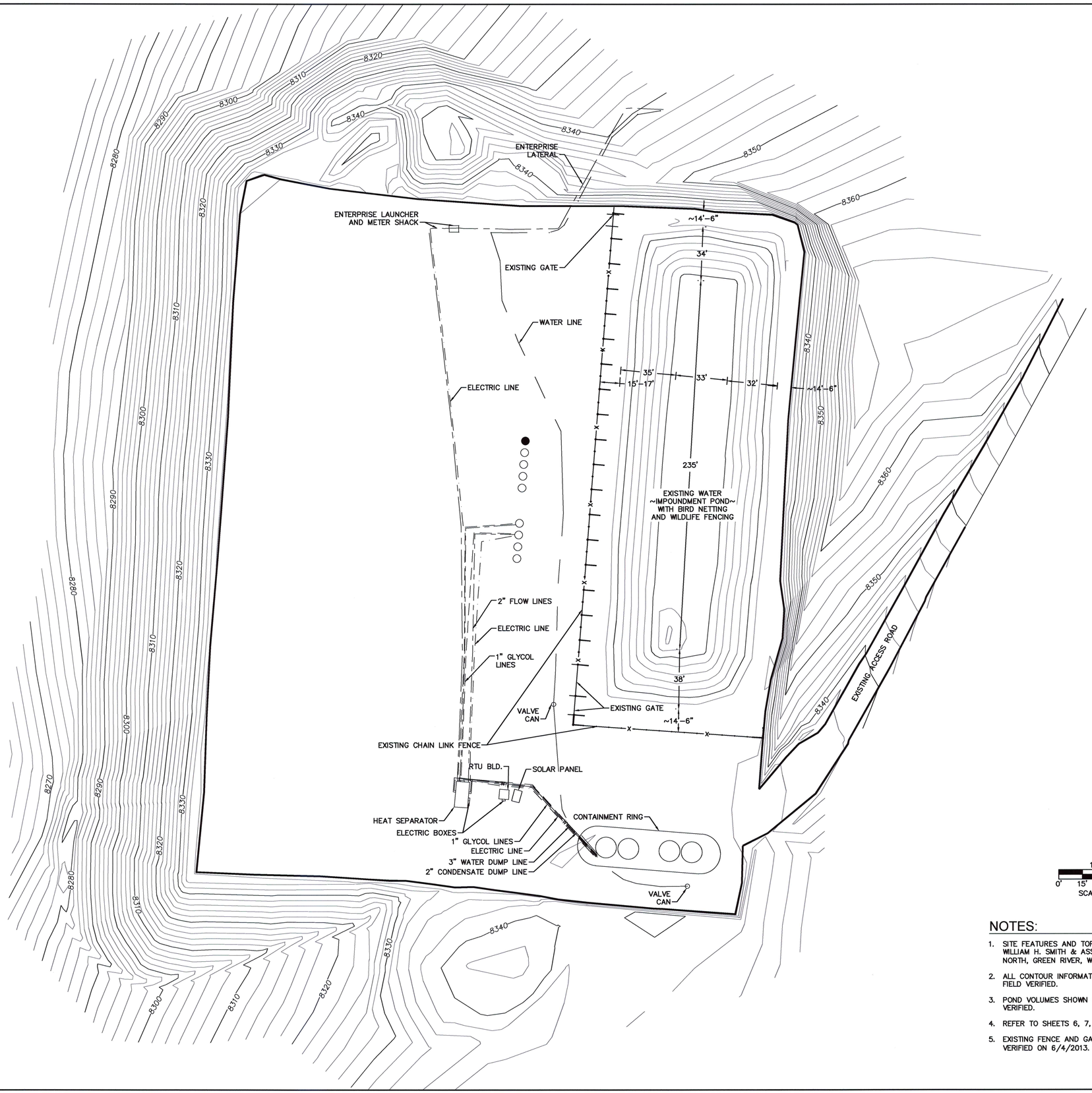

NOTES:

1. SITE FEATURES AND TOPOGRAPHY WAS PROVIDED BY WILLIAM H. SMITH & ASSOCIATES P.C. 550 EAST SECOND NORTH, GREEN RIVER, WY, (307) 875-3638.
2. ALL CONTOUR INFORMATION USED FOR DESIGN SHALL BE FIELD VERIFIED.
3. POND VOLUMES SHOWN ON PLANS SHALL BE FIELD VERIFIED.
4. REFER TO SHEETS 6, 7, AND 8 FOR SITE DETAILS.
5. EXISTING FENCE AND GATE LOCATIONS WERE FIELD VERIFIED ON 6/4/2013.

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REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

SITE PLAN

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by:	AMG
checked by:	WEP
approved by:	WEP
QA/QC by:	WEP
project no.:	012-1372
drawing no.:	03_121372_SIT.dwg
date:	06/28/2013

SHEET
3 of 9

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DATE: Jun 28, 2013 10:33am XREFS: 121372_TB 121372_XBASE

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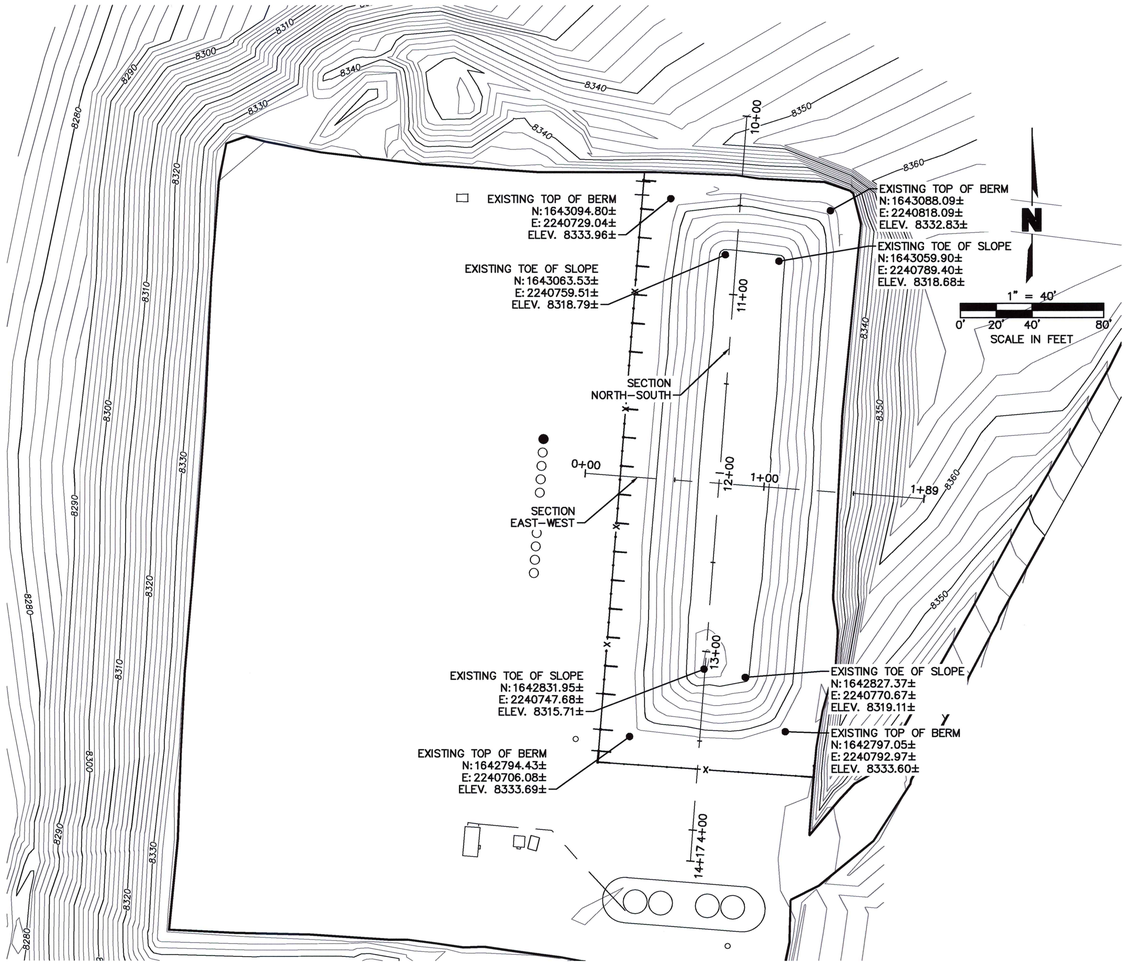
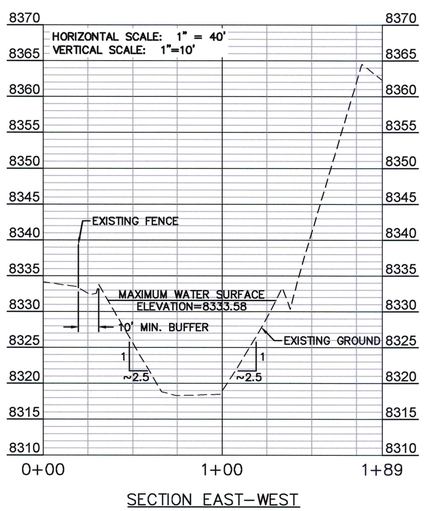
EXISTING WATER IMPOUNDMENT POND STAGE-STORAGE

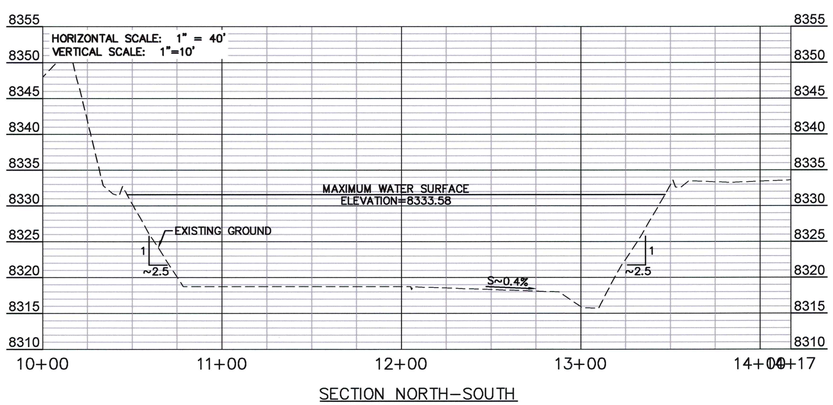
ELEVATION	VOLUME (CF)	VOLUME (BBL)	VOLUME (AF)
8315.68	0	0	0
8316.00	5	1	0.00
8318.00	425	76	0.01
8320.00	10,045	1,789	0.23
8322.00	31,241	5,564	0.72
8324.00	58,081	10,345	1.33
8326.00	90,805	16,173	2.08
8328.00	129,697	23,100	2.98
8330.00	175,005	31,170	4.02
8331.58	215,393	38,363	4.94
8332.00	226,816	40,398	5.21
8333.58	272,380	48,513	6.25

*NOTE: MAXIMUM WATER SURFACE ELEVATION PROVIDING 2' OF FREEBOARD





SECTION EAST-WEST



SECTION NORTH-SOUTH

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REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

GRADING PLAN AND POND SECTIONS

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by: AMG
checked by: WEP
approved by: WEP
QA/QC by: WEP
project no.: 012-1372
drawing no.: 04_121372_PDSEC.dwg
date: 06/28/2013

SHEET 4 of 9

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DATE: Jun 28, 2013 10:54am XREFS: 121372_TB 121372_XBASE

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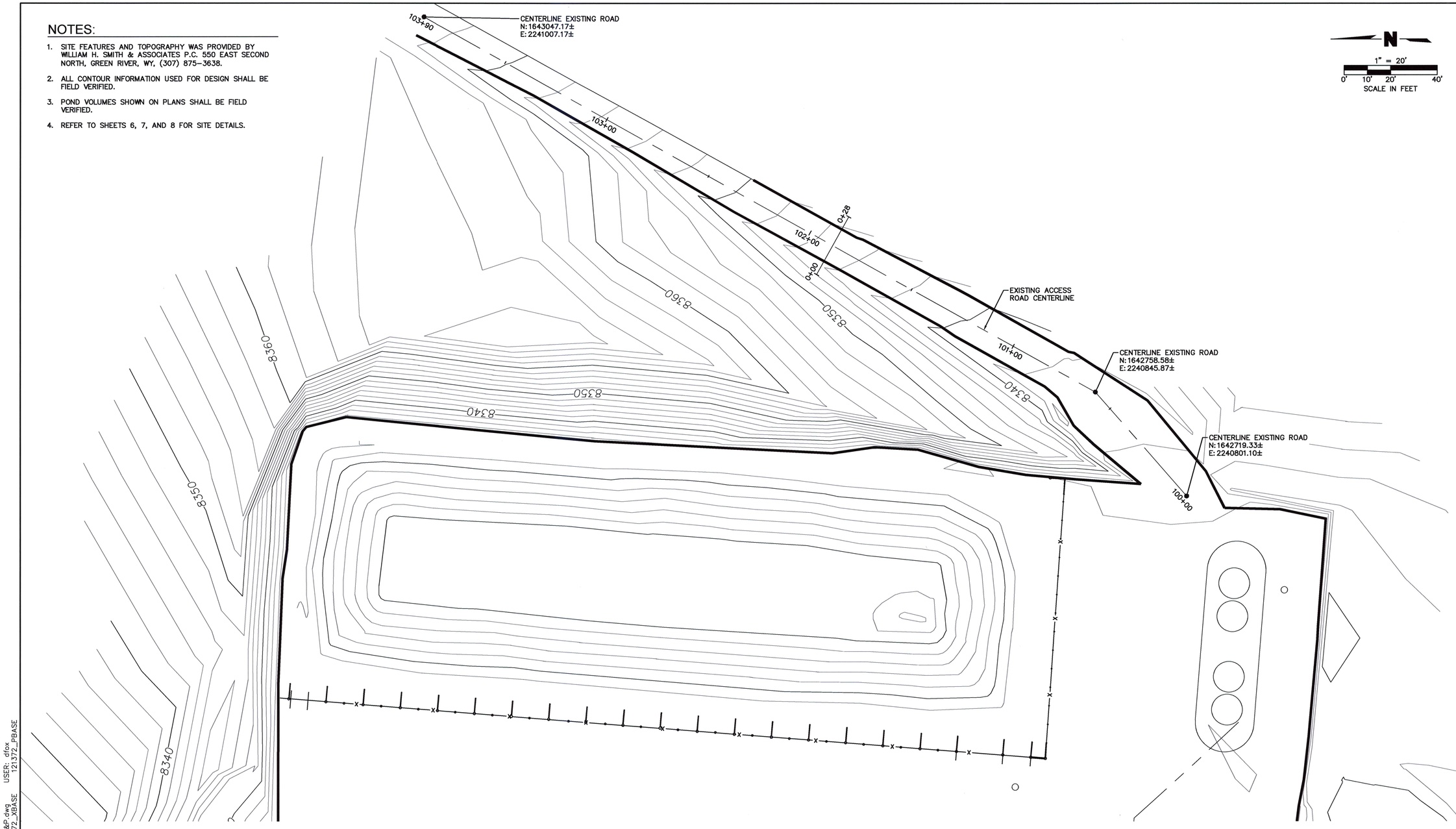

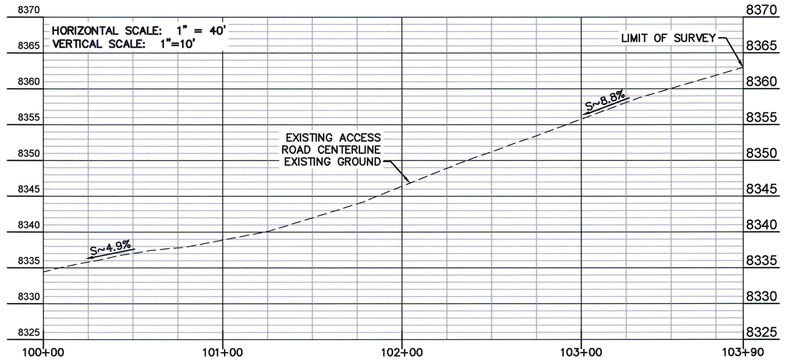

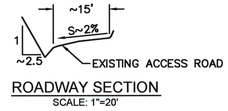

ROADWAY SECTION
SCALE: 1"=20'

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REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

ROADWAY PLAN AND PROFILE

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by:	AMG
checked by:	WEP
approved by:	WEP
QA/QC by:	WEP
project no.:	012-1372
drawing no.:	05_121372_RDP&P.dwg
date:	06/28/2013

SHEET
5 of 9

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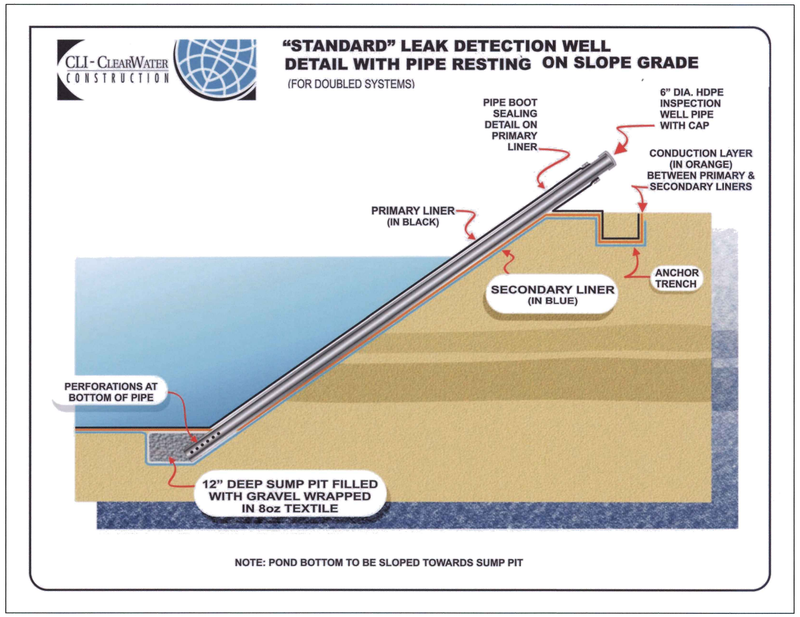
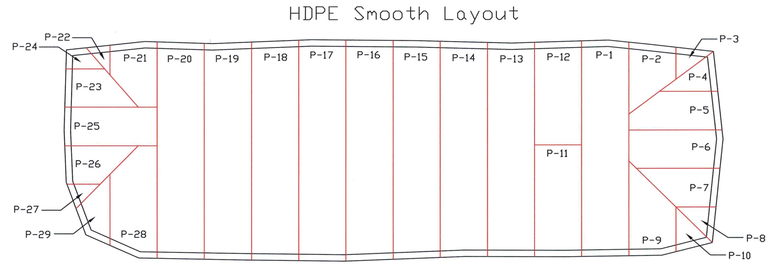
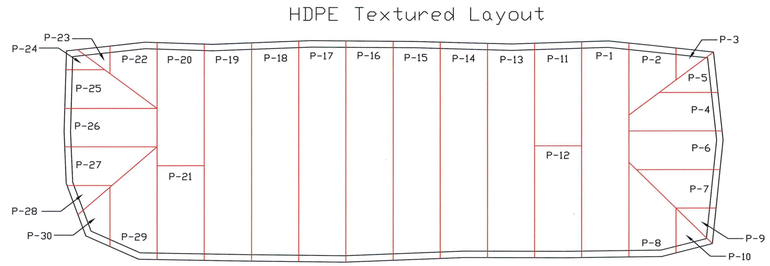


* DETAIL EXTRACTED FROM THE "596-32C TEMPORARY WATER STORAGE POND FORM 15 – EARTHEN PIT PERMIT" DOCUMENT PREPARED BY MARATHON OIL COMPANY ON 08/21/2009.





Notes :

Notes :

	Marathon Oil 596-32C
	60mil HDPE / HDT As-Built
Submitted By: COLORADO LINER INTERNATIONAL	Date: September 10, 2010
	Contractor: Marathon Oil
	Rev: 1
	Scale: None
	Drawn By: bDavis
	Drafting Name: Marathon OR As-Built

EXISTING WATER IMPOUNDMENT POND

EXISTING FENCE AND BIRD NETTING

EXISTING FENCE AND BIRD NETTING

EXISTING LINER

DWG: F:\Projects\012-1372_WTRS\Final_Plans\06_121372_DTL.dwg USER: dfox
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REV. NO.	DATE	REVISIONS DESCRIPTION
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EXISTING SITE DETAILS

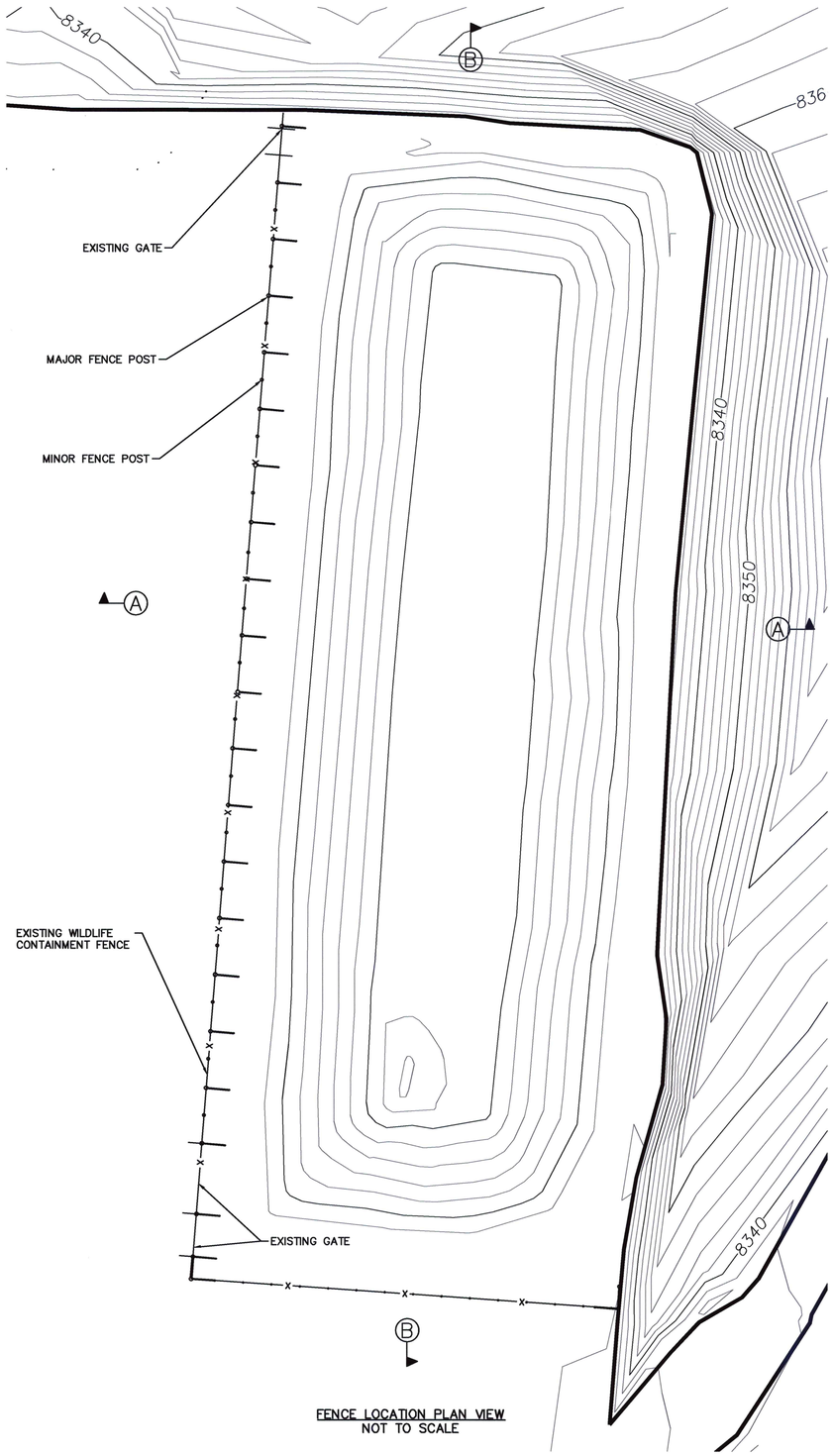
596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

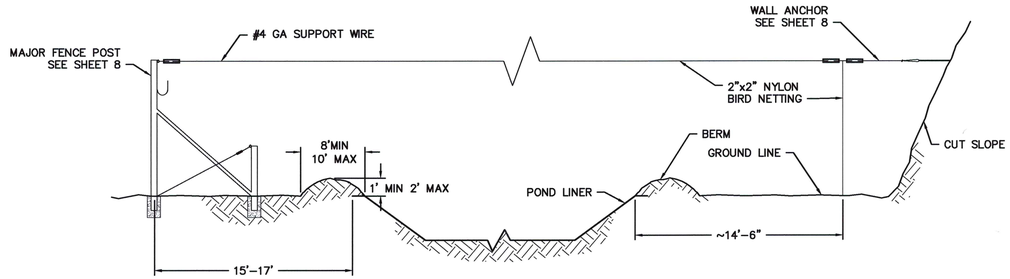
2013

drawn by:	AMG
checked by:	WEP
approved by:	WEP
QA/QC by:	WEP
project no.:	012-1372
drawing no.:	06_121372_DTL.dwg
date:	06/28/2013

SHEET 6 of 9



FENCE LOCATION PLAN VIEW
NOT TO SCALE



SECTION A
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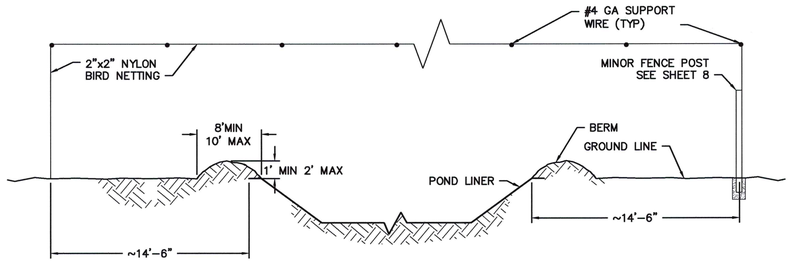

SECTION B
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REVISIONS

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MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

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approved by: WEP
QA/QC by: WEP
project no.: 012-1372
drawing no.: 07_121372_DTL.dwg
date: 06/28/2013

SHEET
7 of 9

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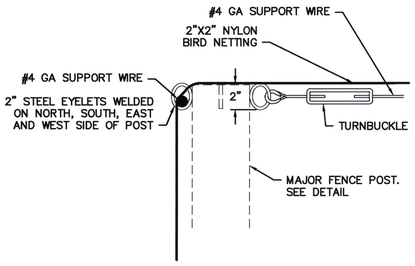
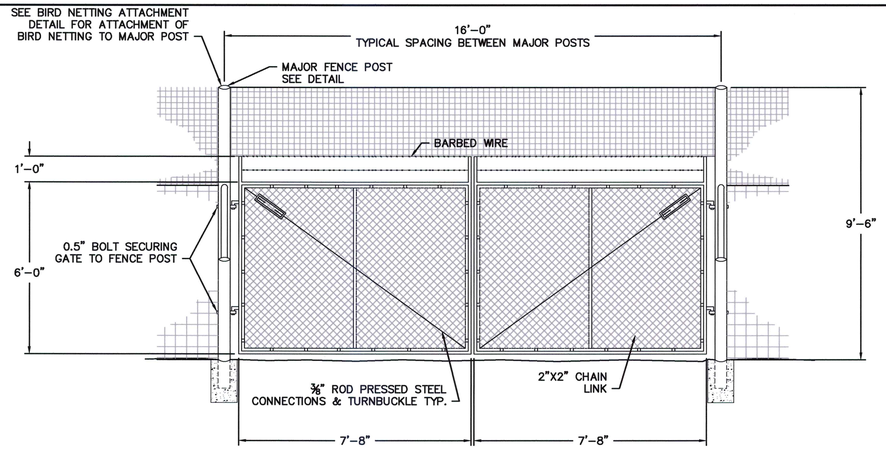
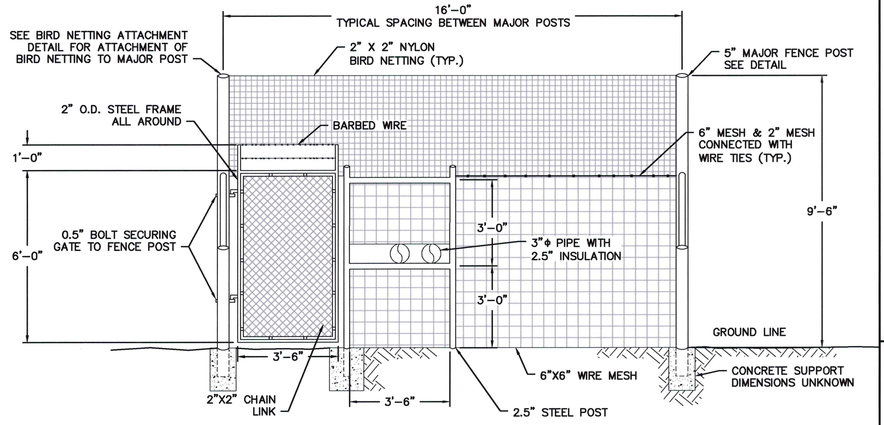


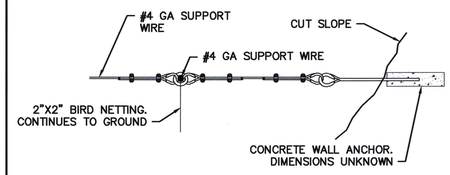
BIRD NETTING ATTACHMENT
NOT TO SCALE



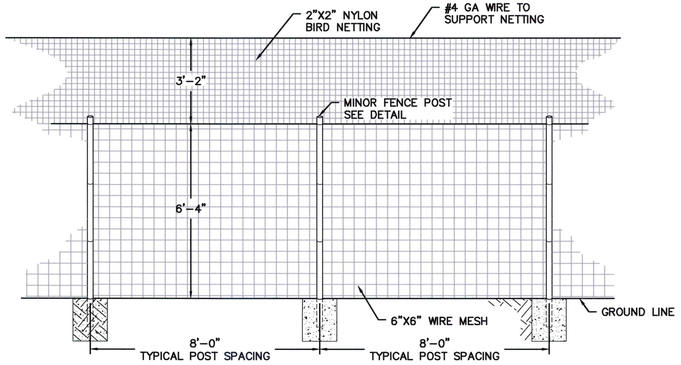
ELEVATION – DOUBLE SWING GATE
NOT TO SCALE



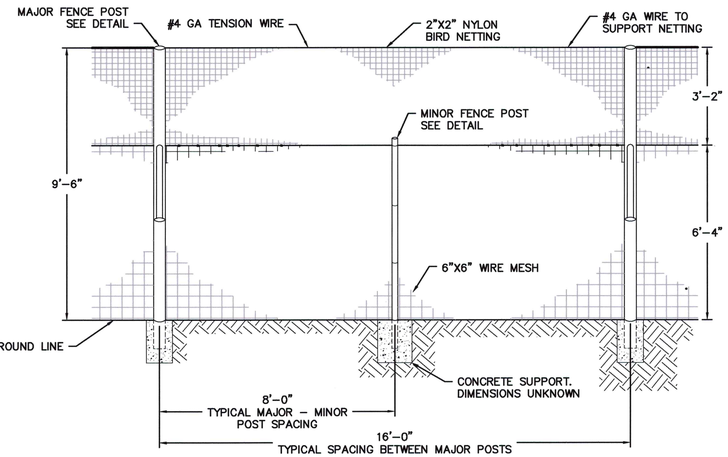
ELEVATION – PERSONAL GATE
NOT TO SCALE



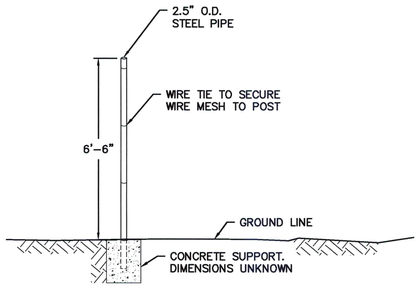
WALL ANCHOR DETAIL
NOT TO SCALE



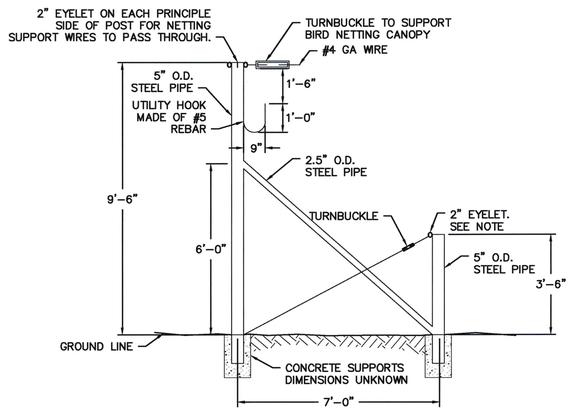
ELEVATION – SOUTH SIDE FENCING
NOT TO SCALE



ELEVATION – WEST SIDE FENCING
NOT TO SCALE



MINOR FENCE POST DETAIL
NOT TO SCALE



MAJOR FENCE POST DETAIL
NOT TO SCALE

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REV NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

EXISTING SITE DETAILS

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by: AMG
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approved by: WEP
QA/QC by: WEP
project no.: 012-1372
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SHEET
8 of 9

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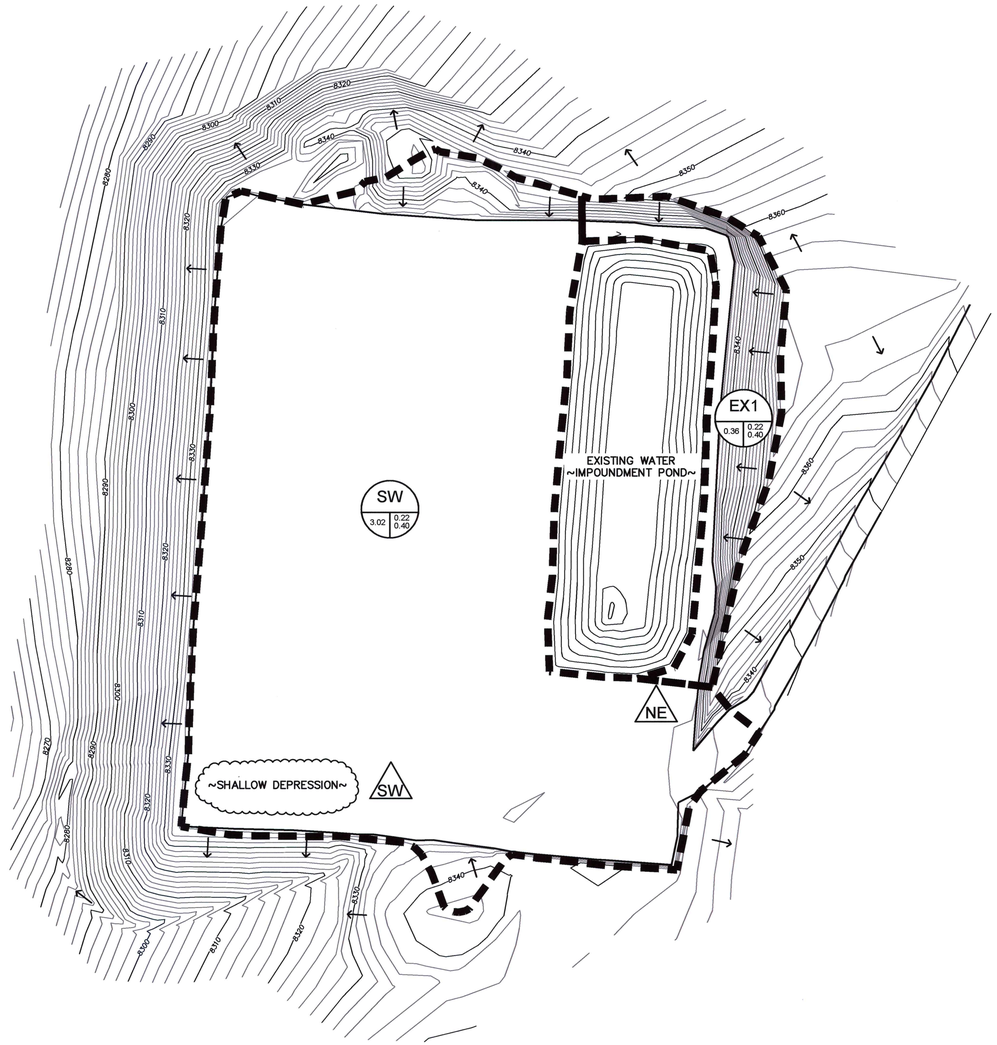
DATE: Jun 28, 2013 10:58am XREFS: 121372_TB



N

1" = 50'

0' 25' 50' 100'

SCALE IN FEET

EXISTING/PROPOSED DRAINAGE CONDITIONS

LEGEND

- BASIN BOUNDARY
- BD — X — Y — BASIN DESIGNATION; 10 YR RUNOFF COEFF.; 100 YR RUNOFF COEFF.; BASIN AREA IN ACRES
- EXISTING MINOR CONTOUR
- 8340 — EXISTING MAJOR CONTOUR
- DRAINAGE FLOW DIRECTION
- NE — DESIGN POINT

NOTES

1. NO BUILDING, STRUCTURE OR FILL WILL BE PLACED IN THE WATER IMPOUNDMENT AREA AND NO CHANGES OR ALTERATIONS AFFECTING THE HYDRAULIC CHARACTERISTICS OF THE WATER IMPOUNDMENT AREA WILL BE MADE WITHOUT THE APPROVAL OF THE COUNTY.
2. MAINTENANCE AND OPERATION OF THE WATER IMPOUNDMENT AREA IS THE RESPONSIBILITY OF THE PROPERTY OWNER. IF OWNER FAILS IN THIS RESPONSIBILITY, THE COUNTY HAS THE RIGHT TO ENTER THE PROPERTY, MAINTAIN THE WATER IMPOUNDMENT AREA, AND BE REIMBURSED FOR COSTS INCURRED.
3. ALL DRAINAGE APPURTENANCES AND BASIN BOUNDARIES SHALL BE VERIFIED. AS-BUILT DRAWINGS SHALL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY FOR ANY STRUCTURE WITHIN THE DEVELOPMENT.
4. PERMISSION TO REPRODUCE THESE PLANS IS HEREBY GIVEN TO GARFIELD COUNTY FOR COUNTY PURPOSES ASSOCIATED WITH PLAN REVIEW, APPROVAL, PERMITTING, INSPECTION AND CONSTRUCTION OF WORK.

EXISTING/PROPOSED DRAINAGE BASIN SUMMARY

DESIGN PT.	BASIN I.D.	AREA (AC)	DISCHARGE 10–YR (CFS)	DISCHARGE 100–YR (CFS)
NE	NE	0.36	0.18	0.33
SW	SW	3.02	1.32	2.40

THE WATER IMPOUNDMENT POND IS SELF CONTAINING AND WILL NOT HAVE AN OUTLET INTO THE EXISTING TERRAIN.

OLSSON ASSOCIATES
760 Horizon Drive, Suite 102
Grand Junction, CO 81506
TEL 970.263.7800
FAX 970.263.7456
www.olssonsulting.com

COLORADO REGISTERED PROFESSIONAL ENGINEER
38514
6/28/13

OLSSON ASSOCIATES ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL OR VERTICAL). THE EXISTING UTILITIES SHOWN ON THIS DRAWING HAVE BEEN PLOTTED FROM THE BEST AVAILABLE INFORMATION. IT IS HOWEVER THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

811 Know what's below. Call before you dig.
CALL 811 SEVENTY-TWO HOURS PRIOR TO DIGGING, GRADING OR EXCAVATING FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

REV. NO.	DATE	REVISIONS DESCRIPTION
		REVISIONS

DRAINAGE SUMMARY

596-32C WATER IMPOUNDMENT
MARATHON OIL COMPANY

GARFIELD COUNTY, COLORADO

2013

drawn by: AMG
checked by: WEP
approved by: WEP
QA/QC by: WEP
project no.: 012-1372
drawing no.: 09_121372_DRNG.dwg
date: 06/28/2013

SHEET 9 of 9

DWG: F:\Projects\012-1372_WTRS\Final_Plans\09_121372_DRNG.dwg USER: dfox
DATE: Jun 28, 2013 10:59am XREFS: 121372_TB PAD 596-32C FLOWLINE DIAGRAM (ASBUILT RECLAIMED UPDATE)

COLORADO LINING
INTERNATIONAL

Installation Reports

for

Marathon 596-32C

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/26/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We went to the safety meeting. Then we went out and filled some sand bags and moved some rolls around.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/27/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed about 4 rolls of Geocomposite before it started raining. Spent about 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/28/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/28/10	1:30	85	800		11.0	130/133		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	128/129		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	128/137		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/	154	R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/	155	R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	128/124		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	131/115		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	129/130		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	/	158	J.L	1630	Pass
7/28/10	1:30	85	800		11.0	/	160	J.L	1630	Pass
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed about 8 rolls of Geocomposite and one roll of HDPE. Spent 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/29/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** _____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/29/10	9:25		800		10.5	123/127		J.L	1630	Pass
7/29/10	9:25		800		10.5	127/119		J.L	1630	Pass
7/29/10	9:25		800		10.5	112/128		J.L	1630	Pass
7/29/10	9:25		800		10.5	/	159	J.L	1630	Pass
7/29/10	9:25		800		10.5	/	158	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	Raining		

Comments: We headed toward the site but the road was down. It took about 2 hours before we got to the job site because of the rain from the day before. We didn't get all the liner in because it was raining on and off all day. Spent 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/30/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** ____x____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/30/10	8:00	70	475	425		88/		B.V	1606	Pass
7/30/10	8:00	70	475	425		/85		B.V	1606	Pass
7/30/10	8:00	70	475	425		89/		B.V	1606	Pass
7/30/10	8:00	70	475	425		/	145	B.V	1606	Pass
7/30/10	8:00	70	475	425		/	142	B.V	1606	Pass
7/30/10	8:10	70	800		10	135/130		J.L	1630	Pass
7/30/10	8:10	70	800		10	127/131		J.L	1630	Pass
7/30/10	8:10	70	800		10	131/129		J.L	1630	Pass
7/30/10	8:10	70	800		10	/	180	J.L	1630	Pass
7/30/10	8:10	70	800		10	/	184	J.L	1630	Pass
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed the rest of the liner. We started to test and patch all the seams. Spent ½ an hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/31/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ___x___ **Extrusion Weld** ___x___

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/31/10	8:00	70	800		10	127/133		J.L	1630	Pass
7/31/10	8:00	70	800		10	138/125		J.L	1630	Pass
7/31/10	8:00	70	800		10	131/139		J.L	1630	Pass
7/31/10	8:00	70	800		10	/	169	J.L	1630	Pass
7/31/10	8:00	70	800		10	/	159	J.L	1630	Pass
						./				
7/31/10	8;00	70	475	425		102/		R.C	1606	Pass
7/31/10	8;00	70	475	425		102/		R.C	1606	Pass
7/31/10	8;00	70	475	425		/97		R.C	1606	Pass
7/31/10	8;00	70	475	425		/	165	R.C	1606	Pass
7/31/10	8;00	70	475	425		/	171	R.C	1606	Pass
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We completed the testing and patching and installed all of the net. Monday we will start on the HDT.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/2/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _x___**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/2/10	8:00		850		9.5	129/133		J.L	1630	Pass
8/2/10	8:00		850		9.5	138/125		J.L	1630	Pass
8/2/10	8:00		850		9.5	131/139		J.L	1630	Pass
8/2/10	8:00		850		9.5	/	169	J.L	1630	Pass
8/2/10	8:00		850		9.5	/	159	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed the 2 pipes and filled in the sump. Then we installed about 2 rolls before it started to rain.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/3/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/3/10	8:30		850		9.0	140/132		J.L	1630	Pass
8/3/10	8:30		850		9.0	138/134		J.L	1630	Pass
8/3/10	8:30		850		9.0	135/138		J.L	1630	Pass
8/3/10	8:30		850		9.0	/	170	J.L	1630	Pass
8/3/10	8:30		850		9.0	/	165	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We arrived on site and had to pump water. Then we installed all of the HDT .

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/4/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld __x__**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/4/10	8:00		450	425		106/		J.C	1606	Pass
8/4/10	8:00		450	425		/110		J.C	1606	Pass
8/4/10	8:00		450	425		108/		J.C	1606	Pass
8/4/10	8:00		450	425		/	126	J.C	1606	Pass
8/4/10	8:00		450	425		/	128	J.C	1606	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We started testing and patching. We got all of the air testing done but only completed the floor patching because it started to rain.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/5/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/5/10	8:00		450	425		132/		J.L	1606	Pass
8/5/10	8:00		450	425		134/		J.L	1606	Pass
8/5/10	8:00		450	425		131/		J.L	1606	Pass
8/5/10	8:00		450	425		/	152	J.L	1606	Pass
8/5/10	8:00		450	425		/	155	J.L	1606	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We completed all of the patching and got the 2 pipe boots done.

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
7/30/10	2:00	2:05	1	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:00	2:05	2	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	3	44'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:00	2:05	4	60'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	5	44'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	6	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:30	2:35	7	20'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:35	2:40	8	56'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:42	2:47	9	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:42	2:47	10	22'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:00	3:05	11	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:10	3:15	12	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:25	3:30	13	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:25	3:30	14	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:32	3:37	15	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:46	3:51	16	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:50	3:55	17	126'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:15	4:20	18	124'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:25	4:30	19	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:35	4:40	20	22'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:40	4:45	21	125'	X				Pass	Jaime L	1630	10.5	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
7/30/10	4:50	4:55	22	54'	X				Pass	Jaime L	1630	10	800
7/30/10	4:50	4:55	23	39'	X				Pass	Jaime L	1630	10	800
7/30/10	5:00	5:05	24	25'	X				Pass	Jaime L	1630	10	800
7/30/10	5:00	5:05	25	79'	X				Pass	Jaime L	1630	10	800
7/30/10	5:10	5:15	26	58'	X				Pass	Jaime L	1630	10	800
7/30/10	5:12	5:17	27	56'	X				Pass	Jaime L	1630	10	800
7/30/10	5:20	5:25	28	22'	X				Pass	Jaime L	1630	10	800
7/30/10	5:20	5:25	29	41'	X				Pass	Jaime L	1630	10	800
7/30/10	5:25	5:30	30	74'	X				Pass	Jaime L	1630	10	800
7/31/10			31t						pass	Jaime L	1630	10	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

CLI / CLEARWATER
1062 Singing Hills Road Parker, Colorado 80138 / 1-800-524-8672 / 303-841-2022 / Fax 303-841-5780 / www.coloradolining.com

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
8/4/10	8:10	8:15	1	24'	X				Pass	Jaime L	1630	7	850
8/4/10	8:10	8:15	2	34'	X				Pass	Jaime L	1630	7	850
8/4/10	8:10	8:15	3	48'	X				Pass	Jaime L	1630	7	850
8/4/10	8:20	8:25	4	48'	X				Pass	Jaime L	1630	7	850
8/4/10	8:22	8:27	5	46'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	6	17'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	7	20'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	8	62'	X				Pass	Jaime L	1630	7	850
8/4/10	9:12	9:17	9	63'	X				Pass	Jaime L	1630	7	850
8/4/10	9:05	9:10	10	117'	X				Pass	Jaime L	1630	7	850
8/4/10	9:45	9:50	11	22'	X				Pass	Jaime L	1630	7	850
8/4/10	10:00	10:05	12	118'	X				Pass	Jaime L	1630	7	850
8/4/10	10:00	10:05	13	120'	X				Pass	Jaime L	1630	7	850
8/4/10	10:25	10:30	14	120'	X				Pass	Jaime L	1630	7	850
8/4/10	10:35	10:45	15	120'	X				Pass	Jaime L	1630	7	850
8/4/10	11:00	11:05	16	122'	X				Pass	Jaime L	1630	7	850
8/4/10	11:15	11:20	17	122'	X				Pass	Jaime L	1630	7	850
8/4/10	11:30	11:35	18	125'	X				Pass	Jaime L	1630	7	850
8/4/10	11:45	11:50	19	125'	X				Pass	Jaime L	1630	7	850
8/4/10	11:45	11:50	20	125'	X				Pass	Jaime L	1630	7	850
8/4/10	12:00	12:05	21	40'	X				Pass	Jaime L	1630	7	850

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
8/4/10	12:05	12:10	22	26'	X				Pass	Jaime L	1630	7	850
8/4/10	12:05	12:10	23	54'	X				Pass	Jaime L	1630	7	850
8/4/10	12:10	12:35	24	63'	X				Pass	Jaime L	1630	7	850
8/4/10	12:30	12:35	25	45'	X				Pass	Jaime L	1630	7	850
8/4/10	12:30	12:35	26	38'	X				Pass	Jaime L	1630	7	850
8/4/10	12:35	12:40	27	69'	X				Pass	Jaime L	1630	7	850
8/4/10	12:40	12:45	28	66'	X				Pass	Jaime L	1630	7	850
8/5/10	8:00	8:05	29	125'	X				Pass	Jaime L	1630	7	850

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

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1062 Singing Hills Road Parker, Colorado 80138 / 1-800-524-8672 / 303-841-2022 / Fax 303-841-5780 / www.coloradolining.com

COLORADO LINING INTERNATIONAL

Field Seam Destructive Test

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 Mil HDPE

Destruct No.	Date of Test	Welder No.	Welder Temp.	Welder Speed	Seam No.	Time of Test	Welder's Name	Peel Value Inside/Outside	Sheer Value	(Pass/Fail)
1	7/31/10	1630	800	10	13	1:00	Jaime L	104/122	157	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	110/120	156	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	110/119	146	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	112/123	158	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	109/120	142	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	114/118	148	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	119/115	145	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	114/112	152	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	112/111	155	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	120/111	154	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	119/120	152	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	115/116	154	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	115/121	155	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	118/120	152	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	11/6/118	158	Pass

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COLORADO LINING INTERNATIONAL

Field Seam Destructive Test

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 Mil HDPET

Destruct No.	Date of Test	Welder No.	Welder Temp.	Welder Speed	Seam No.	Time of Test	Welder's Name	Peel Value Inside/Outside	Sheer Value	(Pass/Fail)
1	8/4/10	1630	850	7	10	10:00	Jaime L	135/132	141	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	138/131	145	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	136/134	146	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	132/138	147	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	133/134	143	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	142/138	150	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	138/140	151	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	136/142	153	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	138/141	154	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	137/139	152	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	130/133	138	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	134/131	140	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	130/134	135	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	129/133	138	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	132/134	139	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	130/139	145	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	140/129	149	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	137/128	152	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	138/132	150	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	130/137	150	Pass

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COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPE**

Panel No.	Roll Number	Date	Material Type	Width	Length
1	Client provided material	7/28/2010	60 Mil HDPE	22'	126'
2	"	7/28/2010	60 Mil HDPE	22'	44'
3	"	7/28/2010	60 Mil HDPE	22'	24'
4	"	7/28/2010	60 Mil HDPE	22'	44'
5	"	7/28/2010	60 Mil HDPE	22'	24'
6	"	7/28/2010	60 Mil HDPE	22'	44'
7	"	7/28/2010	60 Mil HDPE	22'	44'
8	"	7/28/2010	60 Mil HDPE	22'	41'
9	"	7/28/2010	60 Mil HDPE	22'	24'
10	"	7/28/2010	60 Mil HDPE	22'	20'
11	"	7/29/2010	60 Mil HDPE	22'	49'
12	"	7/29/2010	60 Mil HDPE	22'	78'
13	"	7/29/2010	60 Mil HDPE	22'	126'
14	"	7/29/2010	60 Mil HDPE	22'	126'
15	"	7/29/2010	60 Mil HDPE	22'	126'
16	"	7/29/2010	60 Mil HDPE	22'	126'
17	"	7/29/2010	60 Mil HDPE	22'	126'
18	"	7/29/2010	60 Mil HDPE	22'	126'
19	"	7/29/2010	60 Mil HDPE	22'	126'
20	"	7/30/2010	60 Mil HDPE	22'	78'
21	"	7/30/2010	60 Mil HDPE	22'	49'
22	"	7/30/2010	60 Mil HDPE	22'	54'
23	"	7/30/2010	60 Mil HDPE	22'	39'
24	"	7/30/2010	60 Mil HDPE	22'	25'
25	"	7/30/2010	60 Mil HDPE	22'	58'

COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPET**

Panel No.	Roll Number	Date	Material Type	Width	Length
1	104143108	8/2/10	60 Mil HDPET	22	118'
2	104143108	8/2/10	60 Mil HDPET	22	48'
3	104143108	8/2/10	60 Mil HDPET	22	24'
4	104143108	8/2/10	60 Mil HDPET	22	34'
5	104143108	8/2/10	60 Mil HDPET	22	48'
6	104143108	8/2/10	60 Mil HDPET	22	49'
7	104143108	8/2/10	60 Mil HDPET	22	47'
8	104143108	8/2/10	60 Mil HDPET	22	17'
9	104143108	8/2/10	60 Mil HDPET	22	38'
10	104143108	8/2/10	60 Mil HDPET	22	20'
11	104143108	8/2/10	60 Mil HDPET	22	69'
12	103176821	8/2/10	60 Mil HDPET	22	48'
13	103176821	8/3/10	60 Mil HDPET	22	123'
14	103176821	8/3/10	60 Mil HDPET	22	123'
15	103176821	8/3/10	60 Mil HDPET	22	124'
16	103176821	8/3/10	60 Mil HDPET	22	125'
17	108151138	8/3/10	60 Mil HDPET	22	126'
18	108151138	8/3/10	60 Mil HDPET	22	126'
19	108151138	8/3/10	60 Mil HDPET	22	127'
20	108151138	8/3/10	60 Mil HDPET	22	127'
21	104143105	8/3/10	60 Mil HDPET	22	53'
22	104143105	8/3/10	60 Mil HDPET	22	40'
23	104143105	8/3/10	60 Mil HDPET	22	55'
24	104143105	8/3/10	60 Mil HDPET	22	27'
25	104143105	8/3/10	60 Mil HDPET	22	65'

COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPET**

Panel No.	Roll Number	Date	Material Type	Width	Length
26	104143105	8/3/10	60 Mil HDPET	22'	45'
27	104143105	8/3/10	60 Mil HDPET	22'	25'
28	104143105	8/3/10	60 Mil HDPET	22'	51'
29	104143105	8/3/10	60 Mil HDPET	22'	38'

COLORADO LINING INTERNATIONAL

Sub grade Acceptance

Date:_____

Project:	**Marathon 596-32C**
Owner:	**Marathon Oil**
Engineer:	
Contractor:	**Marathon Oil**
Installation Supervisor:	**Mark Lucero**
Material:	**60 mil HDPE**

Is surface acceptable for placement of geomembranes? Yes X No___

Comments _____

_____

Date: 8-5-10

Accepted By Representative of Owner/Owner (Signature) Gary Starks

I certify that I am a representative with the authority to provide this acceptance and recognize that if this is not a true statement that I will be held personally responsible for the integrity of the inspection.

Print Name/Title: Moc. rep Gary Starks

Company: _____

Witnessed By Representative of CLC (Signature) _____

Print Name/Title Mark Lucero

This document only applies to the acceptability of the surface conditions for the installation of the geosynthetic products. Colorado Lining Construction (CLC) does not accept responsibility for anchor trench elevation or design, elevation points for construction, sub-grade compaction, moisture content of neither the sub-grade nor the surface maintenance during deployment. The structural integrity of the sub-grade and maintenance of these conditions are the responsibility of the owner, engineer or contractor. Furthermore, any incidental damage to the liner or seams (e.g. groundwater, gases, cover soil placement and sub-grade movement) during or after the installation is not covered by any warranty expressed or implied and the design, engineering and construction are the responsibility of the owner, engineer and/or contractor.

CORPORATE OFFICE
1062 Singing Hills Road Parker, Colorado 80138 800 524 8672 303 841 2022 Fax 303 841 5780 www.coloradolining.com

COLORADO LINING INTERNATIONAL

Geomembrane Installation Approval

Project:	**Marathon 596-32C**
Owner:	**Marathon Oil**
Engineer:	
Contractor:	**Marathon Oil**
Supervisor:	**Mark Lucero**
Material:	**60 mil HDPE**

The Geomembrane on this project has been installed, inspected and tested in accordance with Industry Standards and Manufacturer recommendations.

Date: 8-5-10

Accepted By: (Signature) Gary Starks

Print Name/Title: Mgr. Rep. Gary Starks

Company: _____

Comments: _____

_____

_____

All warranties to begin on the date of completion.
Warranties to be issued upon receipt of final payment

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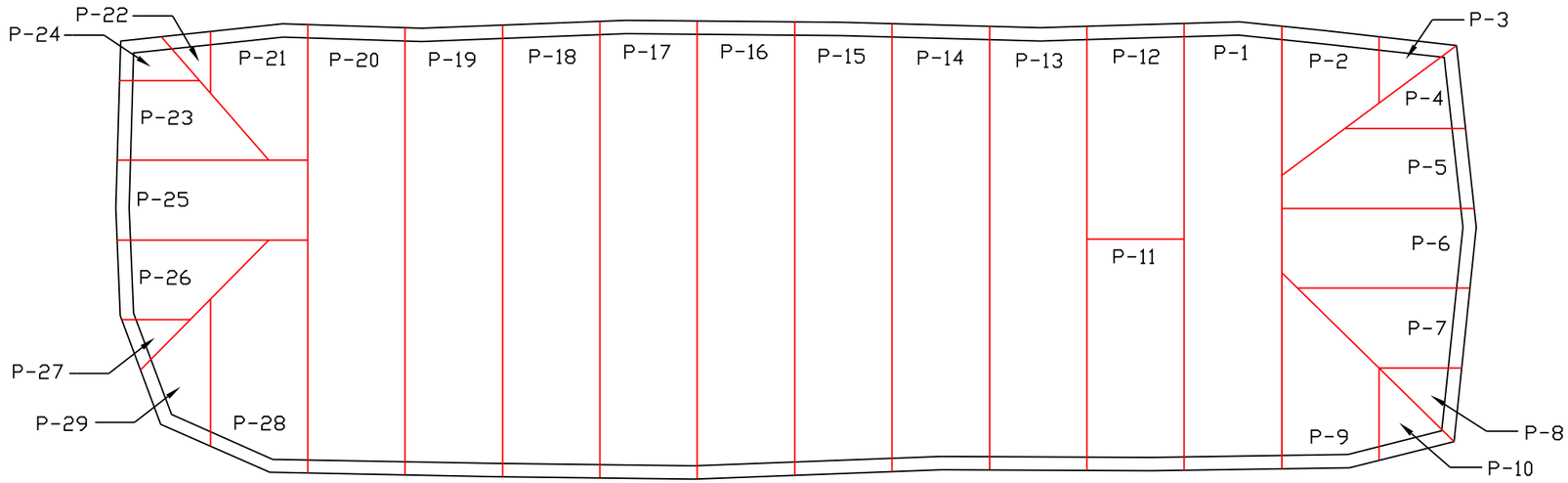
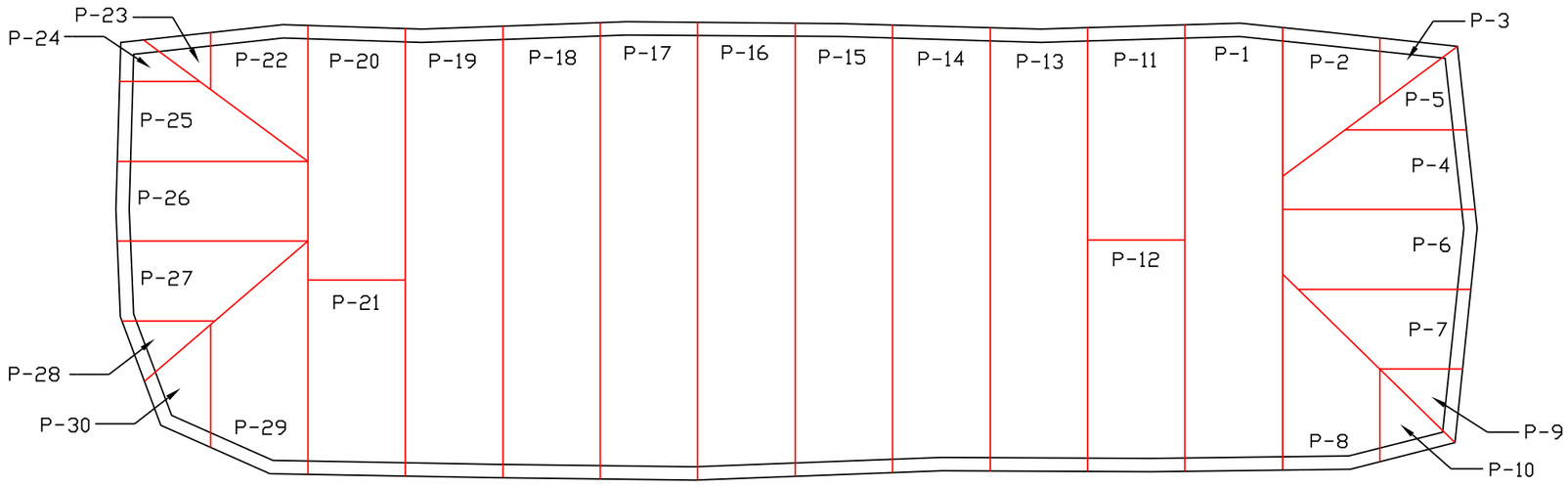
HDPE Smooth Layout



HDPE Textured Layout



Notes :

COLORADO LINING INTERNATIONAL	Marathon Oil 596-32C 60mil HDPE / HDT As-Built
Submitted By: COLORADO LINING INTERNATIONAL	DATE: September 10, 2010 · Contractor: Marathon Oil · REV 1
Scale:	Drawn By: Y.Davis · Drawing Name: Marathon Oil As-Built

Attachment E
Colorado Department of Parks and Wildlife Consultation

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

Marathon Oil Company
743 Horizon Court
Suite 220
Grand Junction, CO 81506

Colorado Parks and Wildlife
711 Independent Avenue
Grand Junction, CO 81505

Re: 596-32C Pit, Application for COGCC Form 28

June 11, 2013

Dear Mr. Warren:

As discussed in our March 15, 2013 meeting, Marathon is in the process of preparing to submit an application for a Form 28 Centralized E&P Waste Facility permit through the Colorado Oil and Gas Conservation Commission and a Limited impact Review through Garfield County. As part of this process, Marathon would like to document the wildlife protections surrounding the facility discussed during the March 15th meeting, and seeks CPW acknowledgement and agreement to our controls currently in place.

The 596-32C Pit includes wildlife protection features such as:

- Wildlife fencing surrounding the pond,
- Bird netting covering the top of the pond,
- Passing all water through a gun-barrel separator prior to entering the pit,
- Pond level and leak detection systems monitored daily through SCADA, with automated call-out alarms to alert operators of potential system upsets,
- And a monthly inspection program to confirm system is operating as designed.

Field wide wildlife protection measures include:

- A wildlife mitigation plan which encompasses all major and critical wildlife species known in the area, and includes:
    - Development plans, avoidance measures, and occupancy restrictions that minimize impacts to local wildlife
    - Periodic raptor surveys
    - Annual invasive / non-native weed controls
    - Periodic land cover / vegetation analysis
- Voluntary surface water sampling program incorporating all areas surrounding existing pits.

Sincerely,

Zach Toellner
HES Professional

CPW Representative Acknowledgement: _____ Date:_____

From:	Romatzke, JT
To:	Jeff Hofman
Cc:	Warren, Michael; Craig Richardson; mrvelasquez@marathonoil.com
Subject:	RE: Marathon 32C DPW consultation
Date:	Friday, September 28, 2012 11:12:33 AM

Thanks Jeff. Michael Warren and I will work on getting a meeting together with Marathon. Melissa, if you can help that would be great. It appears that a quick overview of the Wildlife Mitigation Plan and Marathons development plans would suffice for this. I assume that after a discussion and quick update to the WMP would be best.

JT

From: Jeff Hofman [mailto:jhofman@olssonassociates.com]
Sent: Friday, September 28, 2012 9:56 AM
To: Romatzke, JT
Cc: Warren, Michael; Craig Richardson; mrvelasquez@marathonoil.com
Subject: Marathon 32C DPW consultation

J.T.

Thank you for taking the time to meet with me today regarding the Marathon 32C Water Impoundment Facility located in Garfield County. As I explained during the meeting this is an existing temporary produced water impoundment originally permitted with a State COGCC form 15. This permit is for good for 3 years and now Marathon wishes to make the facility permanent by using a form 28 process. This process requires a consultation with the CPW prior to application. An additional application to Garfield County for a Limit Impact Review (LIR) will follow shortly after the COGCC application.

The current impoundment was constructed with a wildlife fence and netting and these features will remain in place. Please refer to the photos and plans that were provided during our meeting for additional details.

The Marathon Oil contact for this project is:

Melissa Velasquez
mrvelasquez@marathonoil.com
970.245.5233

Thanks again,

Jeff Hofman, AICP | Olsson Associates
826 21½ Road | Grand Junction, CO 81505 | jhofman@olssonassociates.com
TEL 970.263.7800 | FAX 970.263.7456

Attachment F
Operating Plan and Checklists

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

Marathon Oil Company
Proposed 596-32C Centralized E&P Waste Facility

Operating and Maintenance Plan

COGCC Rules Series 908(8)
CDPHE Permit No. 09GA0337

A. Scope and Introduction

Marathon's proposed 596-32C Centralized E&P Waste Facility has been constructed for the purpose of providing a centralized collection facility of produced water from the production pads in the Piceance field, and assists the operation in managing produced water onsite. In operating this centralized E&P Waste Facility, Marathon's objective is to minimize the need for off-site disposal, and therefore water hauling by tanker truck, particularly in time periods where weather conditions make road and driving conditions challenging.

The proposed 596-32C Centralized E&P Waste Facility (32C Pit) is composed of a water impoundment supported by separation equipment and associated tanks, a metered pit inlet, and various pieces of supporting and transfer equipment. Currently, the facility is being used primarily as a storage facility to meet the needs outlined above. Several methods of disposal are available or may be considered in the future, including mechanical and thermal evaporation, beneficial reuse, and water treatment technologies that would provide for additional evaporation or discharge, pending approved permits. The water would mostly be used for completions activities when Marathon undertakes significant drilling in the area.

B. Method of Treatment and Loading Rates

Prior to transport of produced water to the 32C Pit from production locations, residual condensate will be allowed to separate and removed from the produced water via a 3-phase (water, condensate, and gas) separation unit on individual well pads. After this initial separation is complete, water is stored within above ground storage tanks onsite, and then transported to the 596-32C pad via pipeline. Pipeline transport allows Marathon to reduce the operational risk and traffic concerns caused by truck transport. Water may still be transported to the pit by truck on a limited basis, but must enter the facility through the gun barrel separator. Prior to entering the pit, all water will pass through a gun barrel separator that serves as the required Reasonably Available Control Technology (RACT).

C. Dust Control

Current dust control measures in use throughout Marathon's operations have been extended to this site and its access roads. The primary dust control method is the application of water to the roads accessing the facility as needed to control dust, which is contingent on traffic volume and weather patterns. Our most effective means of dust control is to utilize existing water infrastructure to pump produced water to the 32C Pit, in an effort to minimize truck traffic.

D. Sampling

This site is currently operating under a CDPHE Construction Permit, and a site sampling plan and emissions tracking is in place to comply with this permit. Water samples are taken from the pit inlet (gun barrel separator outlet) on a monthly basis. Samples are collected no less than 7 days apart. These samples are analyzed using EPA Method 8260 and EPA Method 8015, as required by the CDPHE.

E. Inspection and Maintenance

During normal operations, monthly inspections will be performed by a Marathon Operator or Designated Representative. These inspections will include the activities outlined on the attached "Monthly Checklist." Adherence to the listed criteria will include visual inspection of the facilities, assessment of water impoundment levels, recording meter values, visual inspection of storm water best management practices, leak detection system inspection, and performance of general housekeeping activities. The operator will ensure all equipment is in proper working order and that the inspection is properly documented. If there are any irregularities noted during inspection, a supervisor will be notified and (if required) an appropriate response plan will be coordinated to resolve the irregularities.

F. Emergency Response Plan

A copy of Marathon's Emergency Response Plan will be provided to applicable Agencies on request, and will be included in permit submissions as appropriate. Marathon will adhere to all representations within the attached plan.

G. Recordkeeping

As stated above, typical operation of the 32C Pit will include pumping produced water to the facility for storage and from the facility for reuse, treatment, or disposal. It will be the responsibility of the operator to manage daily inputs and outputs for the facility. Regarding reuse for drilling and completions, the operator will be in daily communication with production, drilling, and completions staff to track the produced water volumes entering the facility and volumes pumped to Marathon's production and future drilling locations. Based on these observations, Marathon's staff will determine if operational adjustments are required. All 32C Pit operations will fall under the responsibilities of Marathon's production operations group or delegate.

Monthly inspections will be completed onsite, signed by the responsible operator, and filed at Marathon's Parachute, CO field office. Alternatively, these documents may be scanned and filed electronically for ease of access.

To satisfy CDPHE permit requirements, records will be maintained that document the volume of water pumped into the 32C Pit and adjacent Pond Complex. These records will consist of pumping logs completed by pump operators and records of monthly influx to the pits by the previously installed inlet

water flowmeter. Any water trucked to the location will also be accounted for, and trucking tickets will be maintained electronically or at the Grand Junction office.

Monthly water sampling is currently being conducted at the Gun Barrel Outlet / Pit Inlet. These sample records are maintained electronically and are available for inspection when requested.

Water samples are used to calculate pit emissions on a mass flow basis. An associated spreadsheet has been created to maintain emissions data and pit throughput. The spreadsheet also summarizes all data entered, and tracks progress towards annual emissions limitations as defined by the CDPHE Construction Permit.

H. Site Security

Access to the proposed site is via Garden Gulch Road. Garden Gulch Road is a private road with a manned checkpoint near the road entrance. The proposed site is not accessible to the general public.

All gates providing access to the 32C Pit will remain locked and will only be accessible by Marathon personnel. Any contractors requiring access to the facility will require a Marathon escort for access.

I. Hours of Operation

The normal operating hours for the 32C Pit will be from 7 a.m. to 7 p.m., typically during daylight hours. Some operations at the facility may be manned for 24 hours a day as necessary to perform tasks such as maintenance, pumping operations, or treatment / disposal operations.

J. Noise and Odor Mitigation

Due to the remote location of the facility, impacts from noise and odor are not anticipated. Marathon will continue to maintain compliance with COGCC 800 series rules at all times.

K. Final Disposition of Waste

The final disposition of water from the produced water facility will be beneficial reuse or final disposal. Marathon intends to use this facility to manage water in a way that reduces safety and environmental risk by reducing truck traffic and overall produced water loads. Management strategies are focused with this objective in mind. As a result, we are currently exploring systems that can help achieve this objective. Potential water management strategies associated with the facility include:

1. Natural evaporation
2. Mechanical (spray) evaporation
3. Enhanced (thermal) evaporation
4. Water treatment
5. Beneficial reuse

Natural Evaporation
Natural evaporation is currently in use at the facility, and provides a very limited means of disposal.

Mechanical Evaporation

Mechanical (spray) evaporation is also in use at the facility on a seasonal basis. Low impact spray nozzles are used to disperse a mist of water immediately above the water's surface. This system minimizes the potential for overspray. Soil monitoring in the area adjacent to the facility is voluntarily conducted according to dominant wind patterns to ensure compliance with the Table 910-1 concentration levels for inorganic material in soils, as weather allows.

Enhanced Evaporation

Enhanced evaporation is not currently in use at the facility, but has been used historically and may be used again in the future.

Water Treatment

Water treatment facilities are currently being reviewed, but are not in place at the facility. Water treatment would allow for additional opportunities to manage water onsite, and could possibly include enhanced evaporation of treated water or brine, beneficial reuse, and discharge, pending applicable permits.

Beneficial Reuse

The facility may be occasionally used as a storage location for water that may be beneficially reused within Marathon's operations (pending future drilling or completions), or may be transferred to other operators through existing or future water transfer agreements.

596-32C Pit

Monthly Inspection Sheet

	OK	NI	Comments / Readings
Date:			
Inspector:			
32C Pit			
Exposed Liner Inspection			
Flow Meter Total			
Current Flow Rate			
Pond Level			
Water Color / Oil Sheen			
Floating Debris			
Leak Detection Strap Level			
Netting and Fencing			
Security / Gates			
32C GB and Overflow Tanks			
Ovr. Tank – Total Level			
Ovr. Tank – Water Quantity			
Ovr. Tank – Cond. Quantity			
Gun Barrel Inspection			
Piping Inspection			
32C Pad Inspection			
Stormwater BMPs			
Mechanical Evap. System			
Signage / Permit #s Posted			
Additional Observations			

NI = Needs Improvement or Action

Attachment G
Stormwater Management Plan

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

MARATHON OIL COMPANY

STORMWATER MANAGEMENT PLAN FOR PICEANCE AREA

GARFIELD COUNTY, COLORADO

Certification Number: COR-03C052

February 22, 2012

Prepared For:

Marathon Oil Corporation

743 Horizon Court, Suite 220
Grand Junction, Colorado 81506

Prepared By:

InterTech

743 Horizon Court, Suite 110
Grand Junction, Colorado 81506

Marathon Oil Company

Piceance Basin Facility SWMP Tracking Table

Location Name	Inspection Frequency	Date Frequency Changed	Reclamation Status	Area Covered
596-19C Well Pad	Monthly	09/07/2011		4.65
596-20C Well Pad	Monthly	09/07/2011		4.48
596-29C Well Pad	Monthly	09/07/2011		4.78
596-31A Well Pad	Monthly	09/07/2011		4.56
596-31C Well Pad	Monthly	09/07/2011		3.85
596-32C Well Pad	Monthly	09/07/2011		4.85
596-33C Well Pad	Monthly	09/07/2011		3.08
596-34D Well Pad	Monthly	09/08/2011		4.55
596-35D Well Pad	Monthly	09/08/2011		4.43
696-5C Well Pad	Monthly	09/08/2011		5.38
696-18A Well Pad	Monthly	07/15/2011		5.2
696-18C Well Pad	Monthly	07/15/2011		5.0
697-1C Well Pad	Monthly	09/08/2011		4.92
697-1X Well Pad	Monthly	09/08/2011		3.63
697-2C Well Pad	Monthly	09/07/2011		4.98
697-11X Well Pad	Monthly	09/08/2011		3.84
697-12A Well Pad	Monthly	09/08/2011		3.82
697-13C Well Pad	Monthly	09/08/2011		4.34
697-21A Well Pad	Monthly	09/08/2011		5.25
697-23A Well Pad	Monthly	07/15/2011		3.13
697-23X Well Pad	Monthly	07/15/2011		3.6
697-26A Well Pad	Monthly	09/08/2011		5.0
697-28C Well Pad	Monthly	09/08/2011		4.36
596-19C Road	Monthly	09/07/2011		1.82
596-20C Road	Monthly	09/07/2011		1.5
596-29C Road	Monthly	09/07/2011		0.65
596-31A/C Road	Monthly	09/07/2011		7.16
596-32C Road	Monthly	09/07/2011		0.57
596-33C Road	Monthly	09/07/2011		0.93
596-35D Road	Monthly	09/08/2011		5.31
696-5C Road	Monthly	09/08/2011		1.92
696-18A/C Road	Monthly	09/08/2011		2.95
697-2C Road	Monthly	09/07/2011		3.62
697-11X Road	Monthly	09/08/2011		1.75
697-12A Road	Monthly	09/08/2011		1.74
697-13C Road	Monthly	09/08/2011		1.01
697-21A Road	Monthly	09/08/2011		0.34
697-23A Road	Monthly	09/08/2011		0.82
697-26A Road	Monthly	09/08/2011		0.5
697-28C Road	Monthly	09/08/2011		1.43
596-34D Road	Monthly	09/08/2011		1.5
Jackrabbit Road	Monthly	09/08/2011		2.0

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

Eric R. Ward — 11/16/2011

SIGNATURE — DATE

Eric Ward
Operations Superintendent
Marathon Oil Company

Modifications to the Stormwater Management Plan			
Name of person who made changes	**Section and Page #**	**Change(s) made**	**Date**
Jacob Parker	19C Map	Removed spoils area.	11/21/11
Jacob Parker	20C Map	Add and identify main snow storage area.	11/21/11
Jacob Parker	31A Map	Remove old snow storage area and add new main snow storage area	11/21/11
Jacob Parker	31C Map	Added new contours to map and remove spoils area.	11/21/11
Jacob Parker	34D Map	Move north snow storage to east, and add contours on SW edge	11/21/11
Jacob Parker	35D Map	Remove spoil area.	11/21/11
Jacob Parker	18C Map	Add snow storage area on SE corner inside berm	11/21/11
Jacob Parker	1C Map	Add snow storage area in NW corner, add new contours.	11/21/11
Jacob Parker	2C Map	Remove snow storage area outside N berm	11/21/11
Jacob Parker	12A Map	Remove snow storage area outside berm on south	11/21/11
Jacob Parker	13C Map	Add snow storage area to north west corner	11/21/11
Jacob Parker	26A Map	Add snow storage area to west corner of pad.	11/21/11
Jacob Parker	28C Map	Add snow storage are on SW corner, remove same outside berm on North	11/21/11
Jacob Parker	29C Map	Add sediment pond in northwest corner, add new snow storage area on SW corner of pad	11/21/11
Tim Coakley	5C Map	Remove cuttings pit and cement wash up area	11/8/11
Tim Coakley	12A Map	Remove reserve pit from map	11/8/11
Tim Coakley	19C Map	Remove reserve pit from map	11/8/11
Tim Coakley	20C Map	Remove reserve pit and cement washout from map	11/8/11
Tim Coakley	21A Map	Remove reserve pit and concrete washout from map	11/8/11
Tim Coakley	28C Map	Remove cuttings pit and add new berm along west edge of pad	11/8/11
Tim Coakley	31A Map	Remove reserve pit from map	11/8/11
Tim Coakley	31C Map	Remove reserve pit from map	11/8/11
Cody Lofland	33C Map	Add sed traps on SW and east sides, remove reserve pit	8/26/11
Cody Lofland	33C Map	Add outlet protection to sed traps 8/30/11	8/30/11

Continued on following page...

Modifications to the Stormwater Management Plan (cont...)			
Name of person who made changes	**Section and Page #**	**Change(s) made**	**Date**
Cody Lofland	33C Map	Removed silt fence	8/26/11
Tim Coakley	33C Map	Add concrete washout to SE corner of pad, inside berm.	9/25/11
Tim Coakley	33C Map	Remove concrete washout from map	11/30/11
Tim Coakley	33C Rd Map	Add Culvert at sed trap location on map	11/30/11
Tim Coakley	34D Map	Remove reserve pit, remove silt fence on east side, remove straw bales on east side, replace bales and fence with berm	10/5/11
Tim Coakley	35D Map	Remove reserve pit	11/8/11
Tim Coakley	35D Map	Straw bales removed from SE corner of disturbance	10/5/11
Tim Coakley	1C Map	Remove helipad, snow storage outside berm on north, and reserve pit	8-31-11
Tim Coakley	1C Map	Site was reseeded and mulched	11/1/11
Tim Coakley	20C Map	Site seeded and mulched	10/31/11
Tim Coakley	20C Map	Add new methanol tank and containment	10/31/11
Tim Coakley	31C Map	Site seeded and mulched	11/1/11
Tim Coakley	29C Map	Site seeded and mulched	11/1/11
Tim Coakley	33C Map	Site seeded and mulched	11/1/11
Tim Coakley	19C Map	Site seeded and mulched	11/1/11
Tim Coakley	19C Map	Add new methanol tank and containment	11/1/11
Tim Coakley	31A Map	Site seeded and mulched	11/1/11
Tim Coakley	31A Map	Add sed basin and pipe slope drain to map	11/1/11
Tim Coakley	32C Map	Move Snow storage area from northwest to south west, remove snow storage area outside north berm	11/1/11
Tim Coakley	32C Map	Site seeded and mulched	11/1/11
Tim Coakley	28C Map	Site re-contoured	9/15/11
Tim Coakley	28C Map	Added wells to map, added new methanol injection tank and containment	11/1/11
Tim Coakley	21A Map	Added new methanol injection tank and containment	11/1/11
Scott Distel	Main body of text	Updated "Tracking Table" and signature page; changed Appendix E to "Inactivation Forms" and added forms; and changed Appendix F to "Obsolete"	2/22/2012

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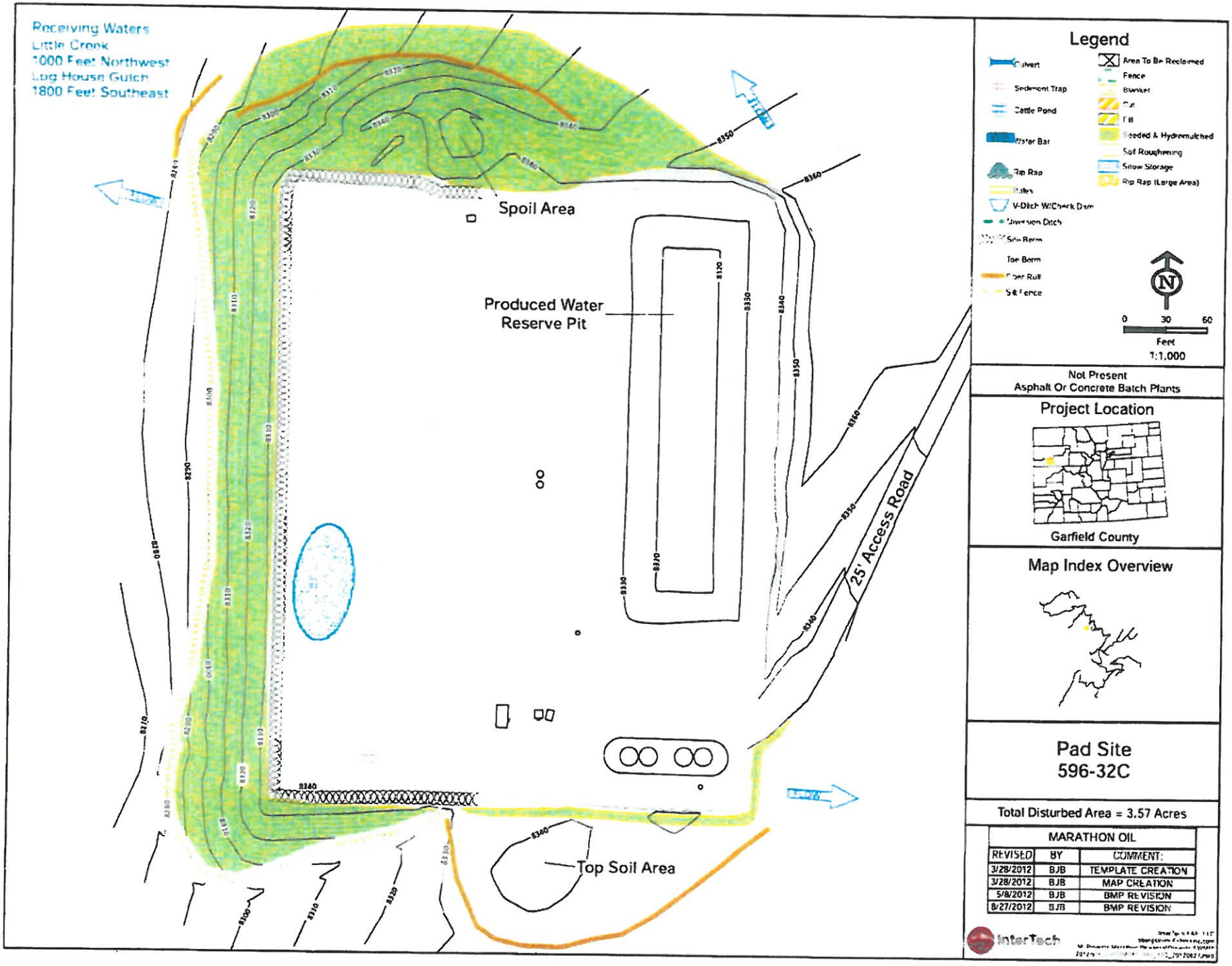

Receiving Waters
Little Creek
1000 Feet Northwest
Log House Gulch
1800 Feet Southeast
Spoil Area
Produced Water
Reserve Pit
25' Access Road
Top Soil Area
Legend
Culvert
Sediment Trap
Cattle Pond
Water Bar
Rip Rap
Bales
V-Ditch W/Check Dam
Diversion Ditch
Silt Berm
Toe Berm
Fiber Roll
Silt Fence
Area To Be Reclaimed
Fence
Blanket
Cut
Fill
Seeded & Hydromulched
Soil Roughening
Snow Storage
Rip Rap (Large Area)
N
0 30 60
Feet
1:1,000
Not Present
Asphalt Or Concrete Batch Plants
Project Location
Garfield County
Map Index Overview
Pad Site
596-32C
Total Disturbed Area = 3.57 Acres
MARATHON OIL
REVISED BY COMMENT:
3/28/2012 BJB TEMPLATE CREATION
3/28/2012 BJB MAP CREATION
5/8/2012 BJB BMP REVISION
8/27/2012 BJB BMP REVISION
InterTech

Attachment H
Waste Profile and Mass Flow Balance

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

Total Feed Water (Influent)			
Type	Percent	BPM	GPM
Water	99.96	21241	892122
Condensate	0.04	9	378
Total	100	21250	892500

Onsite			
Type	Percent	BPM	GPM
Water	99.96	21241	892122
Condensate	0.04	9	378
Total	100	21250	892500

Pond 32C / Reuse and Evaporation			
Type	Percent	BPM	GPM
Water	100	21241	892122
Condensate	0	0	0
Total	100	21241	892122

Assumptions: 255,000 bbls per year total and 0.04% Condensate

Explanation

BPM Barrels Per Month
GPM Gallons Per Month

PROJECT NO:	012-1372
DRAWN BY:	TME
DATE:	09-25-2012

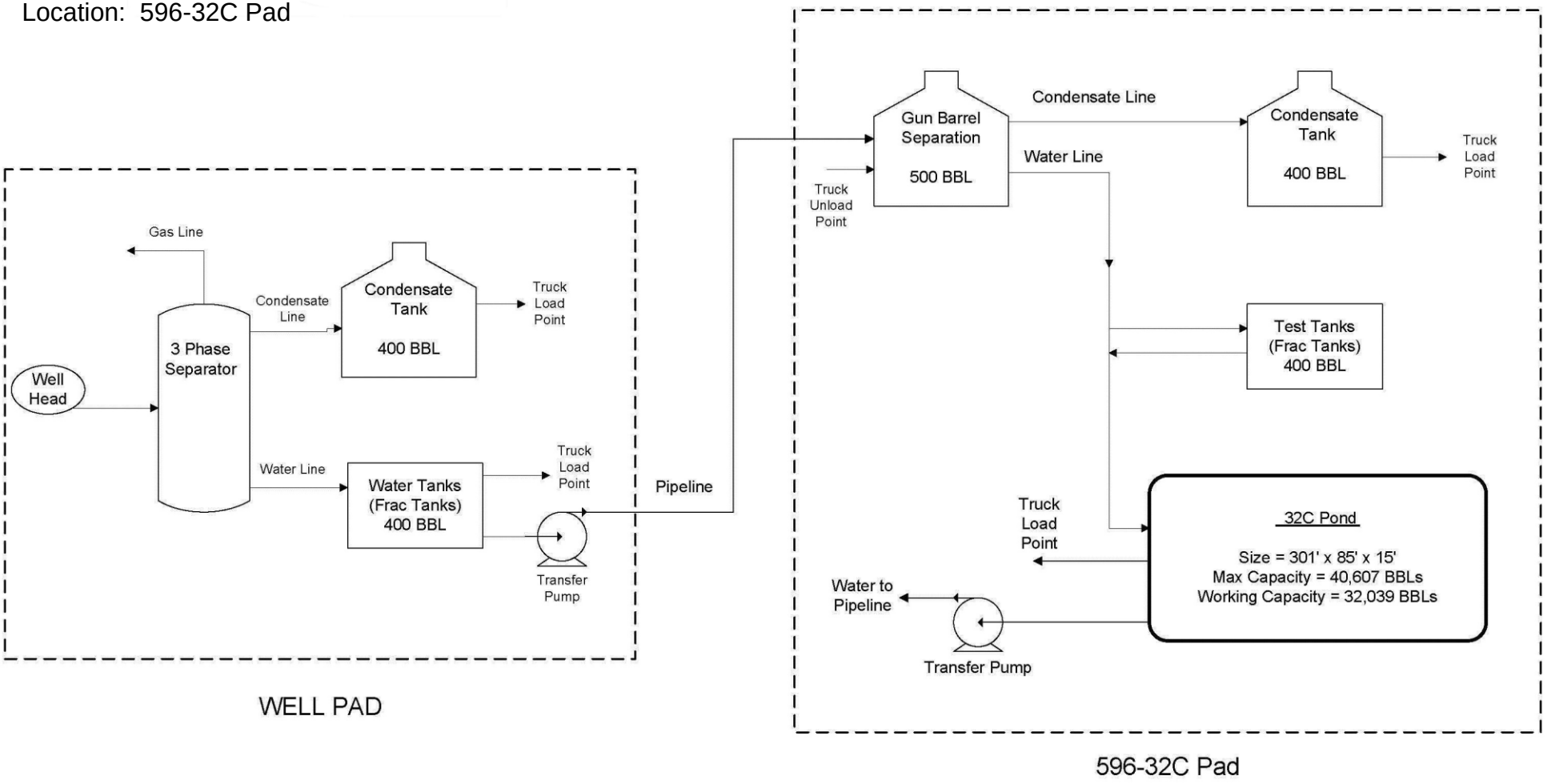
Representative Mass Flow Balance

Marathon Oil Company
Water Storage Facility
Garfield County, Colorado

OLSSON ASSOCIATES
826 21½ Road
Grand Junction, CO 81505
TEL 970.263.7800
FAX 970.263.7456

FIGURE
MFB-1

Marathon Oil – 32C
Location: 596-32C Pad



PROJECT NO:	012-1372
DRAWN BY:	TME
DATE:	09-25-2012

596-32C Process Flow Diagram

Marathon Oil Company
Water Storage Facility
Garfield County, Colorado

OLSSON ASSOCIATES
826 21½ Road
Grand Junction, CO 81505
TEL 970.263.7800
FAX 970.263.7456

FIGURE
PFD-1

ANALYTICAL SUMMARY REPORT

November 01, 2012

Marathon Oil Company
743 Horizon Court Ste. 220
Grand Junction, CO 81506

Workorder No.: G12100484 Quote ID: G203 - 32C APEN and Pond Complex

Project Name: Produced_Water

Energy Laboratories Inc. Gillette WY received the following 3 samples for Marathon Oil Company on 10/19/2012 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
G12100484-001	PW_32C_GB_Inlet	10/18/12 13:25	10/19/12	Aqueous	Conductivity Diesel Range Organics Gasoline Range Organics Non-Halogenated Organics by GC-FID pH Solids, Total Dissolved Solids, Total Suspended 8260-Volatile Organic Compounds-Short List
G12100484-002	PW_32C_GB_Outlet	10/18/12 13:30	10/19/12	Aqueous	Same As Above
G12100484-003	PW_32C_GB_Pond	10/18/12 13:35	10/19/12	Aqueous	Conductivity Non-Halogenated Organics by GC-FID pH Solids, Total Dissolved Solids, Total Suspended

The analyses presented in this report were performed by Energy Laboratories, Inc., 400 W. Boxelder Rd., Gillette, WY 82718, unless otherwise noted.

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these tests results, please call.

Report Approved By:

CLIENT: Marathon Oil Company
Project: Produced_Water
Sample Delivery Group: G12100484

Report Date: 11/01/12

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Gillette, WY Branch

Client: Marathon Oil Company
Site Name: APEN_09GA0337
Project: Produced_Water
Client Sample ID PW_32C_GB_Inlet
Location:
Samp FRQ/Type: Q4
Lab ID: G12100484-001

Report Date: 11/01/12
Collection Date: 10/18/12 13:25
Date Received: 10/19/12
Sampled By: Scott Distel
Matrix: Aqueous
Tracking Number: 215548

Analyses	Result	Units	RL	Qualifier	Method	Analysis Date / By
NON-METALS						
pH	6.17	s.u.	0.01	H	A4500-H B	10/19/12 14:46 / blb
Solids, Total Dissolved TDS @ 180 C	8440	mg/L	200		A2540 C	10/22/12 09:39 / blb
Solids, Total Suspended TSS @ 105 C	11	mg/L	10		A2540 D	10/19/12 14:26 / blb
NON-HALOGENATED ORGANICS BY GC-FID						
Methanol	60	mg/L	1.0		SW8015B	10/23/12 15:09 / eli-b
Surr: sec-Butyl Alcohol	102	%REC	80-120		SW8015B	10/23/12 15:09 / eli-b
PETROLEUM HYDROCARBONS-VOLATILE						
Gasoline Range Organics (GRO)	95600	ug/L	4000		SW8015B	10/23/12 12:36 / eli-b
Total Purgeable Hydrocarbons	97300	ug/L	4000		SW8015B	10/23/12 12:36 / eli-b
Surr: Trifluorotoluene	109	%REC	70-130		SW8015B	10/23/12 12:36 / eli-b
- Note 1: Gasoline Range Organics(GRO) are defined as all hydrocarbons eluting between 2-Methylpentane and 1,2,4-Trimethylbenzene.						
- Note 2: Total Purgeable Hydrocarbons are defined as the total hydrocarbon response regardless of elution time.						
PETROLEUM HYDROCARBONS-SEMI-VOLATILE						
Diesel Range Organics (DRO)	430	mg/L	15		SW8015B	10/25/12 11:08 / eli-b
Total Extractable Hydrocarbons	656	mg/L	15		SW8015B	10/25/12 11:08 / eli-b
Surr: o-Terphenyl	0	%REC	50-150	O	SW8015B	10/25/12 11:08 / eli-b
- Note 1: Diesel Range Organics are defined as all hydrocarbons eluting between C10 and C28.						
- Note 2: Total Extractable Hydrocarbons are defined as the total hydrocarbon response regardless of elution time.						
VOLATILE ORGANIC COMPOUNDS						
Benzene	22900	ug/L	1000		SW8260B	10/24/12 14:09 / eli-b
Ethylbenzene	1100	ug/L	100		SW8260B	10/24/12 15:32 / eli-b
n-Hexane	702	ug/L	200		SW8260B	10/24/12 15:32 / eli-b
Toluene	36000	ug/L	1000		SW8260B	10/24/12 14:09 / eli-b
m+p-Xylenes	11800	ug/L	1000		SW8260B	10/24/12 14:09 / eli-b
o-Xylene	1840	ug/L	1000		SW8260B	10/24/12 14:09 / eli-b
Xylenes, Total	13700	ug/L	1000		SW8260B	10/24/12 14:09 / eli-b
Surr: Dibromofluoromethane	105	%REC	77-126		SW8260B	10/24/12 15:32 / eli-b
Surr: 1,2-Dichloroethane-d4	109	%REC	70-130		SW8260B	10/24/12 15:32 / eli-b
Surr: Toluene-d8	99.0	%REC	79-122		SW8260B	10/24/12 15:32 / eli-b
Surr: p-Bromofluorobenzene	107	%REC	76-127		SW8260B	10/24/12 15:32 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
O - Diluted out.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Gillette, WY Branch

Client: Marathon Oil Company
Site Name: APEN_09GA0337
Project: Produced_Water
Client Sample ID PW_32C_GB_Outlet
Location:
Samp FRQ/Type: Q4
Lab ID: G12100484-002

Report Date: 11/01/12
Collection Date: 10/18/12 13:30
Date Received: 10/19/12
Sampled By: Scott Distel
Matrix: Aqueous
Tracking Number: 215549

Analyses	Result	Units	RL	Qualifier	Method	Analysis Date / By
NON-METALS						
pH	6.75	s.u.	0.01	H	A4500-H B	10/19/12 14:49 / blb
Solids, Total Dissolved TDS @ 180 C	8480	mg/L	200		A2540 C	10/22/12 09:40 / blb
Solids, Total Suspended TSS @ 105 C	84	mg/L	10		A2540 D	10/19/12 14:26 / blb
NON-HALOGENATED ORGANICS BY GC-FID						
Methanol	73	mg/L	1.0		SW8015B	10/23/12 15:31 / eli-b
Surr: sec-Butyl Alcohol	106	%REC	80-120		SW8015B	10/23/12 15:31 / eli-b
PETROLEUM HYDROCARBONS-VOLATILE						
Gasoline Range Organics (GRO)	136000	ug/L	4000		SW8015B	10/23/12 13:45 / eli-b
Total Purgeable Hydrocarbons	150000	ug/L	4000		SW8015B	10/23/12 13:45 / eli-b
Surr: Trifluorotoluene	164	%REC	70-130	S	SW8015B	10/23/12 13:45 / eli-b
- Note 1: Gasoline Range Organics(GRO) are defined as all hydrocarbons eluting between 2-Methylpentane and 1,2,4-Trimethylbenzene.						
- Note 2: Total Purgeable Hydrocarbons are defined as the total hydrocarbon response regardless of elution time.						
- S=The Surrogate recovery was outside QC advisory limits due to positive sample matrix interference.						
PETROLEUM HYDROCARBONS-SEMI-VOLATILE						
Diesel Range Organics (DRO)	200	mg/L	15		SW8015B	10/25/12 10:19 / eli-b
Total Extractable Hydrocarbons	334	mg/L	15		SW8015B	10/25/12 10:19 / eli-b
Surr: o-Terphenyl	0	%REC	50-150	O	SW8015B	10/25/12 10:19 / eli-b
- Note 1: Diesel Range Organics are defined as all hydrocarbons eluting between C10 and C28.						
- Note 2: Total Extractable Hydrocarbons are defined as the total hydrocarbon response regardless of elution time.						
VOLATILE ORGANIC COMPOUNDS						
Benzene	17600	ug/L	1000		SW8260B	10/24/12 14:36 / eli-b
Ethylbenzene	1340	ug/L	100		SW8260B	10/24/12 16:28 / eli-b
n-Hexane	1070	ug/L	200		SW8260B	10/24/12 16:28 / eli-b
Toluene	35100	ug/L	1000		SW8260B	10/24/12 14:36 / eli-b
m+p-Xylenes	16300	ug/L	1000		SW8260B	10/24/12 14:36 / eli-b
o-Xylene	2490	ug/L	1000		SW8260B	10/24/12 14:36 / eli-b
Xylenes, Total	18800	ug/L	1000		SW8260B	10/24/12 14:36 / eli-b
Surr: Dibromofluoromethane	104	%REC	77-126		SW8260B	10/24/12 16:28 / eli-b
Surr: 1,2-Dichloroethane-d4	107	%REC	70-130		SW8260B	10/24/12 16:28 / eli-b
Surr: Toluene-d8	101	%REC	79-122		SW8260B	10/24/12 16:28 / eli-b
Surr: p-Bromofluorobenzene	110	%REC	76-127		SW8260B	10/24/12 16:28 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
O - Diluted out.
S - Spike recovery outside of advisory limits.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
H - Analysis performed past recommended holding time.

LABORATORY ANALYTICAL REPORT

Prepared by Gillette, WY Branch

Client:	Marathon Oil Company		
Site Name:	APEN_09GA0337	**Report Date:**	11/01/12
Project:	Produced_Water	**Collection Date:**	10/18/12 13:35
Client Sample ID	PW_32C_GB_Pond	**Date Received:**	10/19/12
Location:		**Sampled By:**	Scott Distel
Samp FRQ/Type:	Q4	**Matrix:**	Aqueous
Lab ID:	G12100484-003	**Tracking Number:**	215550

Analyses	Result	Units	RL	Qualifier	Method	Analysis Date / By
NON-METALS						
Solids, Total Dissolved TDS @ 180 C	18300	mg/L	1000		A2540 C	10/22/12 09:40 / blb
Solids, Total Suspended TSS @ 105 C	95	mg/L	10		A2540 D	10/19/12 14:26 / blb
NON-HALOGENATED ORGANICS BY GC-FID						
Methanol	4.7	mg/L	1.0		SW8015B	10/23/12 15:52 / eli-b
Surr: sec-Butyl Alcohol	101	%REC	80-120		SW8015B	10/23/12 15:52 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Marathon Oil Company
Report Date: 10/29/12
Project: Produced_Water
Work Order: G12100484

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW8260B									Analytical Run: R193953
Sample ID: CCV102412	Continuing Calibration Verification Standard								10/24/12 09:50
Benzene	5.12	ug/L	1.0	102	70	130			
Ethylbenzene	4.64	ug/L	1.0	93	80	120			
n-Hexane	5.40	ug/L	1.0	108	70	130			
Toluene	4.76	ug/L	1.0	95	80	120			
m+p-Xylenes	9.04	ug/L	1.0	90	70	130			
o-Xylene	4.56	ug/L	1.0	91	70	130			
Xylenes, Total	13.6	ug/L	1.0		0	0			
Surr: 1,2-Dichloroethane-d4			1.0	115	70	130			
Surr: Dibromofluoromethane			1.0	110	77	126			
Surr: p-Bromofluorobenzene			1.0	112	76	127			
Surr: Toluene-d8			1.0	101	79	122			
Method: SW8260B									Batch: R193953
Sample ID: LCS102412	Laboratory Control Sample				Run: SV5972.I_121024A				10/24/12 10:27
Benzene	5.08	ug/L	1.0	102	71	133			
Ethylbenzene	4.80	ug/L	1.0	96	78	131			
n-Hexane	5.36	ug/L	1.0	107	70	130			
Toluene	4.80	ug/L	1.0	96	78	134			
m+p-Xylenes	9.32	ug/L	1.0	93	78	133			
o-Xylene	4.52	ug/L	1.0	90	79	136			
Surr: 1,2-Dichloroethane-d4			1.0	116	70	130			
Surr: Dibromofluoromethane			1.0	107	77	126			
Surr: p-Bromofluorobenzene			1.0	110	76	127			
Surr: Toluene-d8			1.0	101	79	122			
Sample ID: BLK102412	Method Blank				Run: SV5972.I_121024A				10/24/12 10:55
Benzene	ND	ug/L	1.0						
Ethylbenzene	ND	ug/L	1.0						
n-Hexane	ND	ug/L	1.0						
Toluene	ND	ug/L	1.0						
m+p-Xylenes	ND	ug/L	1.0						
o-Xylene	ND	ug/L	1.0						
Xylenes, Total	ND	ug/L	1.0						
Surr: 1,2-Dichloroethane-d4			1.0	113	70	130			
Surr: Dibromofluoromethane			1.0	106	77	126			
Surr: p-Bromofluorobenzene			1.0	112	76	127			
Surr: Toluene-d8			1.0	100	79	122			
Sample ID: B12101976-003Bms	Sample Matrix Spike				Run: SV5972.I_121024A				10/24/12 12:46
Benzene	71.6	ug/L	5.0	110	71	133			
Ethylbenzene	56.0	ug/L	5.0	103	78	131			
n-Hexane	86.0	ug/L	10	106	70	130			
Toluene	101	ug/L	5.0	108	78	134			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Marathon Oil Company
Report Date: 10/29/12
Project: Produced_Water
Work Order: G12100484

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW8260B									Batch: R193953
Sample ID: B12101976-003Bms	Sample Matrix Spike				Run: SV5972.I_121024A				10/24/12 12:46
m+p-Xylenes	139	ug/L	5.0	102	78	133			
o-Xylene	64.8	ug/L	5.0	101	79	136			
Surr: 1,2-Dichloroethane-d4			10	108	70	130			
Surr: Dibromofluoromethane			10	105	77	126			
Surr: p-Bromofluorobenzene			10	109	76	127			
Surr: Toluene-d8			10	101	79	122			
Sample ID: B12101976-003Bmsd	Sample Matrix Spike Duplicate				Run: SV5972.I_121024A				10/24/12 13:13
Benzene	70.4	ug/L	5.0	107	71	133	1.7	20	
Ethylbenzene	56.0	ug/L	5.0	103	78	131	0.0	20	
n-Hexane	83.2	ug/L	10	101	70	130	3.3	20	
Toluene	97.6	ug/L	5.0	102	78	134	3.2	20	
m+p-Xylenes	134	ug/L	5.0	97	78	133	3.5	20	
o-Xylene	64.0	ug/L	5.0	99	79	136	1.2	20	
Surr: 1,2-Dichloroethane-d4			10	108	70	130			
Surr: Dibromofluoromethane			10	104	77	126			
Surr: p-Bromofluorobenzene			10	108	76	127			
Surr: Toluene-d8			10	100	79	122			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Marathon Oil Company
Report Date: 10/29/12
Project: Produced_Water
Work Order: G12100484

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW8015B									Analytical Run: R193856
Sample ID: CCV_1022PE137r	Continuing Calibration Verification Standard								10/23/12 05:40
Total Purgeable Hydrocarbons	202	ug/L	20	101	85	115			
Surr: Trifluorotoluene			1.0	101	85	115			
Method: SW8015B									Batch: R193856
Sample ID: LCS_1022PE138r	Laboratory Control Sample				Run: PE 1_121022B				10/23/12 06:15
Total Purgeable Hydrocarbons	182	ug/L	20	91	70	130			
Surr: Trifluorotoluene			1.0	100	70	130			
Sample ID: MBLK_1022PE140r	Method Blank				Run: PE 1_121022B				10/23/12 07:23
Gasoline Range Organics (GRO)	ND	ug/L	20						
Total Purgeable Hydrocarbons	ND	ug/L	20						
Surr: Trifluorotoluene			1.0	93	70	130			
Sample ID: G12100484-001CMS	Sample Matrix Spike				Run: PE 1_121022B				10/23/12 15:29
Total Purgeable Hydrocarbons	195000	ug/L	4000	98	70	130			
Surr: Trifluorotoluene			200	125	70	130			
Sample ID: G12100484-001CMSD	Sample Matrix Spike Duplicate				Run: PE 1_121022B				10/23/12 16:38
Total Purgeable Hydrocarbons	197000	ug/L	4000	100	70	130	1.2	20	
Surr: Trifluorotoluene			200	124	70	130			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Marathon Oil Company
Project: Produced_Water

Report Date: 10/29/12
Work Order: G12100484

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW8015B									Batch: 66403
Sample ID: LCS-66403	Laboratory Control Sample				Run: GCFID-FISON-B_121023A				10/23/12 13:39
Diesel Range Organics (DRO)	11.7	mg/L	0.30	78	60	140			
Total Extractable Hydrocarbons	12.2	mg/L	0.30	81	60	140			
Surr: o-Terphenyl			0.0040	87	50	150			
Sample ID: MB-66403	Method Blank				Run: GCFID-FISON-B_121023A				10/23/12 15:16
Diesel Range Organics (DRO)	ND	mg/L	0.30						
Total Extractable Hydrocarbons	ND	mg/L	0.30						
Surr: o-Terphenyl			0.0040	104	50	150			
Sample ID: B12101885-002FMS	Sample Matrix Spike				Run: GCFID-FISON-B_121023A				10/23/12 16:54
Diesel Range Organics (DRO)	27.4	mg/L	0.61	90	60	140			
Total Extractable Hydrocarbons	28.6	mg/L	0.61	94	60	140			
Surr: o-Terphenyl			0.0081	94	50	150			
Sample ID: B12101885-002FMSD	Sample Matrix Spike Duplicate				Run: GCFID-FISON-B_121023A				10/23/12 17:43
Diesel Range Organics (DRO)	26.8	mg/L	0.61	89	60	140	2.0	20	
Total Extractable Hydrocarbons	27.8	mg/L	0.61	92	60	140	2.7	20	
Surr: o-Terphenyl			0.0081	94	50	150			
Method: SW8015B									Analytical Run: R194005
Sample ID: CCV_1023FIS58r	Continuing Calibration Verification Standard								10/25/12 08:41
Total Extractable Hydrocarbons	15.1	mg/L	0.30	101	85	115			
Surr: o-Terphenyl			0.0040	96	85	115			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Marathon Oil Company
Project: Produced_Water

Report Date: 10/29/12
Work Order: G12100484

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW8015B									Batch: 66440
Sample ID: LCS-66440	Laboratory Control Sample				Run: GCFID-HP1-B_121023A				10/23/12 08:58
Methanol	45.2	mg/L	1.0	90	71	128			
Surr: sec-Butyl Alcohol			1.0	101	80	120			
Sample ID: MB-66440	Method Blank				Run: GCFID-HP1-B_121023A				10/23/12 09:19
Methanol	ND	mg/L	1.0						
Surr: sec-Butyl Alcohol			1.0	102	80	120			
Sample ID: B12101885-011LMS	Sample Matrix Spike				Run: GCFID-HP1-B_121023A				10/23/12 13:40
Methanol	51.5	mg/L	1.1	94	71	128			
Surr: sec-Butyl Alcohol			1.1	93	80	120			
Sample ID: B12101885-011LMSD	Sample Matrix Spike Duplicate				Run: GCFID-HP1-B_121023A				10/23/12 14:03
Methanol	51.9	mg/L	1.1	94	71	128	0.8	20	
Surr: sec-Butyl Alcohol			1.1	93	80	120			
Method: SW8015B									Analytical Run: R193945
Sample ID: CCV_1023HM103r-W	Continuing Calibration Verification Standard								10/23/12 08:36
Methanol	100	mg/L	1.0	100	85	115			
Surr: sec-Butyl Alcohol			1.0	101	80	120			
Sample ID: CCV_1023HM119r-W	Continuing Calibration Verification Standard								10/23/12 14:24
Methanol	98.5	mg/L	1.0	99	85	115			
Surr: sec-Butyl Alcohol			1.0	99	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

Standard Reporting Procedures

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Workorder Receipt Checklist

Marathon Oil Company G12100484

Login completed by: Tracey Archer
Date Received: 10/19/2012
Reviewed by: BL2000\kscottruff
Received by: kls
Reviewed Date: 10/19/2012
Carrier name: FedEx

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	5.0°C On Ice		
Water - VOA vials have zero headspace?	Yes ☑	No ☐	No VOA vials submitted ☐
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Contact and Corrective Action Comments:

None

Chain of Custody and Analytical Request Record

ENERGY LABORATORIES

PLEASE PRINT- Provide as much information as possible.

Company Name: Marathon Oil Company	Project Name, PWS, Permit, Etc.: APEN_09GA0337/Produced_Water	Sample Origin State: CO	EPA/State Compliance: Yes ☑ No ☐
Report Mail Address: InterTech Environmental & Engineering, 743 Horizon Court, Suite 110, Grand Junction, CO 81506	Contact Name: Scott Distel; Phone/Fax: (307) 399-2329; Email: sdistel@cbmainc.com		Sampler: (Please Print) Scott Distel
Invoice Address: Marathon Oil Company, 743 Horizon Court, Suite 220, Grand Junction, CO 81506	Invoice Contact & Phone: Stacey Wales (970) 244-5725	Purchase Order:	Quote/Bottle Order:

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

- ☐ DW
- ☐ GSA
- ☐ POTW/WWTP
- ☐ State: _____
- ☑ Other: PDF
- ☐ A2LA
- ☑ EDD/EDT (Electronic Data) Format: _____
- ☐ LEVEL IV
- ☐ NELAC

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	TSS	TDS	pH	Methanol							SEE ATTACHED	Normal Turnaround (TAT)	RUSH	
1 PW_32C_GB_Inlet	10/18/2012	13:25	10W	X	X	X								X	X		Q4
2 PW_32C_GB_Outlet	10/18/2012	13:30	10W	X	X	X								X	X		Q4
3 PW_32C_GB_Pond	10/18/2012	13:35	5W	X	X		X								X		Q4
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Contact ELI prior to **RUSH** sample submittal for charges and scheduling – See Instruction Page

Comments:

Shipped by: FedEX

Cooler ID(s):

Receipt Temp 5.0 °C IR

On Ice: (Yes) No

Custody Seal Y N
Intact Y N
Signature Match Y N

LABORATORY USE ONLY

610100484

Custody Record MUST be Signed

Relinquished by (print): Scott Distel	Date/Time: 10/18/12 16:15	Signature: Scott Distel	Received by (print):	Date/Time: / Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time: / Signature:
Sample Disposal: Return to Client: _____ Lab Disposal: X			Received by Laboratory:	Date/Time: 10/19/12 1035 / Signature:

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.
This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

The Division has determined uncontrolled actual emissions of VOC from the gun barrel separation tank, portable test "frac" tanks, and condensate tank are less than two tons per year each. Therefore, these sources are not required to report air emissions by filing an APEN (Reference: Regulation No. 3, Part A, Section II.D.1.a). Consequently, the Division has also determined these sources are not required to obtain an air pollution emissions permit (Reference: Regulation No. 3, Part B, Section II.D.1.a). The operator shall maintain records of emissions on an annual basis for each APEN exempt emission source listed above, to be made available to the Division for inspection upon request

These exemptions from permit requirements are based on the emission calculations associated with this review. This determination is made in reliance upon the accuracy and completeness of the information supplied by the applicant and is conditioned upon construction, installation and operation in accordance with this information.

REASONABLY AVAILABLE CONTROL TECHNOLOGY (RACT)

The 596-32C Produced Water Storage Pond (Point 001), is subject to the requirements for the disposal of volatile organic compounds (Reference: Regulation No. 7, Section V.A), which states that "no person shall dispose of volatile organic compounds by evaporation or spillage unless RACT is utilized."

To satisfy this requirement, the inlet water to this facility will first enter a gun barrel separation tank to achieve condensate separation and removal, with condensate oil being routed to a condensate storage tank on site. The operator will also use best management practices to reduce the volatilization of pollutants. The best management practices will include produced water throughput limits and periodic water sampling and analysis.

Limitations and Records Requirements

This source shall be limited to a maximum produced water throughput as listed below and all other activities, operational rates and numbers of equipment as stated in the application:

Facility Equipment ID	AIRS Point	Production Description	Production Limit
596-32C Pond	001	Throughput of produced water to the storage pond	**90,000 barrels of water per year**

Please be advised that annual records of the actual throughput of produced water shall be maintained by the applicant and made available to the Division for inspection upon request.

[redacted]

The operator shall sample the water at the locations in the table below according to the sampling frequency and duration listed. The samples shall be taken with a minimum of two months separating sampling dates, to determine total hydrocarbons (including gasoline range plus diesel range) and hazardous air pollutant concentrations (including methanol, benzene, toluene, ethylbenzene, xylene, and n-hexane). Each water sample shall be analyzed using EPA Method 8015 for methanol, gasoline range organics (total volatile hydrocarbons), and diesel range organics (total extractable hydrocarbons) and EPA Method 8260 for benzene, toluene, ethylbenzene, xylene, and n-hexane.

Sampling Location	Sampling Frequency	Sampling Duration
GB_Inlet Inlet of the facility (prior to the gun barrel separation tank)	Quarterly	One year (4 samples)
GB_outlet Inlet to the storage pond (after the gun barrel separation tank)	Quarterly	Ongoing

* Please analyze the PW_32C_GB_Inlet & PW_32C_GB_Outlet samples in accordance with this attachment.

Thanks, Scott Dietel

Attachment I
Emergency Response Plan

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

Marathon Oil®

PICEANCE OPERATIONS EMERGENCY RESPONSE PLAN

Piceance Basin, CO

743 HORIZON COURT - SUITE 220
GRAND JUNCTION, CO 81506
970-245-5233 Main Number
866-MOC-CERT (866-662-2378)

The Response Group
Emergency Response | Pre-Planning & Support

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PICEANCE OPERATIONS
EMERGENCY RESPONSE PLAN

Section 1: General

Section 2: Emergency Response Actions

Section 3: Pollution Prevention Measures

Section 4: Plan Implementation

Section 5: Maintenance and Training Program

Section 6: Response Management System

Appendix A: Notifications

Appendix B: Glossary of Terms and Acronyms

Term	Definition
	A
Absorbent Material	Any of several materials designed to absorb oil, both hydrocarbon and non-hydrocarbon.
Access/Staging Areas	Designated areas offering access to spill sites for the gathering and deployment of spill response equipment and personnel.
Activate	The process of mobilizing personnel and/or equipment within the response organization to engage in response operations.
Adjoining Shoreline	Any area within the mean high water line of any "navigable waters" listed.
Adverse Weather	The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operation environment. Factors to consider include significant wave height, ice conditions, temperatures, weather-related visibility, and currents within the area in which the systems or equipment are intended to function.
AFE	Authorization for Expenditure
Agency	A division of government with a specific function offering a particular kind of assistance. In ICS, agencies are defined either as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or other assistance).
Agency Representative	Individual assigned to an incident from an assisting or cooperating agency that has been delegated full authority to make decisions on all matters affecting his/her agency's participation at the incident.
Allocated Resources	Resources dispatched to an incident.
ALS	Advanced Life Support
Alteration	Any work on a tank or related equipment involving cutting, burning, welding, or heating operations that changes the physical dimensions or configuration of a tank.
AQI	Alternate Qualified Individual
Area	The geographic area for which a separate and distinct Area Contingency Plan has been prepared as described in the Oil Pollution Act of 1990. For EPA Areas with sub-area plans or annexes to the Area Contingency Plan, the EPA Regional Administrator will decide which sub-area is to be exercised within the triennial cycle.

Appendix C: Forms

Attachment J
NRCS Soils Report

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties

Marathon 32C Water Impoundment

July 18, 2012

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

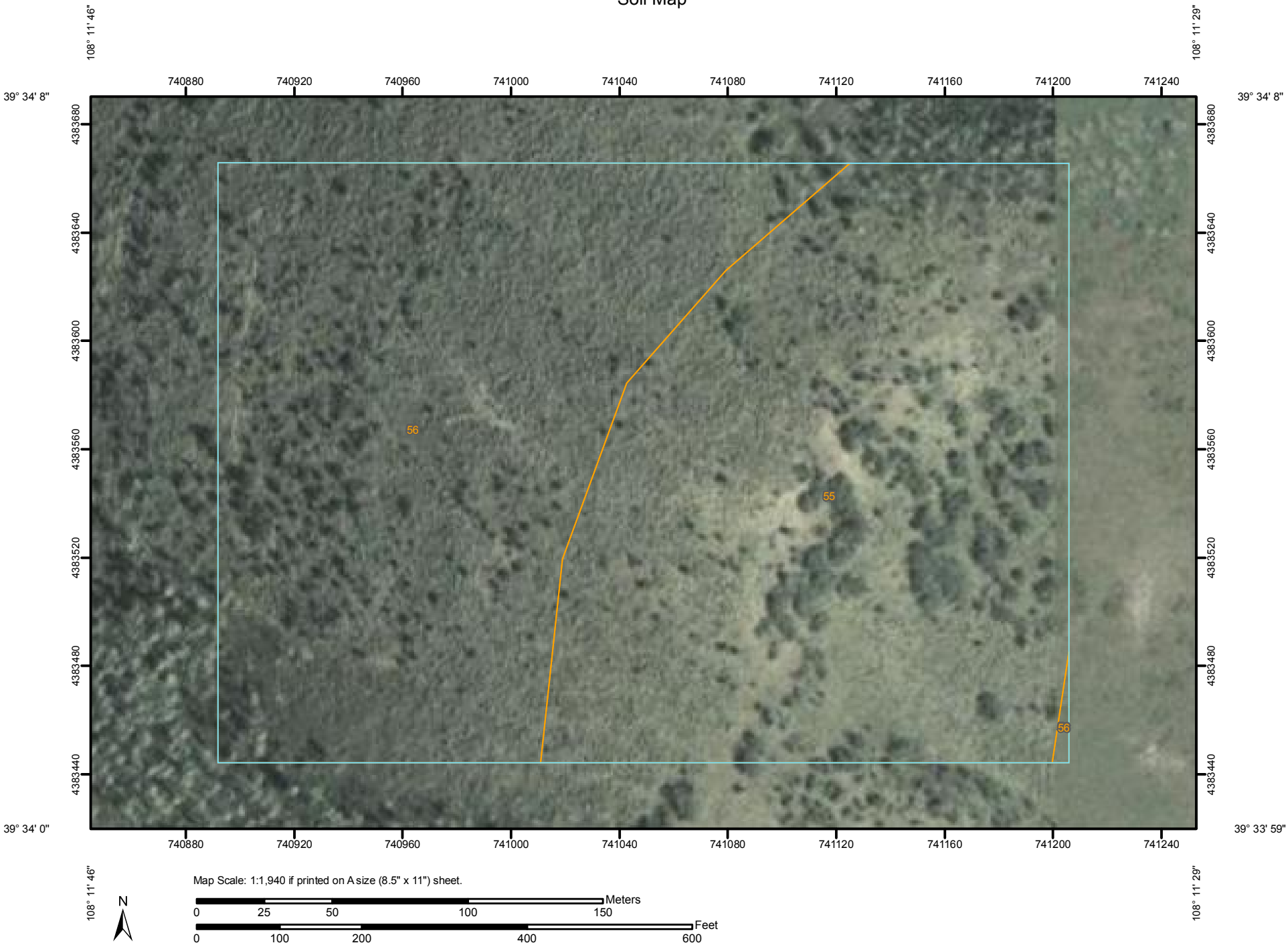
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	8.3	48.6%
Totals for Area of Interest		**17.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties

55—Parachute-Irigul complex, 5 to 30 percent slopes

Map Unit Setting

Elevation: 7,600 to 8,800 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 36 to 40 degrees F
Frost-free period: 65 to 90 days

Map Unit Composition

Parachute and similar soils: 60 percent
Irigul and similar soils: 30 percent

Description of Parachute

Setting

Landform: Mountains
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Residuum weathered from shale and siltstone and/or residuum weathered from sandstone and shale

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Land capability (nonirrigated): 6e
Ecological site: Mountain Loam (R048AY228CO)

Typical profile

0 to 10 inches: Loam
10 to 25 inches: Very channery loam, extremely channery loam
25 to 29 inches: Unweathered bedrock

Description of Irigul

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, toeslope, summit, footslope
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 5 to 30 percent
Depth to restrictive feature: 5 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.3 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: Loamy Slopes (R048AY303CO)

Typical profile

0 to 6 inches: Channery loam
6 to 13 inches: Very channery loam
13 to 17 inches: Unweathered bedrock

56—Parachute-Irigul-Rhone association, 25 to 50 percent slopes

Map Unit Setting

Elevation: 7,600 to 8,800 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 36 to 40 degrees F
Frost-free period: 65 to 80 days

Map Unit Composition

Parachute and similar soils: 35 percent
Irigul and similar soils: 30 percent
Rhone and similar soils: 20 percent

Description of Parachute

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium derived from sandstone and shale and/or residuum weathered from siltstone

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: Brushy Loam (R048AY238CO)

Typical profile

0 to 10 inches: Loam
10 to 25 inches: Very channery loam, extremely channery loam
25 to 29 inches: Unweathered bedrock

Description of Irigul

Setting

Landform: Hills
Landform position (two-dimensional): Toeslope, summit, footslope, backslope, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: 5 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.3 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: Loamy Slopes (R048AY303CO)

Typical profile

0 to 6 inches: Channery loam
6 to 13 inches: Very channery loam
13 to 17 inches: Unweathered bedrock

Description of Rhone

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope, shoulder, summit, footslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Colluvium derived from sandstone and shale and/or residuum weathered from sandstone and shale

Properties and qualities

Slope: 25 to 50 percent

Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.5 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: Brushy Loam (R048AY238CO)

Typical profile

0 to 10 inches: Loam
10 to 39 inches: Channery loam
39 to 55 inches: Very channery loam
55 to 59 inches: Unweathered bedrock

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

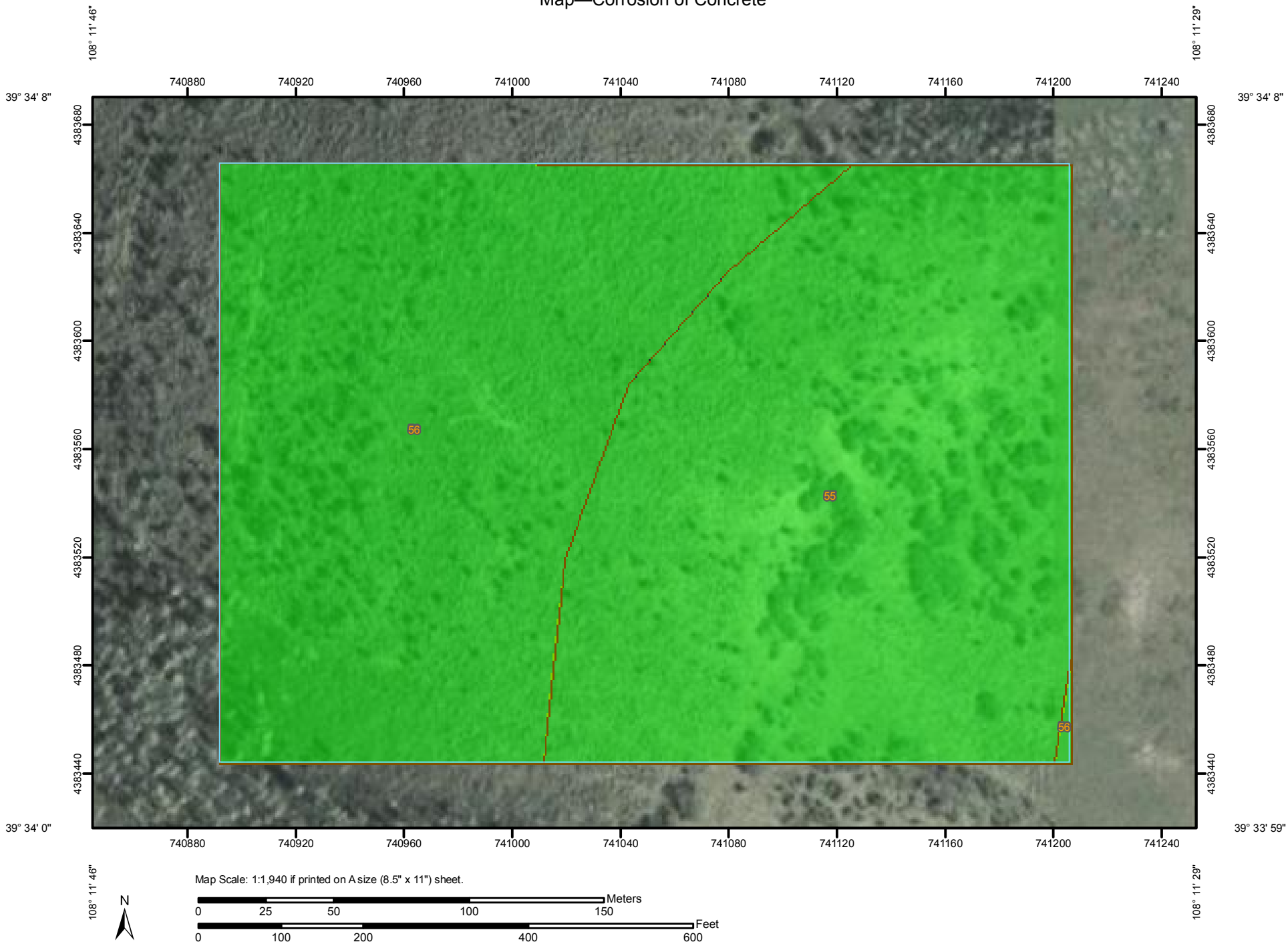
Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Concrete



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- High
- Moderate
- Low
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Corrosion of Concrete— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	Low	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	Low	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

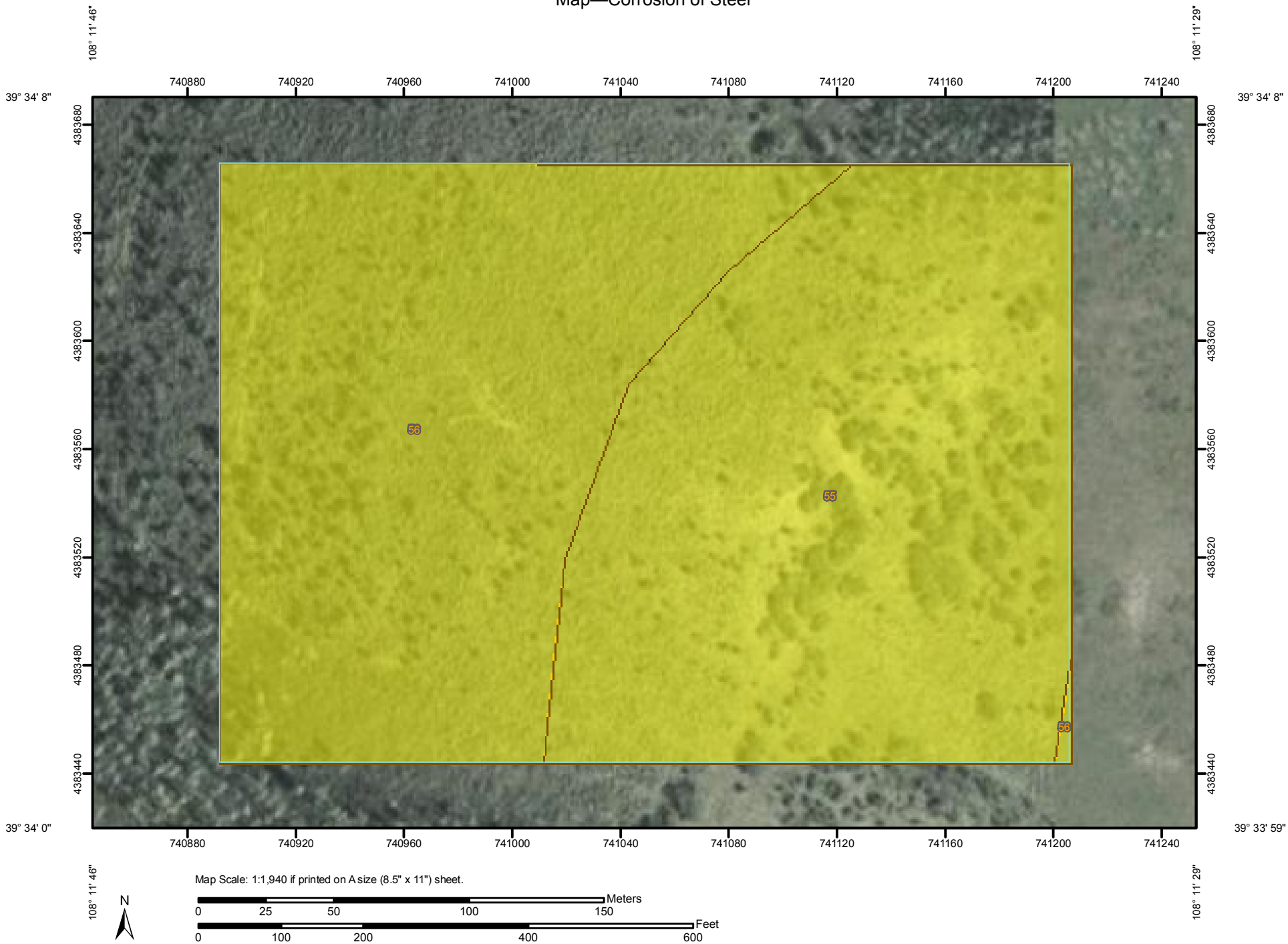
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Corrosion of Steel

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Custom Soil Resource Report
Map—Corrosion of Steel



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- High
- Moderate
- Low
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Steel

Corrosion of Steel— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	Moderate	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	Moderate	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Local Roads and Streets

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

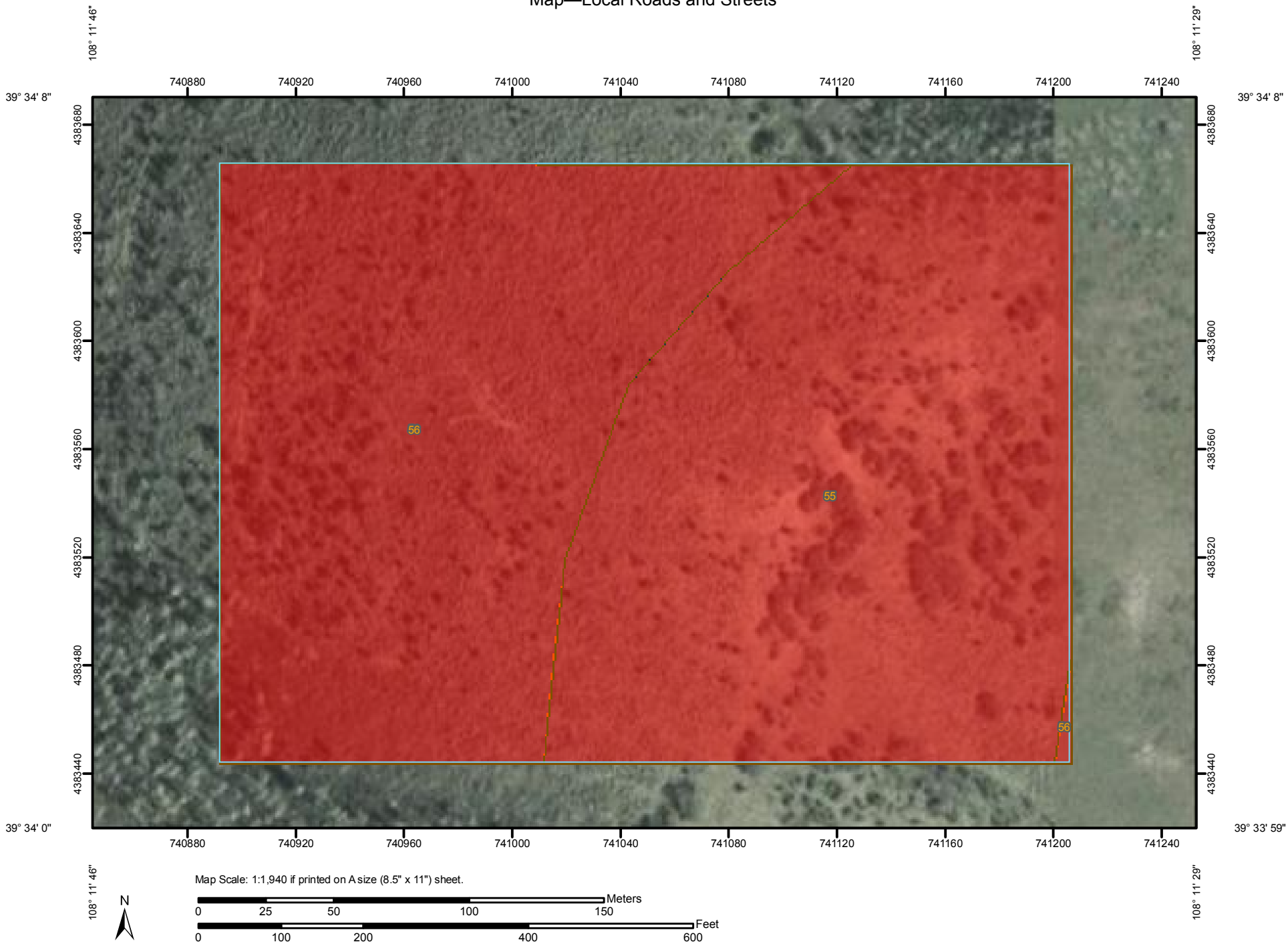
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Local Roads and Streets



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Local Roads and Streets

Local Roads and Streets— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	Very limited	Parachute (60%)	Slope (1.00)	8.8	51.4%
				Frost action (0.50)		
			Irigul (30%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	Very limited	Parachute (35%)	Slope (1.00)	8.3	48.6%
				Frost action (0.50)		
			Irigul (30%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
			Rhone (20%)	Slope (1.00)		
				Frost action (0.50)		
Totals for Area of Interest					**17.2**	**100.0%**

Local Roads and Streets— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	17.2	100.0%
Totals for Area of Interest	**17.2**	**100.0%**

Rating Options—Local Roads and Streets

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

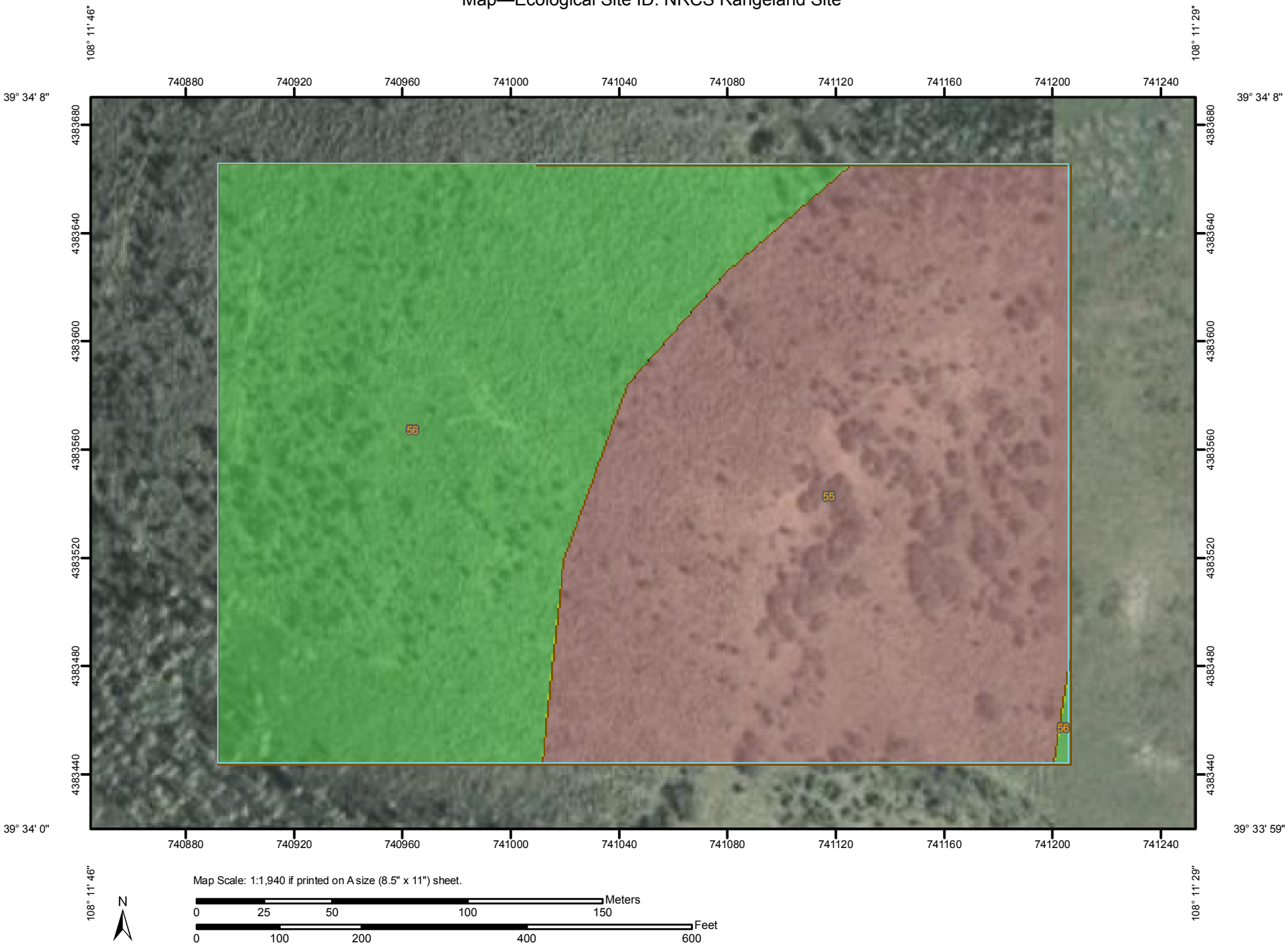
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Ecological Site ID: NRCS Rangeland Site

An "ecological site ID" is the symbol assigned to a particular ecological site. An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Custom Soil Resource Report
Map—Ecological Site ID: NRCS Rangeland Site



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- R048AY228CO
- R048AY238CO
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Ecological Site ID: NRCS Rangeland Site

Ecological Site ID: NRCS Rangeland Site— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	R048AY228CO	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	R048AY238CO	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Ecological Site ID: NRCS Rangeland Site

Class: NRCS Rangeland Site

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be

considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Water Management

Water Management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Excavated Ponds (Aquifer-Fed)

Excavated ponds (aquifer-fed) are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, saturated hydraulic conductivity (Ksat) of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

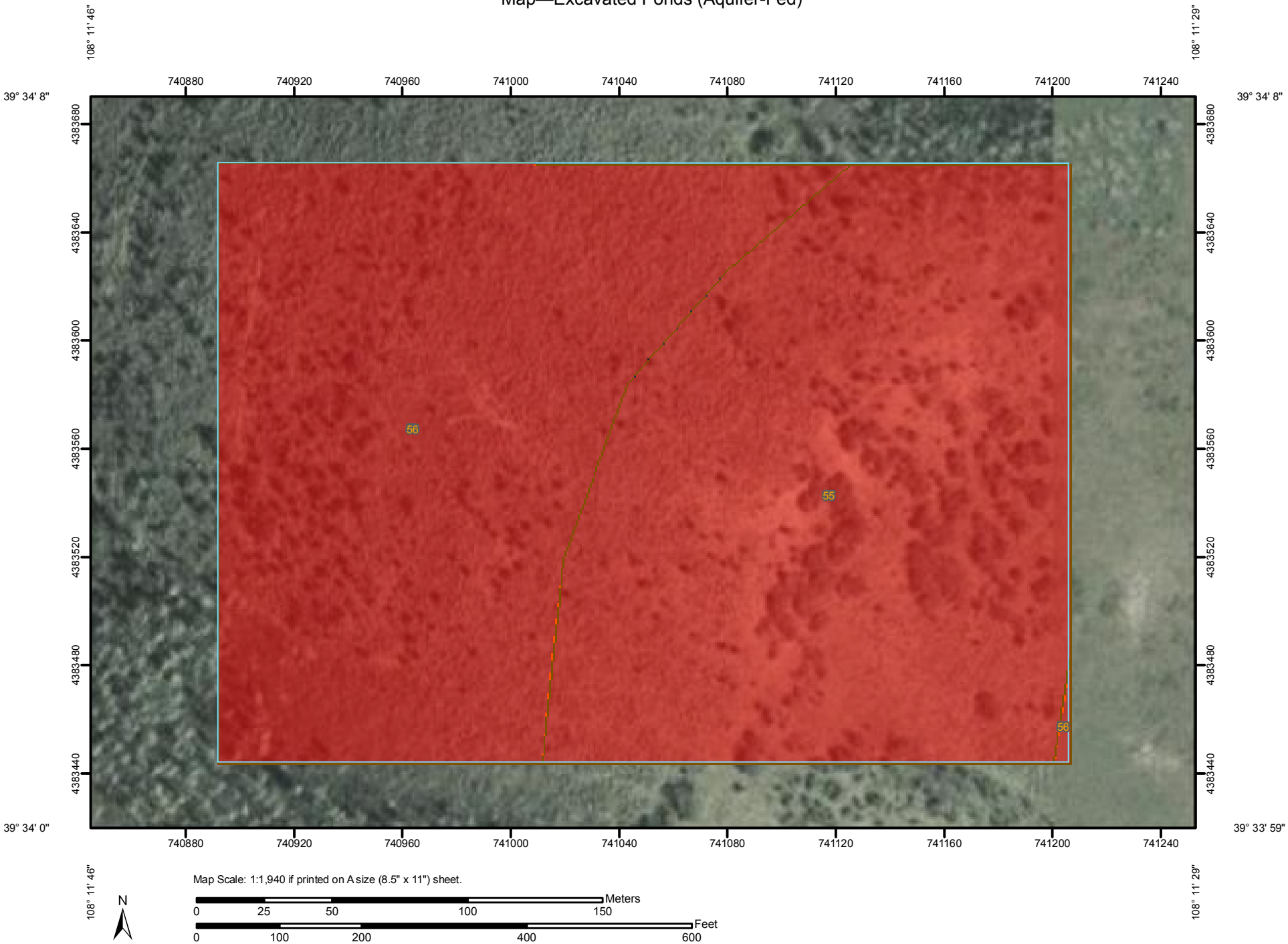
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Excavated Ponds (Aquifer-Fed)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Excavated Ponds (Aquifer-Fed)

Excavated Ponds (Aquifer-Fed)— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	Very limited	Parachute (60%)	Depth to water (1.00)	8.8	51.4%
			Irigul (30%)	Depth to water (1.00)		
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	Very limited	Parachute (35%)	Depth to water (1.00)	8.3	48.6%
			Irigul (30%)	Depth to water (1.00)		
			Rhone (20%)	Depth to water (1.00)		
Totals for Area of Interest					**17.2**	**100.0%**

Excavated Ponds (Aquifer-Fed)— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	17.2	100.0%
Totals for Area of Interest	**17.2**	**100.0%**

Rating Options—Excavated Ponds (Aquifer-Fed)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more

than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Pond Reservoir Areas

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

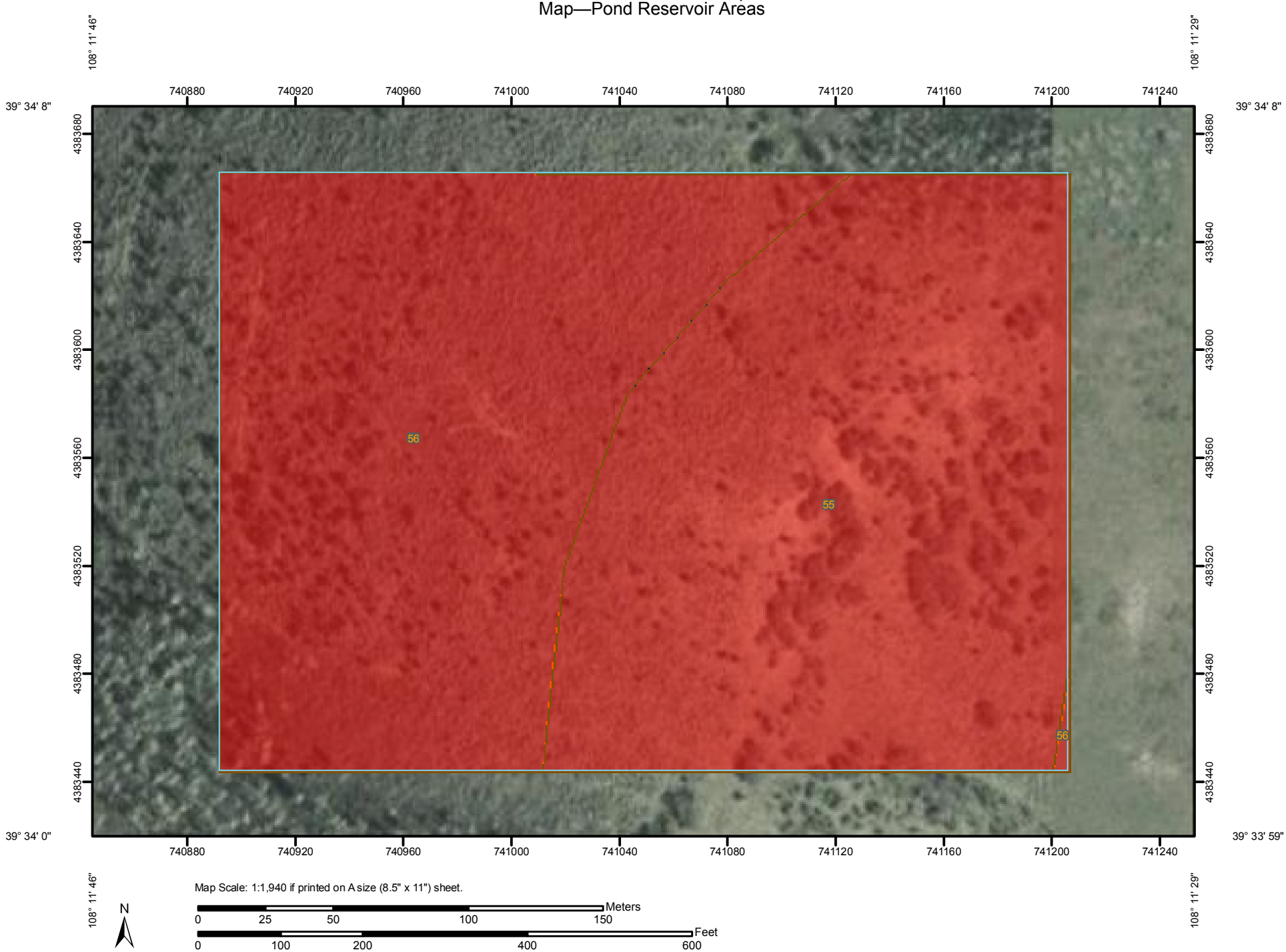
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Pond Reservoir Areas



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Pond Reservoir Areas

Pond Reservoir Areas— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	Very limited	Parachute (60%)	Slope (1.00)	8.8	51.4%
				Seepage (0.72)		
				Depth to bedrock (0.26)		
			Irigul (30%)	Depth to bedrock (1.00)		
				Slope (1.00)		
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	Very limited	Parachute (35%)	Slope (1.00)	8.3	48.6%
				Seepage (0.72)		
				Depth to bedrock (0.26)		
			Irigul (30%)	Slope (1.00)		
				Depth to bedrock (1.00)		
			Rhone (20%)	Slope (1.00)		
				Seepage (0.72)		
				Depth to bedrock (0.00)		
Totals for Area of Interest					**17.2**	**100.0%**

Pond Reservoir Areas— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	17.2	100.0%
Totals for Area of Interest	**17.2**	**100.0%**

Rating Options—Pond Reservoir Areas

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

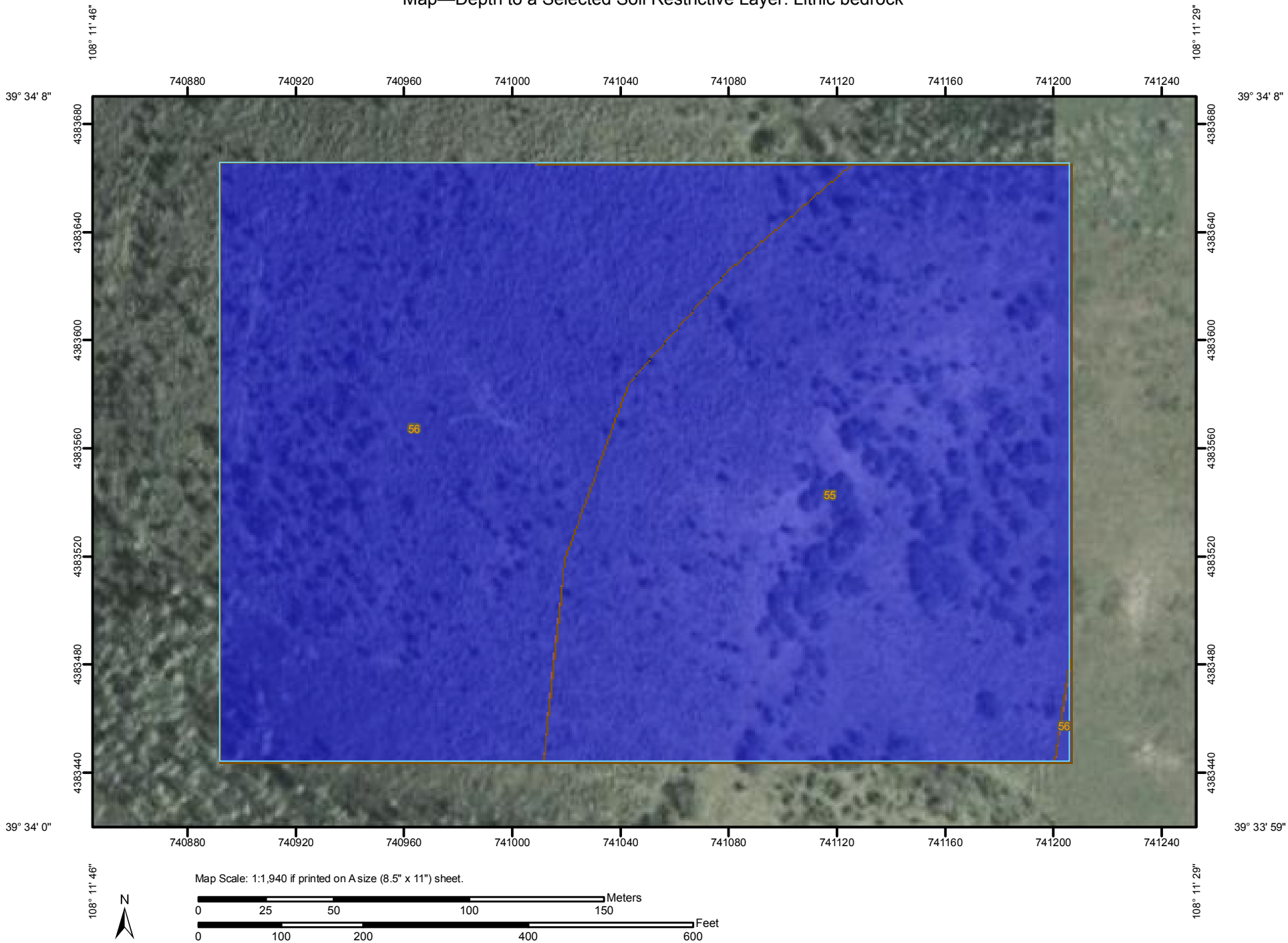
Depth to a Selected Soil Restrictive Layer: Lithic bedrock

A "restrictive layer" is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers.

This theme presents the depth to the user selected type of restrictive layer as described in for each map unit. If no restrictive layer is described in a map unit, it is represented by the "> 200" depth class.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to a Selected Soil Restrictive Layer: Lithic bedrock



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

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Table—Depth to a Selected Soil Restrictive Layer: Lithic bedrock

Depth to a Selected Soil Restrictive Layer: Lithic bedrock— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	>200	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	>200	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Depth to a Selected Soil Restrictive Layer: Lithic bedrock

Units of Measure: centimeters

Restriction Kind: Lithic bedrock

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be

considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

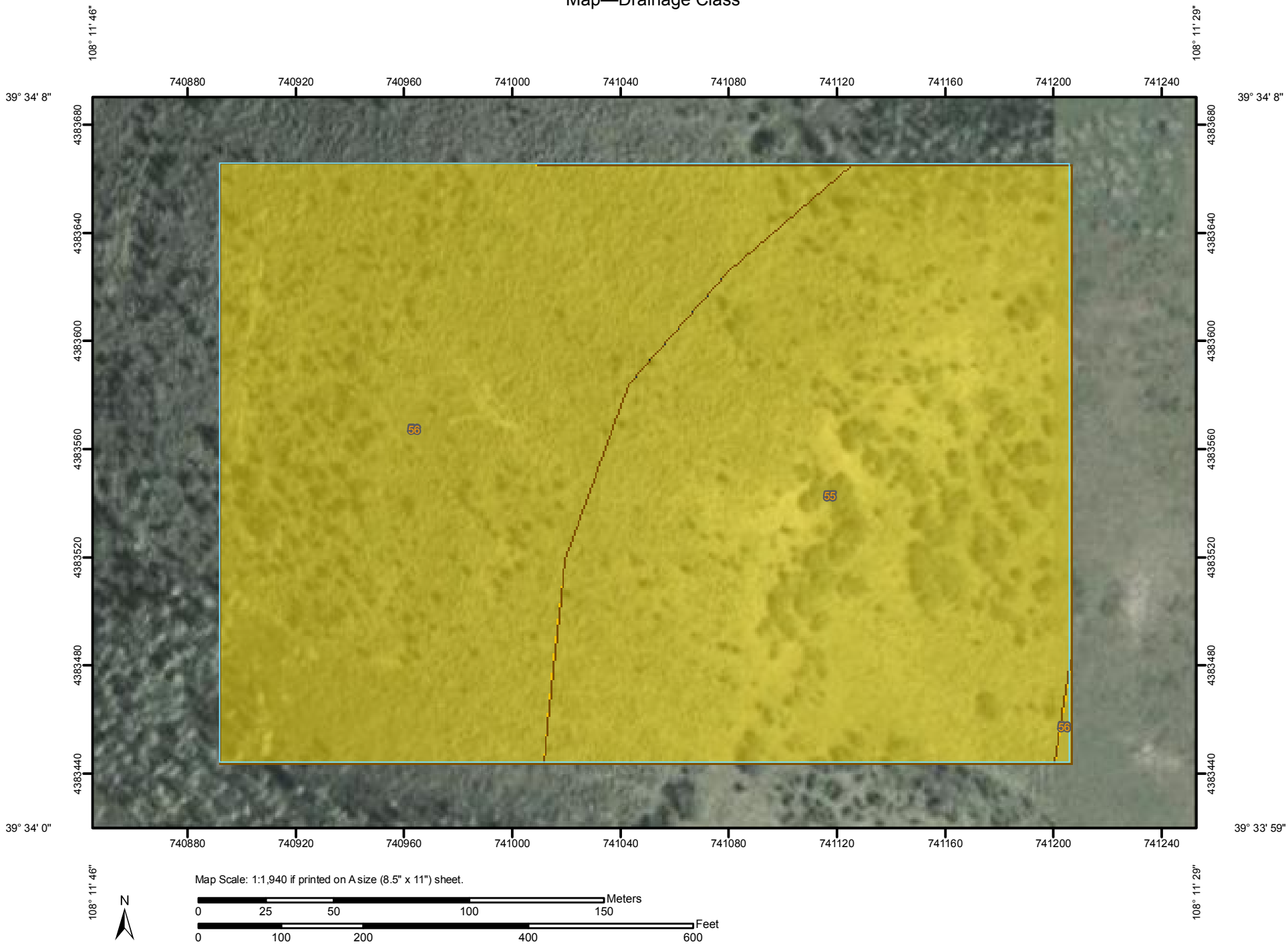
Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Drainage Class

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Custom Soil Resource Report
Map—Drainage Class



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

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Table—Drainage Class

Drainage Class— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	Well drained	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	Well drained	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Drainage Class

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

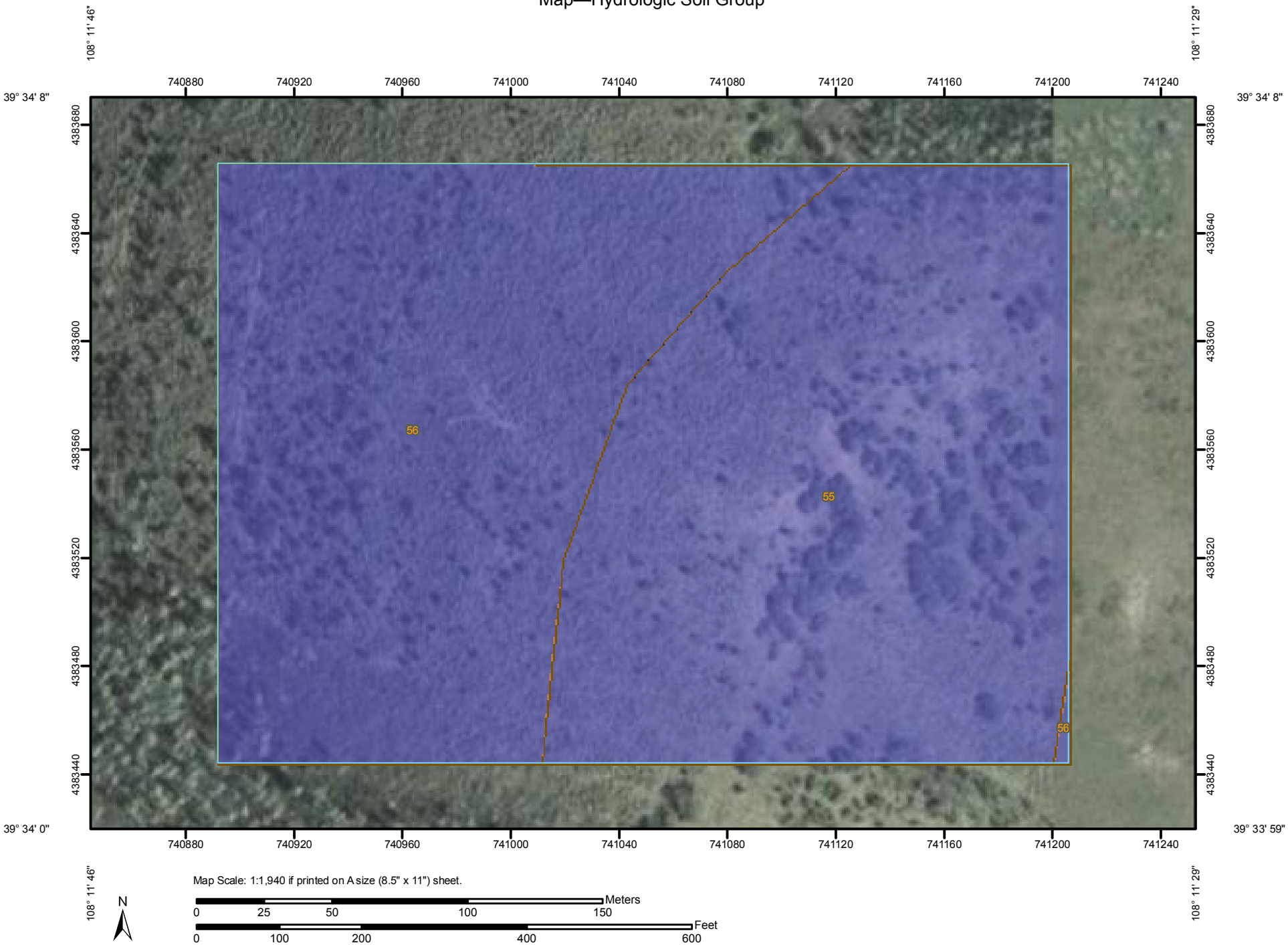
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	B	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	B	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

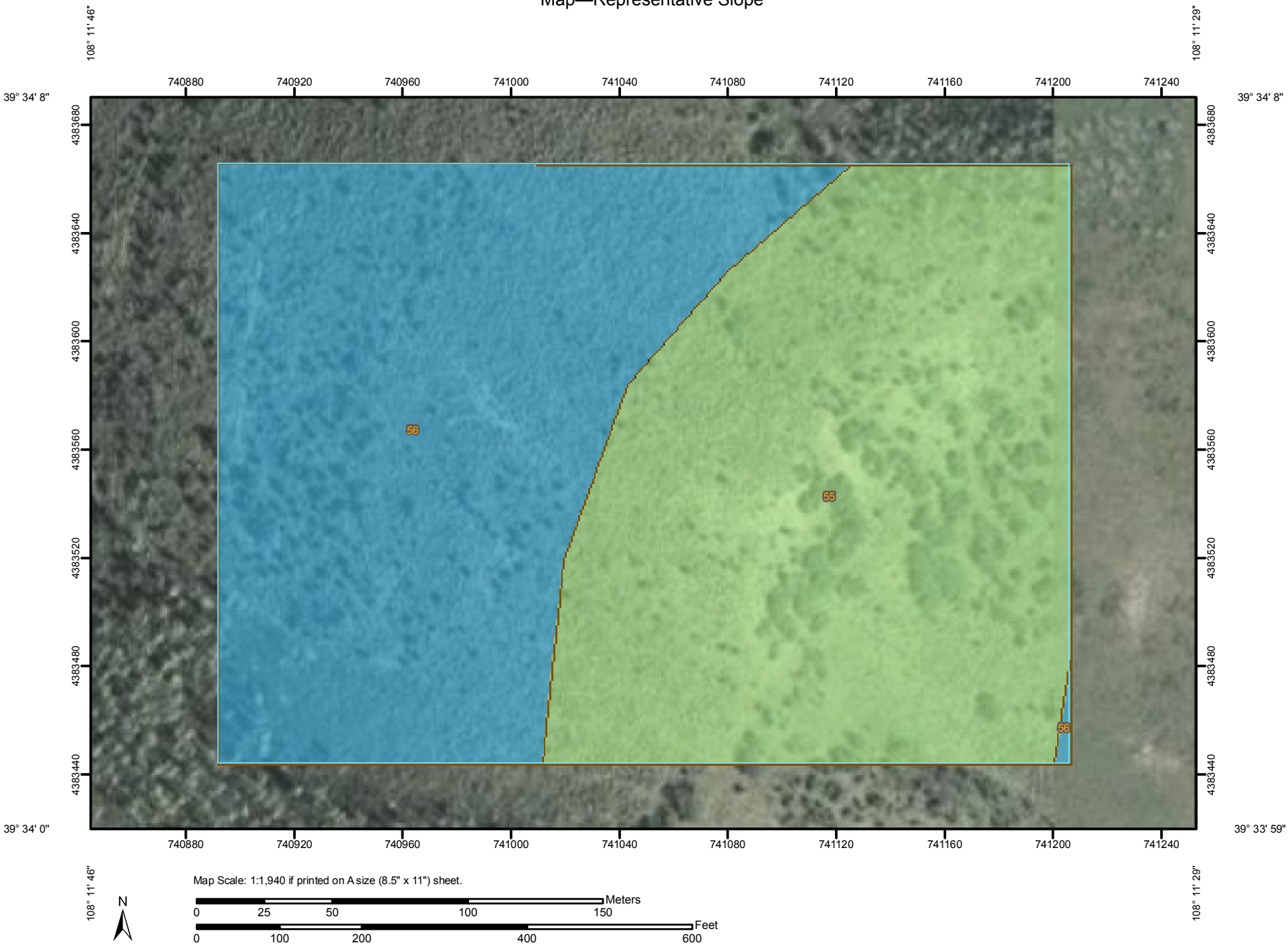
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Representative Slope

Slope gradient is the difference in elevation between two points, expressed as a percentage of the distance between those points.

The slope gradient is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Representative Slope



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- 0 - 5
- 5 - 15
- 15 - 30
- 30 - 45
- 45 - 60
- Not rated or not available

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Representative Slope

Representative Slope— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating (percent)**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	18.0	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	38.0	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Representative Slope

Units of Measure: percent

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

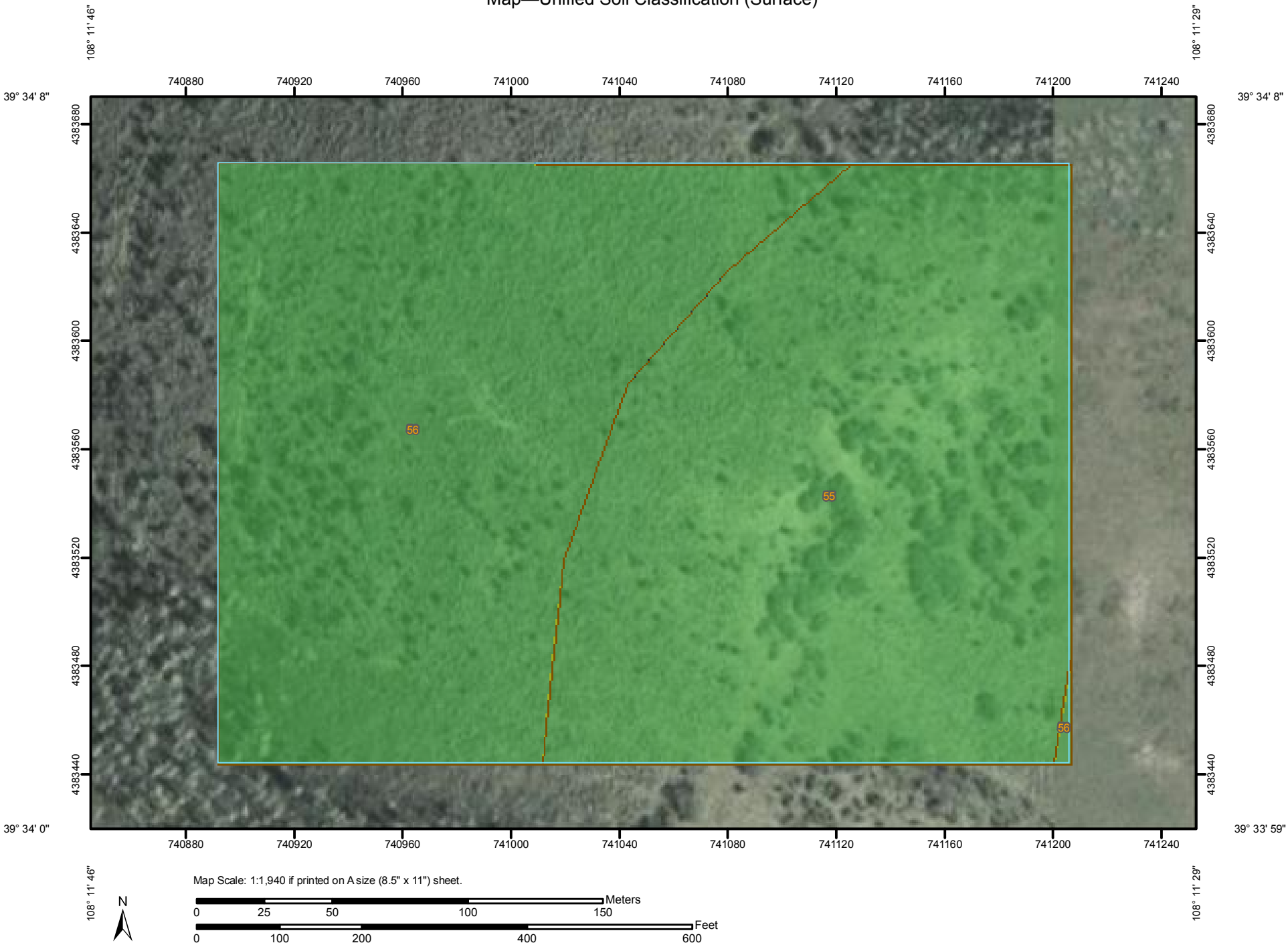
Unified Soil Classification (Surface)

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The representative classification is shown here for the surface layer of the soil.

Custom Soil Resource Report
Map—Unified Soil Classification (Surface)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- CH
- CL
- CL-A (proposed)
- CL-K (proposed)
- CL-ML
- CL-O (proposed)
- CL-T (proposed)
- GC
- GC-GM
- GM
- GP
- GP-GC
- GP-GM
- GW
- GW-GC
- GW-GM
- MH
- MH-A (proposed)
- MH-K (proposed)
- MH-O (proposed)
- MH-T (proposed)
- ML
- ML-A (proposed)
- ML-K (proposed)
- ML-O (proposed)
- ML-T (proposed)
- OH
- OH-T (proposed)
- OL
- PT
- SC
- SC-SM
- SM
- SP
- SP-SC
- SP-SM
- SW
- SW-SC
- SW-SM
- Not rated or not available

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Unified Soil Classification (Surface)

Unified Soil Classification (Surface)— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	CL	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	CL	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Unified Soil Classification (Surface)

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Layer Options: Surface Layer

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

Water Features

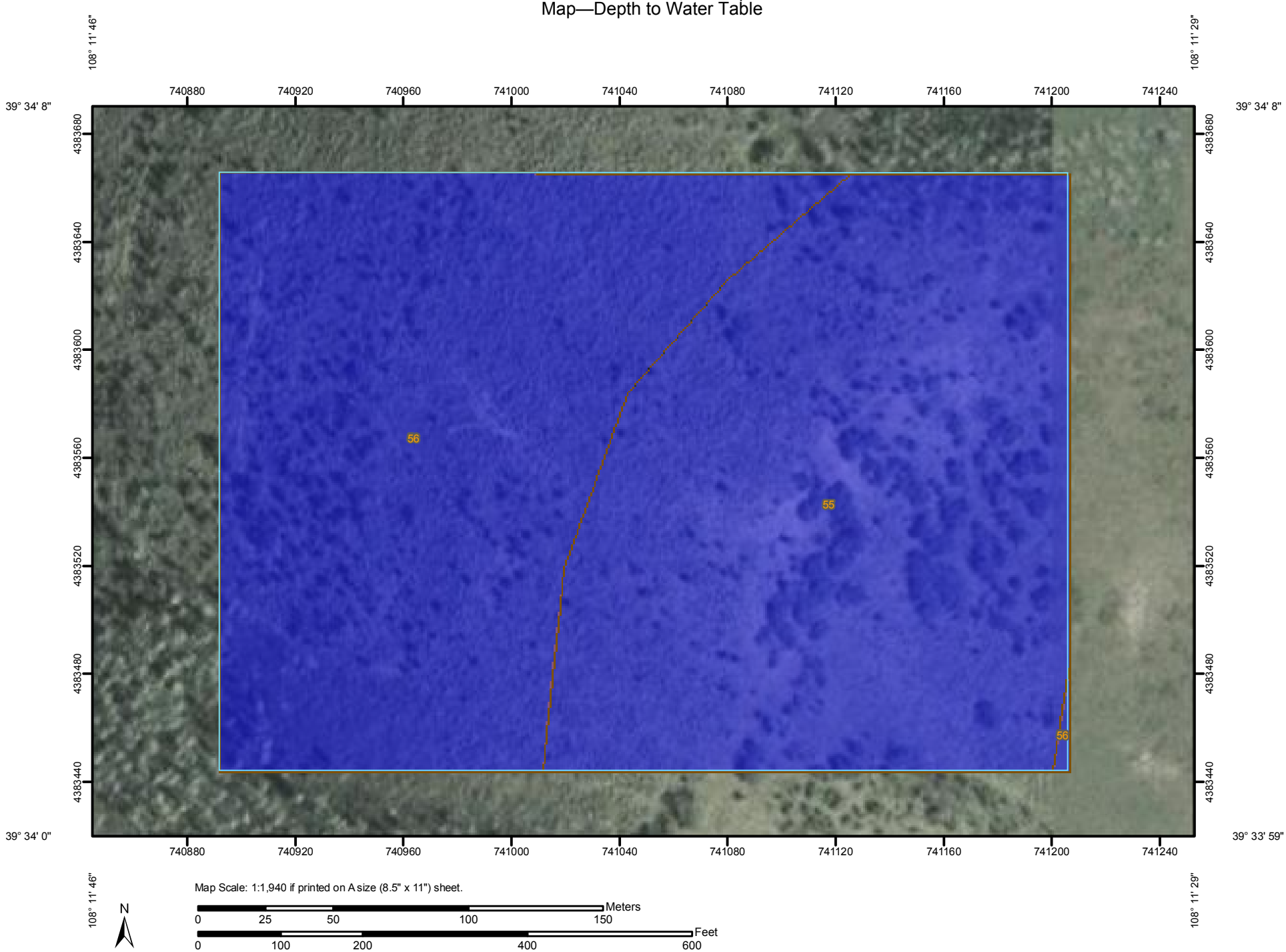
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Water Table



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Depth to Water Table

Depth to Water Table— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	>200	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	>200	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Depth to Water Table

Units of Measure: centimeters

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie.

The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Beginning Month: January

Ending Month: December

Flooding Frequency Class

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.

"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.

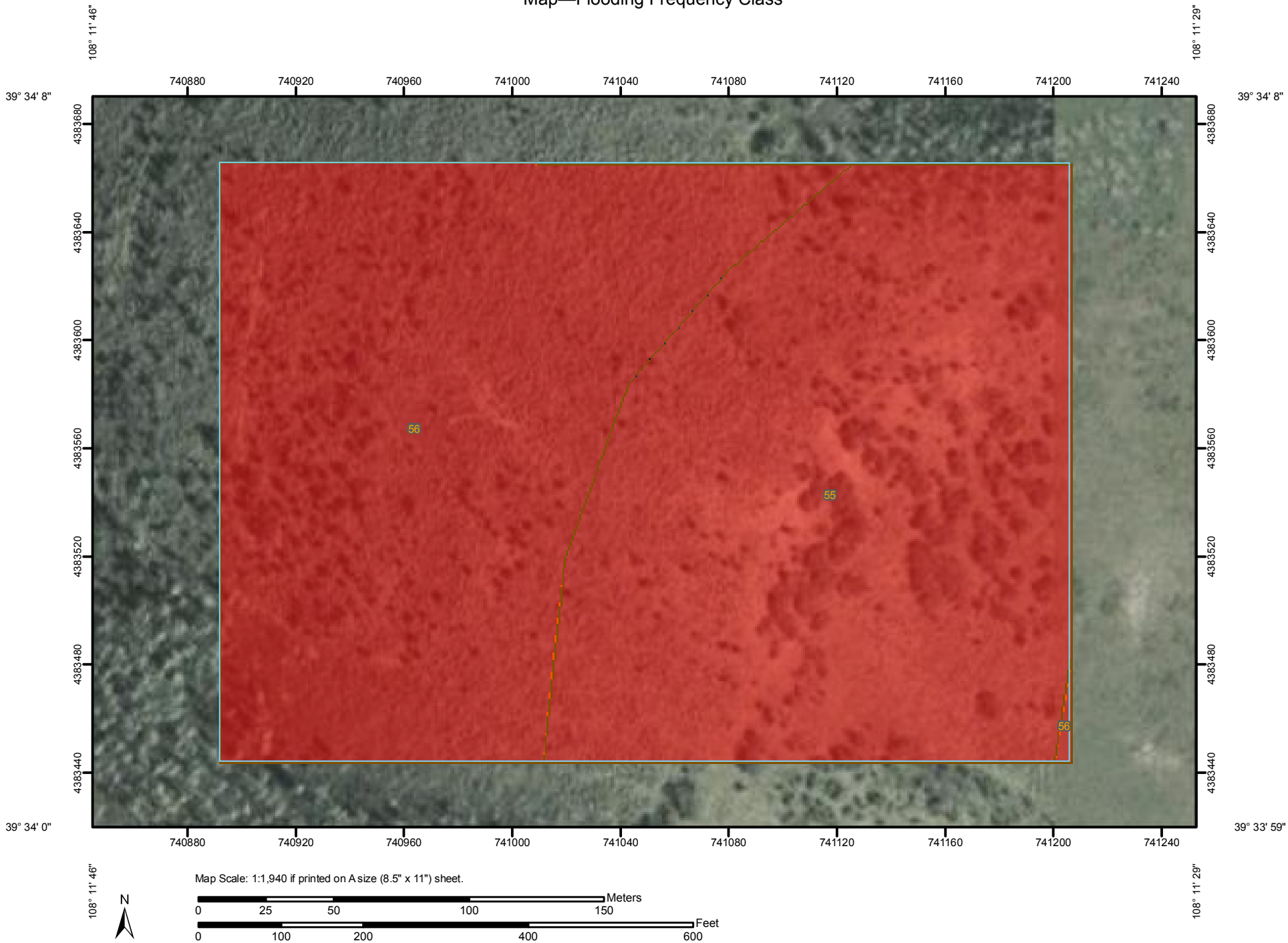
"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.

"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.

"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.

"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

Custom Soil Resource Report
Map—Flooding Frequency Class



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:1,940 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties
Survey Area Data: Version 5, Feb 1, 2008

Date(s) aerial images were photographed: 8/29/2005; 6/30/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Flooding Frequency Class

Flooding Frequency Class— Summary by Map Unit — Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties (CO682)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
55	Parachute-Irigul complex, 5 to 30 percent slopes	None	8.8	51.4%
56	Parachute-Irigul-Rhone association, 25 to 50 percent slopes	None	8.3	48.6%
Totals for Area of Interest			**17.2**	**100.0%**

Rating Options—Flooding Frequency Class

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: More Frequent

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Beginning Month: January

Ending Month: December

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Building Site Development

This folder contains a collection of tabular reports that present soil interpretations related to building site development. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Roads and Streets, Shallow Excavations, and Lawns and Landscaping

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel,

crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Roads and Streets, Shallow Excavations, and Lawns and Landscaping

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
55—Parachute-Irigul complex, 5 to 30 percent slopes							
Parachute	60	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	0.50	Depth to soft bedrock	0.84	Depth to bedrock	0.84
				Cutbanks cave	0.10	Droughty	0.65
Irigul	30	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Droughty	1.00
		Slope	1.00	Slope	1.00	Depth to bedrock	1.00
						Slope	1.00
						Gravel content	0.05
56—Parachute-Irigul-Rhone association, 25 to 50 percent slopes							
Parachute	35	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	0.50	Depth to soft bedrock	0.84	Depth to bedrock	0.84
				Cutbanks cave	0.10	Droughty	0.65
Irigul	30	Very limited		Very limited		Very limited	
		Depth to hard bedrock	1.00	Depth to hard bedrock	1.00	Slope	1.00
		Slope	1.00	Slope	1.00	Droughty	1.00
						Depth to bedrock	1.00
						Gravel content	0.05
Rhone	20	Very limited		Very limited		Very limited	
		Slope	1.00	Slope	1.00	Slope	1.00
		Frost action	0.50	Cutbanks cave	0.10		

Land Classifications

This folder contains a collection of tabular reports that present a variety of soil groupings. The reports (tables) include all selected map units and components for each map unit. Land classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Taxonomic Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2003). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. This table shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Alfisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalfs (*Ud*, meaning humid, plus *alfs*, from Alfisols).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalfs*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic Hapludalfs.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

References:

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. (The soils in a given survey area may have been classified according to earlier editions of this publication.)

Report—Taxonomic Classification of the Soils

[An asterisk by the soil name indicates a taxadjunct to the series]

Taxonomic Classification of the Soils– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties	
Soil name	**Family or higher taxonomic classification**
Irigul	Loamy-skeletal, mixed Lithic Cryoborolls
Parachute	Loamy-skeletal, mixed Typic Cryoborolls
Rhone	Fine-loamy, mixed Pachic Cryoborolls

Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Chemical Soil Properties

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Chemical Soil Properties– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
55—Parachute-Irigul complex, 5 to 30 percent slopes								
Parachute	0-10	10-25	—	6.6-7.3	0	0	0	0
	10-25	10-20	—	6.6-7.3	0	0	0	0
	25-29	—	—	—	—	—	—	—
Irigul	0-6	10-20	—	6.6-7.8	0	0	0	0
	6-13	5.0-15	—	6.6-7.8	0	0	0	0
	13-17	—	—	—	—	—	—	—
56—Parachute-Irigul-Rhone association, 25 to 50 percent slopes								
Parachute	0-10	10-25	—	6.6-7.3	0	0	0	0
	10-25	10-20	—	6.6-7.3	0	0	0	0
	25-29	—	—	—	—	—	—	—
Irigul	0-6	10-20	—	6.6-7.8	0	0	0	0
	6-13	5.0-15	—	6.6-7.8	0	0	0	0
	13-17	—	—	—	—	—	—	—
Rhone	0-10	15-30	—	6.6-7.3	0	0	0	0
	10-39	10-20	—	6.6-7.3	0	0	0	0
	39-55	10-20	—	6.6-7.3	0	0	0	0
	55-59	—	—	—	—	—	—	—

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots.

Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Physical Soil Properties– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
55—Parachute-Irigul complex, 5 to 30 percent slopes														
Parachute	0-10	-42-	-38-	15-20- 25	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	3.0-6.0	.20	.20	3	5	56
	10-25	-41-	-37-	18-22- 25	1.25-1.40	4.23-14.11	0.07-0.09	0.0-2.9	1.0-2.0	.10	.28			
	25-29	—	—	—	—	0.42-1.41	—	—	—					
Irigul	0-6	-40-	-38-	18-23- 27	1.25-1.40	4.23-14.11	0.10-0.13	0.0-2.9	1.0-3.0	.15	.28	1	6	48
	6-13	-40-	-38-	18-23- 27	1.25-1.40	4.23-14.11	0.07-0.09	0.0-2.9	0.0-0.5	.15	.43			
	13-17	—	—	—	—	0.42-1.41	—	—	—					
56—Parachute-Irigul-Rhone association, 25 to 50 percent slopes														
Parachute	0-10	-42-	-38-	15-20- 25	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	3.0-6.0	.20	.20	3	5	56
	10-25	-41-	-37-	18-22- 25	1.25-1.40	4.23-14.11	0.07-0.09	0.0-2.9	1.0-2.0	.10	.28			
	25-29	—	—	—	—	0.42-1.41	—	—	—					
Irigul	0-6	-40-	-38-	18-23- 27	1.25-1.40	4.23-14.11	0.10-0.13	0.0-2.9	1.0-3.0	.15	.28	1	6	48
	6-13	-40-	-38-	18-23- 27	1.25-1.40	4.23-14.11	0.07-0.09	0.0-2.9	0.0-0.5	.15	.43			
	13-17	—	—	—	—	0.42-1.41	—	—	—					
Rhone	0-10	-39-	-37-	20-24- 27	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	3.0-6.0	.20	.20	4	6	48
	10-39	-39-	-37-	20-24- 27	1.25-1.40	4.23-14.11	0.14-0.17	0.0-2.9	1.0-3.0	.15	.28			
	39-55	-39-	-37-	20-24- 27	1.25-1.40	4.23-14.11	0.07-0.09	0.0-2.9	0.0-1.0	.15	.37			
	55-59	—	—	—	—	0.42-1.41	—	—	—					

Soil Qualities and Features

This folder contains tabular reports that present various soil qualities and features. The reports (tables) include all selected map units and components for each map unit. Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Soil Features

This table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The table shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel

or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Soil Features– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties									
Map symbol and soil name	**Restrictive Layer**				**Subsidence**		**Potential for frost action**	**Risk of corrosion**	
	Kind	**Depth to top**	**Thickness**	**Hardness**	**Initial**	**Total**		**Uncoated steel**	**Concrete**
		In	*In*		*In*	*In*			
55—Parachute-Irigul complex, 5 to 30 percent slopes									
Parachute	Paralithic bedrock	20-40	—	Weakly cemented	0	—	Moderate	Moderate	Low
Irigul	Lithic bedrock	5-20	—	Indurated	0	—	Low	Moderate	Low
56—Parachute-Irigul-Rhone association, 25 to 50 percent slopes									
Parachute	Paralithic bedrock	20-40	—	Weakly cemented	0	—	Moderate	Moderate	Low
Irigul	Lithic bedrock	5-20	—	Indurated	0	—	Low	Moderate	Low
Rhone	Paralithic bedrock	40-60	—	Weakly cemented	0	—	Moderate	Moderate	Low

Water Management

This folder contains a collection of tabular reports that present soil interpretations related to water management. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Water management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Ponds and Embankments

This table gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or

salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, Ksat of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Report—Ponds and Embankments

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

Ponds and Embankments– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties							
Map symbol and soil name	**Pct. of map unit**	**Pond reservoir areas**		**Embankments, dikes, and levees**		**Aquifer-fed excavated ponds**	
		Rating class and limiting features	**Value**	**Rating class and limiting features**	**Value**	**Rating class and limiting features**	**Value**
55—Parachute-Irigul complex, 5 to 30 percent slopes							
Parachute	60	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Thin layer	0.96	Depth to water	1.00
		Seepage	0.72				
		Depth to bedrock	0.26				
Irigul	30	Very limited		Very limited		Very limited	
		Depth to bedrock	1.00	Thin layer	1.00	Depth to water	1.00
		Slope	1.00	Seepage	0.25		

Ponds and Embankments– Douglas-Plateau Area, Colorado, Parts of Garfield and Mesa Counties							
Map symbol and soil name	Pct. of map unit	Pond reservoir areas		Embankments, dikes, and levees		Aquifer-fed excavated ponds	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
56—Parachute-Irigul-Rhone association, 25 to 50 percent slopes							
Parachute	35	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Thin layer	0.96	Depth to water	1.00
		Seepage	0.72				
		Depth to bedrock	0.26				
Irigul	30	Very limited		Very limited		Very limited	
		Slope	1.00	Thin layer	1.00	Depth to water	1.00
		Depth to bedrock	1.00	Seepage	0.25		
Rhone	20	Very limited		Somewhat limited		Very limited	
		Slope	1.00	Seepage	0.25	Depth to water	1.00
		Seepage	0.72	Thin layer	0.02		
		Depth to bedrock	0.01				

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Attachment K
Spill Prevention, Control and Countermeasures Plan

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

596-32C Facility

Production Phase Facility Configuration

- Certifications
- Facility Layout Diagram
- Storage Tank Inventory
- Secondary Containment Capacities
- Facility Site Berm Design

Certifications

- Professional Engineer Certification
- Implementation Requirements
- Management Approval
- EPA Applicability of Substantial Harm Criteria

PROFESSIONAL ENGINEER CERTIFICATION

By means of this Professional Engineer Certification, I hereby attest, to the best of my knowledge and belief, to the following:

- I am familiar with the requirements of 40 CFR Part 112 and have verified that these Plans have been prepared in accordance with the requirements of this Part.
- I or my agent have visited and examined the Facilities.
- I have verified that these Plans have been prepared in accordance with good engineering practice, including consideration of applicable industry standards.
- I have verified that the required inspection and testing procedures have been established as described in the Plans.
- I have verified that the Plans are adequate for the Facilities.
- My certification of these Plans in no way relieves the owner/operator of the Facilities of their duty to prepare and fully implement the Plans in accordance with the requirements of 40 CFR Part 112.

PE Signature & Date shall appear through seal
per Colorado AES Board Rules

Date of Facilities
Visit/Exam: 6/19/2012

Frank K. Ferris
InterTech Environmental & Engineering
Colorado PE 46342

Implementation Requirements for Marathon Oil Company Spill Prevention, Control, and Countermeasure Plan

If further examination of the Facility covered by this SPCC plan identifies the need for corrective action to bring the Facility into compliance with the Spill Prevention, Control and Countermeasures Planning requirements detailed in 40 CFR Part 112 (SPCC Planning regulation) the action items will be listed below.

This Plan is approved and certified by the Professional Engineer based upon satisfactory completion and documentation of the corrective action item(s) listed below. It is recommended that you complete the corrective action(s) and provide adequate documentation of completion as soon as possible.

Corrective Action Items:	Completion Scheduled Date Due	Date * Completed
Remove KAS Unit from App C; 32C-B	9/17/2013	

* Date should be initialed by Management when completed.

MANAGEMENT APPROVAL OF THE IMPLEMENTATION ITEMS

Date: 6/17/2013

Management Signature: Eric R Ward

Name and Title: Eric R. Ward Operations Manager

MANAGEMENT APPROVAL

Owner/Operator responsible for Facilities: Marathon Oil Company

- By Signature below, the Manager approves this Plan as part of the Multi-Facility SPCC plan, has the authority to commit the necessary resources to implement this Plan, and acknowledges that the elements identified within this Plan will be implemented.
- This page may be used for the initial Management Approval or for subsequent change of management and/or change of designated person accountable.

Signature:	Eric R. Ward	Designated person accountable for spill prevention:	
Name:	**Eric R. Ward**	Name:	**Eric R. Ward**
Date:	6/17/2013	Title:	Operations ~~Superintendent~~ Manager
Title:	Operations ~~Superintendent~~ Manager		

Signature:		Designated person accountable for spill prevention:	
Name:		Name:	
Date:		Title:	
Title:			

Signature:		Designated person accountable for spill prevention:	
Name:		Name:	
Date:		Title:	
Title:			

Signature:		Designated person accountable for spill prevention:	
Name:		Name:	
Date:		Title:	
Title:			

EPA APPLICABILITY OF SUBSTANTIAL HARM CRITERIA

1. Does the facility transfer oil over water to or from vessels ***and*** does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

   YES _____ NO ✓

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground oil storage tank area?

   YES _____ NO ✓

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** is the facility located at a distance[1] such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments?

   YES ✓ NO _____

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** is the facility located at a distance[1] such that a discharge from the facility would shut down a public drinking water intake[2]?

   YES ✓ NO _____

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons ***and*** has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

   YES _____ NO ✓

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Substantial Harm Determination document, and that based on my inquiry of those individuals responsible for obtaining information, I believe that the submitted information is true, accurate, and complete.

Signature: Eric R. Ward

Name: **Eric R. Ward**

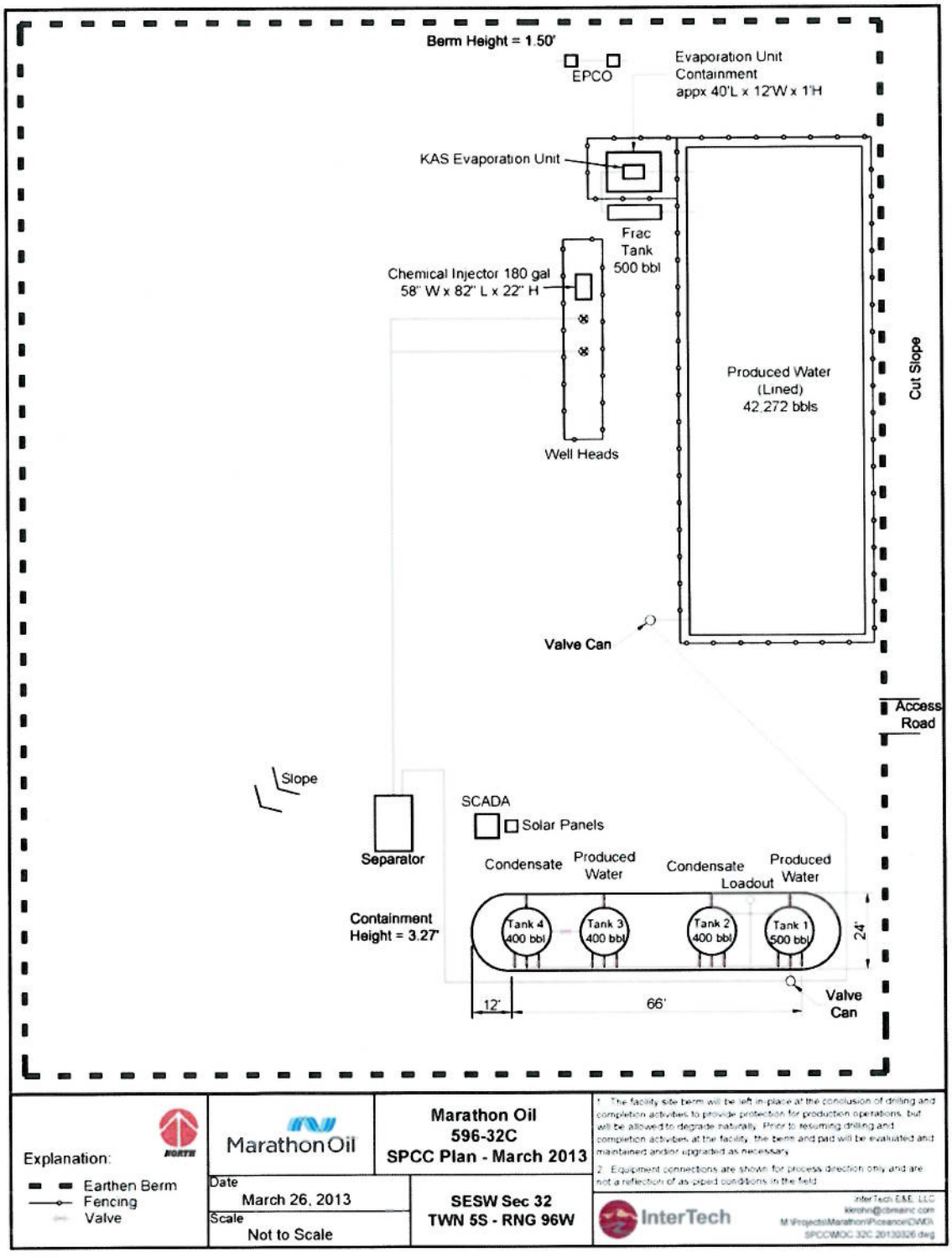
Title: **Operations ~~Superintendent~~ Manager**

Date: 6/17/2013

1 As calculated using the appropriate formula in Attachment C-III to 40 CFR Part 112 or a comparable formula). If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.

2 For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).

Facility Layout Diagram


Berm Height = 1.50'
EPCO
Evaporation Unit
Containment
appx 40'L x 12'W x 1'H
KAS Evaporation Unit
Frac
Tank
500 bbl
Chemical Injector 180 gal
58" W x 82" L x 22" H
Well Heads
Produced Water
(Lined)
42,272 bbls
Cut Slope
Valve Can
Access
Road
Slope
SCADA
Solar Panels
Separator
Condensate
Produced
Water
Condensate
Loadout
Produced
Water
Containment
Height = 3.27'
Tank 4
400 bbl
Tank 3
400 bbl
Tank 2
400 bbl
Tank 1
500 bbl
24'
12'
66'
Valve
Can
Explanation:
Earthen Berm
Fencing
Valve
Marathon Oil
Marathon Oil
596-32C
SPCC Plan - March 2013
Date
March 26, 2013
Scale
Not to Scale
SESW Sec 32
TWN 5S - RNG 96W
1. The facility site berm will be left in place at the conclusion of drilling and completion activities to provide protection for production operations, but will be allowed to degrade naturally. Prior to resuming drilling and completion activities at the facility, the berm and pad will be evaluated and maintained and/or upgraded as necessary.
2. Equipment connections are shown for process direction only and are not a reflection of as-piped conditions in the field.
InterTech

Storage Tank Inventory

BULK STORAGE CONTAINER IDENTIFICATION AND INVENTORY - PRODUCTION

(Any container that stores 55 gallons or more of oil)

Container/ Source I.D.	Number of Tanks Possible	Substance Stored *(oil & Haz. Substance)*	Maximum Capacity *(Gal or bbls)*	Container Type *(i.e. floating roof, fixed roof, etc.)*	Vacuum/ Pressure Relief	Level Alarm/ Gauge	Potential Failure *(Leak/Rupture/ Overflow)*	Rate of Flow	Direction of Flow	Secondary Containment Capacity *(Gallons)*	Applicable Regulations (40 CFR 112)
BULK STORAGE CONTAINERS											
Tank 1	1	Produced Water	21,000 gal	Steel, Fixed	Yes	Yes	Up to 21,000 gal	Gradual to Instantaneous	Southwest	41,507	112.7, 112.9
Tank 2	1	Condensate	16,800 gal	Steel, Fixed	Yes	Yes	Up to 16,800 gal	Gradual to Instantaneous	Southwest	41,507	112.7, 112.9
Tank 3	1	Produced Water	16,800 gal	Steel, Fixed	Yes	Yes	Up to 16,800 gal	Gradual to Instantaneous	Southwest	41,507	112.7, 112.9
Tank 4	1	Condensate	16,800 gal	Steel, Fixed	Yes	Yes	Up to 16,800 gal	Gradual to Instantaneous	Southwest	41,507	112.7, 112.9
Frac Tank	1	Produced Water	21,000 gal	Steel, Fixed	Yes	Yes	Up to 21,000 gal	Gradual to Instantaneous	Southwest	NA[2]	112.7, 112.9
Pond	1	Produced Water	1,775,424 gal	Lined	No	Yes	Up to 2,893,144 gal	Gradual to Instantaneous	Southwest	NA[2]	112.7, 112.9
MOBILE/VARIABLE BULK STORAGE CONTAINERS[1]											
OTHER POTENTIAL SOURCES											
Separator	1	Condensate / Water	NA	Steel	NA	NA	Varies with Production	Gradual to Instantaneous	Southwest	NA[2]	112.7, 112.9
KAS Evap Unit	1	Produced Water	NA	Steel	NA	NA	Varies with Production	Gradual to Instantaneous	Southwest	3,590	112.7, 112.9
NON-JURISDICTIONAL CONTAINERS											
NA	1	Corrosion Inhibitor	180 gal	Steel	NA	NA	Up to 180 gal	Gradual to Instantaneous	Southwest	NA	NA

* Identified tank(s) are field constructed containers.

[1] The number of mobile/variable bulk storage containers on site may vary as containers are added and removed during operations. Each type and capacity of mobile/variable container is represented in the inventory along with the maximum number of containers stored on site at any given time.

[2] In lieu of secondary containment measures, in accordance with 40 CFR 112.7(d), Marathon has provided in the SPCC plan an oil spill contingency plan following the provision of part 109 and a written commitment of manpower, equipment, and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful.

Secondary Containment Capacities

SECONDARY CONTAINMENT CALCULATIONS - PRODUCTION TANK BATTERY

Tank Battery Secondary Containment Capacity	
Actual Containment Height	3.27 ft
Minimum Containment Height[2]	1.46 ft
Secondary Containment Area	66 ft x 24 ft + (π x 12² ft) = 2,036 ft²
Tank Footprint	4 tanks @ 12 ft dia. each = (4 – 1) x (π x 12²/4) = 339 ft²
Net Volume	3.27 ft x (2,036 ft² - 339 ft²) = 5,549 ft³ x 7.48 gal/ft³ = 41,507 gal
Freeboard for Precipitation	
25 Year, 24 Hour Storm Event Precipitation (NOAA) [1]	0.19 ft
Volume of the Largest Facility Tank	21,000 gal x (1 ft³ / 7.48 gal) = 2,807 ft³
Net Area (Minus Tank Footprint)	2,036 ft² - 339 ft² = 1,697 ft²
Minimum Containment Height to Contain the Largest Tank	2,807 ft³ / 1,697 ft² = 1.65 ft
Freeboard	3.27 ft – 1.65 ft = 1.62 ft
25 Year, 24 Hour Storm Event Volume	2,612 ft² x 0.19 ft = 496 ft³
Freeboard use by a 25 Year, 24 Hour Storm Event	496 ft³ / 2,273 ft² = 0.22 ft
Available Freeboard (Minus 25 Year, 24 Hour Storm Event)	1.62 ft – 0.22 ft = 1.4 ft

[1] The 25 Year, 24 Hour Storm Event information is from the NOAA Atlas 2: Precipitation-Frequency Atlas of the Western United States, Volume III-Colorado

[2]The minimum containment height is calculated to: accommodate the footprint volume of other structures within the containment and hold the volume of the largest tank and the volume of the 25-year 24-hour rainfall event; and account for surface irregularities (sloping and settling) within the containment. Marathon will ensure that, at a minimum, this height is maintained.

CONTAINMENT CALCULATIONS - PRODUCTION FACILITY SITE BERM

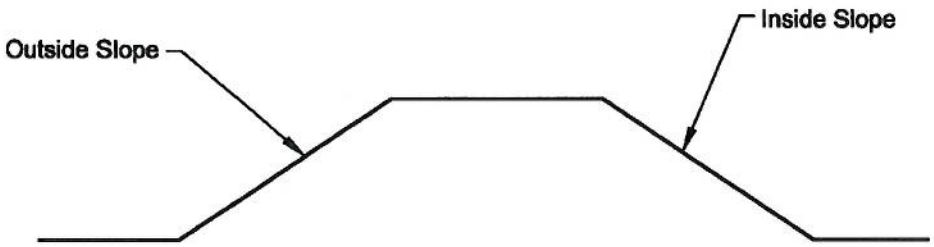
Facility Site Berm Capacity	
Actual Berm Height[3]	1.50 ft
Minimum Facility Site Berm Area	367 ft x 485 ft = 177,995 ft^2
Facility Equipment Footprint [1]	2,141 ft^2
Net Volume	1.50 ft x (177,955 ft^2 – 2,141 ft^2) = 263,721 ft^3 x 7.48 gal/ft^3 = 1,972,633 gal
Freeboard for Precipitation	
25 Year, 24 Hour Storm Event Precipitation (NOAA) [2]	0.19 ft
Volume of the Largest Facility Tank	21,000 gal x (1 ft^3 / 7.48 gal) = 2,807 ft^3
Net Area (Minus Facility Equipment Footprint)	177,955 ft^2 – 2,141 ft^2 = 175,814 ft^2
Minimum Facility Site Berm Height to Contain the Largest Tank	3,369 ft^3 / 175,814 ft^2 = 0.02 ft
Freeboard	1.50 ft – 0.02 ft = 1.48 ft
25 Year, 24 Hour Storm Event Volume	177,995 ft^2 x 0.19 ft = 33,819 ft^3
Freeboard use by a 25 Year, 24 Hour Storm Event	33,819 ft^3 / 175,814 ft^2 = 0.19 ft
Available Freeboard (Minus 25 Year, 24 Hour Storm Event)	1.48 ft - 0.19 ft = 1.29 ft

[1] The Equipment Footprint is an estimate of the area within the Facility Site Berm which is unusable as containment due to equipment, storage tanks, vehicles, etc. The footprint is based on the following calculation: Gas production, separation and dehydration unit (8' x 10') + Scada unit (5' x 5') + Tank Battery (66' x 24' + (π x 12^{2}')).

[2] The 25 Year, 24 Hour Storm Event information is from the NOAA Atlas 2: Precipitation-Frequency Atlas of the Western United States, Volume III-Colorado.

[3] The facility site berm will be left in-place at the conclusion of drilling and completion activities to provide protection for production operations, but will be allowed to degrade naturally. Prior to resuming drilling and completion activities at the facility, the berm and pad will be evaluated and maintained and/or upgraded as necessary. In lieu of secondary containment measures, Marathon has, as required, included in Appendix G and H an Oil Spill Response Procedure and Written Commitment of Manpower to expeditiously control and remove any quantity of oil discharged that may be harmful.

Facility Site Berm Design



Berm Section Detail
Slope is exaggerated

Note:

Facility site berms are left in place at the conclusion of drilling and completions activities to provide additional protection for production operations, but are allowed to degrade naturally. Prior to resuming drilling or completions activities on a pad, the berm and pad will be evaluated and maintained / upgraded as necessary.

Piceance Well Pad Facilities Generic Berm Production Phase		
Date July 15, 2009	Drawn K. Anders	Scale 1"=1'-0"
Drawing Ref. No. Generic Berm		Rev. April 2, 2013
Drawing M:\Projects\Marathon\Piceance\DWG\Generic SPCC Documents \20130402_SPCC_Piceance_Facility_Berm_Generic_Production.dwg		InterTech

Attachment L
Geohydrology Report

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

Form 28 - Centralized E&P Waste Management Facility
Permit Application for Facility #335982
Marathon Oil Company Water Storage Facility
SE SW Section 32, T5S, R96W, 6th P.M., Garfield County, Colorado

Rule 908.b (4)

Topography

The Marathon Oil Company (MOC) Water Storage Facility No. 335982 (facility) is located in the highlands of the Roan Plateau region in central Garfield County, Colorado. The general terrain surrounding the facility undulates between numerous northeast trending drainages that have incised into the underlying bedrock, creating hummocky uplands that parallel the drainages. Local relief between these valleys and surrounding ridges typically range from 200-400 feet. At the proposed site location, the elevation is approximately 8,340 feet above sea level with the elevation in the adjacent drainage to the north (Little Creek) at 8,070 feet above sea level.

Soils (Rule 908.b (7).A.i)

The proposed facility is underlain primarily by soil of the Parachute-Irigul complex, 5 to 30 percent slopes. This complex is characterized as a loam to extremely channery loam that ranges in depth between 20 and 40 inches. The soil is well drained with low available water capacity. Water transmitting capacity ranges from moderately low to moderately high (0.06-0.2 in/hr). The parent material of the soil is residuum from weathered bedrock, which typically is composed of siltstone, sandstone, or shale in the vicinity of the proposed facility. Also present on the western extent the proposed facility area is the Parachute-Irigul-Rhone association, 25-50 percent slopes. This association has similar physical and textural characteristics to the Parachute-Irigul complex, although the Rhone member has a greater potential depth (up to 55 inches in thickness) that is derived from colluvium.

Bedrock Geology (Rule 908.b (7).A.ii)

The bedrock underlying the proposed facility is composed of interlayered, early Tertiary-age sedimentary units of varying grain-size and composition. The uppermost bedrock unit immediately below the unconsolidated soil in the project area is the late Eocene-age Uinta Formation. In western Colorado, the Uinta Formation is composed of silty sandstone, siltstone and marlstone. The Uinta Formation that can approach 1,000 feet in thickness (Self and others, 2010). Underlying the Uinta Formation is the Parachute Creek member of Eocene-age Green River Formation. The Parachute Creek member, with thicknesses upwards of 1,000 feet, is composed primarily of dolomitic marlstone. Kerogen, a waxy hydrocarbon, also called "oil shale," is present in great abundance within intervals of the Parachute Creek member. Below the Parachute Creek member are the Garden Gulch, Douglas Creek, and Anvil Points member of the Green River Formation. These units are composed of limestone and carbonate-rich

mudstones with intervals of oil shale with varying percentages of kerogen present (Self and others, 2010).

Underlying the Green River Formation are the early Eocene- and Paleocene Wasatch and Fort Union Formations as well as the Cretaceous Mesaverde Group (Robson and Banta, 1995). A bore log of Marathon's well 596-32A-#18, which is located at the project site indicates that the top of the Wasatch Formation was encountered at a depth of 4,720 feet below ground level (bgl), indicating that the combined thickness of the Uinta and Green River Formations exceeds 4,700 feet in the project area (Colorado Oil and Gas Conservation Commission website, accessed October 3rd, 2012).

Local and Regional Geologic Structures (Rule 908.b (7).A.iii)

The proposed storage facility is located near the southwestern rim of the Roan Plateau, an upland area demarcated regionally by cliffs over 3,000 feet in height north of the Colorado River valley in Garfield County. The Roan Plateau is situated in the east-central part of the Piceance Basin, a northwest-southeast trending structural depression covering over 7,000 square miles in west-central Colorado. The Piceance Basin lies within the Colorado Plateau physiographic province, a structurally stable, uplifted region of Precambian- to Holocene-age geologic formations noted for high plateaus, thick sequences of Mesozoic stratigraphy, and deeply incised canyons in the Colorado River watershed (USGS, 2004).

The project site is situated on the northeastern limb of the Crystal Creek Anticline (upwarp of strata). The axis of the anticline trends northwest-southeast and the structure plunges into the subsurface about 4 miles northwest of the project area. The anticline is slightly asymmetrical, with steeper dipping strata on the southwest flank (200 feet/mile) as compared to the northeast flank (65 feet/mile) that the project site is situated on. The Douglas Creek Anticline continues northwestward for approximately 19 miles from the northwest terminus of the Crystal Creek Anticline towards the western edge of the Piceance Basin in the Douglas Creek Arch area (Hail, 1992).

No major faults are present in the project area. Two small groups of normal faults are present in the southern extent of the Roan Plateau with one set approximately 15 miles northeast and a second smaller group about 20 miles northwest of the project site (Hail, 1992).

Geologic Hazards (Rule 908.b (7).A.i)

Minimal seismic activity near the proposed disposal facility has occurred in recent geologic time. One earthquake of magnitude greater than 5.0 occurred in Garfield County since the early 1960s when proper instrumentation was implemented in the state of Colorado. The epicenter of this earthquake was approximately 17 miles southeast of the project site. A second recorded earthquake greater than 5.0 occurred in Rio Blanco County with an epicenter about 20 miles northwest of the project site. According to the Colorado Geological Survey, no Quaternary-age faults are present in the Roan Plateau area (Widmann and others, 1998). However, the Geologic Map of Colorado (Tweeto, 1979) reveals that a large swath of northeast-southwest

trending normal faults exist in the Cretaceous bedrock near the Douglas Creek Arch and the western fringe of the Piceance Basin. In addition, a series of normal faults trace along the eastern Piceance Basin boundary near the Grand Hogback. Although these faults are not always visible at the surface, this does not preclude the chance of an earthquake happening in the area at some point in the future. According to the Colorado Earthquake Hazard Mitigation Council (2008), "Earthquakes can also occur on faults that do not rupture the ground surface or on faults that are not yet recognized as being hazardous. These so called “random” earthquakes are considered in most hazard analyses to help account for faults that are not apparent at the earth’s surface."

No surficial geologic hazards (landslide, mudflow, fan) or soils hazards have been mapped in the immediate vicinity of the proposed disposal facility. The location is not located in an area mapped as a floodplain hazard by the Federal Emergency Management Agency (FEMA). However, because of the natural slope across the property within the northwest-to-southeast oriented drainage, overland flow is possible in the event of an extreme precipitation event. Although records of extreme rainfall events are unavailable for locations on top of the Roan Plateau, climate records since the mid-20th century indicate that the record 24-hour rainfall amounts at Grand Junction, Palisade, and Parachute have not exceeded 2 inches (Western Regional Climate Center, 2011). The duration of these events within a 24 hour period is not known, and it is possible that a short burst of intense rainfall event could cause local overland flow in the watershed that encompasses the project site if a precipitation rate exceeds the infiltration rate of the watershed soils.

The primary limitations for shallow excavations are based on the slopes, the shallow depth to bedrock, and the potential for caving of cut banks. Consideration will be given to the design and construction of this facility to ensure that slopes are graded appropriately to minimize the potential for cutback caving. The suitability of the soils in the project area is identified as being somewhat to very limited in regard to the construction of ponds and embankments. The limitations identified are primarily applicable to unlined water impoundments. Consideration will be given to design and construction characteristics related to the area soil thickness and depth to bedrock to mitigate these limitations. Consideration will also be given to the design and operation of the liner system for the impoundments, which will mitigate potential seepage and leaks.

Surface Water Features (Rule 908.b (7).B.i)

Surface water features within two miles of the project site include the northeast-sloping Little Creek to the north and House Log Gulch to the south. The proposed storage facility is located about 1,000 feet south of Little Creek and 2,100 feet north of House Log Gulch and sits approximately 320 feet and 240 feet in elevation above the two creeks, respectively. Both streams are shown on the USGS 1:24,000 topographic map (Circle Dot Gulch Quadrangle) to have perennial flow, although no flow records are available to determine the flow conditions in these drainages. Evaluation of aerial imagery in Google Earth taken in August 2011 shows very little to no flow in the two streams near the proposed storage facility. Willow Creek flows roughly parallel to Little Creek and is about 1.4 miles north of the proposed facility and joins with Bear

Run (1.8 miles north) just before draining off the rim of the Roan Plateau towards West Parachute Creek. Also within 2 miles of the proposed facility, Circle Dot Gulch and Sheep Kill Gulch are south of and roughly parallel to House Log Gulch and drain northeastward towards West Parachute Creek.

Four springs have been mapped within 2 miles of the proposed storage facility on the Circle Dot Gulch Quadrangle topographic map. One mapped spring is located within the House Log Gulch Drainage about 1.2 miles southwest of the proposed storage facility. A second spring is mapped in the source area of Circle Dot Gulch, and two other springs are identified within the Willow Creek drainage northwest of the proposed facility. Each of the identified springs within 2 miles of the project site are located near the upper headwall areas of the drainages previously described. Flow rates and duration of the springs are not presently known.

Shallow Groundwater and Major Aquifers (Rule 908.b (7).B.ii)

According to the Colorado Department of Water Resources CDSS Map Viewer, no alluvial aquifers are mapped in the vicinity of the proposed storage facility location. However, as noted in the previous section, springs indicate the presence of shallow groundwater in the area. Over half of the precipitation at higher elevations in the Piceance Basin falls as winter precipitation, of which serves as a groundwater recharge source in the form of snowpack (Taylor, 1987). The residuum material on the Roan Plateau acts as an absorptive veneer that transmits snowmelt as recharge to the underlying bedrock during the spring runoff period (Topper and others, 2003). The shallow groundwater enters the groundwater flow system via the surficial residuum and through downward movement, eventually enters into fractures, joints and other cavities considered secondary porosity in the underlying bedrock aquifer. Based on the surface topography, shallow groundwater movement in materials above the Tertiary bedrock most likely follows the surface gradient towards the east/northeast where the surface drainages empty off the Roan Plateau and into the West Parachute Creek valley. Depth to shallow groundwater can range from less than 20 feet in the narrow drainages and near the identified springs to beyond 100 feet on the divides that separate the drainages. Site specific data for the presence and depth of groundwater at the specific project area should be gathered prior to construction activities. Since the project location is over 200 feet above the nearest drainage and is situated on a local flow divide, it is likely that groundwater is greater than 100 feet in depth below the project site area.

The bedrock aquifer underlying the site is composed of the Uinta Formation and the Parachute Creek Member of the Green River Formation. This aquifer has been named the Uinta-Animas Aquifer by the U.S. Geological Survey (Robson and Banta, 1995) and the Piceance Basin Aquifer by the Colorado Geological Survey (Topper and others, 2003). The Colorado Geological Survey subdivides the aquifer into Upper and Lower Piceance Basin aquifers, with the upper zone composed of the siltstones and sandstones in the Uinta Formation and the upper portion of the Parachute Creek Member. Immediately below this portion of the aquifer is the Mahogany confining unit, a 100 feet to 150 feet thick unit of kerogen-rich shale and marlstone. Beneath this confining unit is the lower portion of the Parachute Creek Member that is considered the Lower Piceance Basin aquifer. The thickness of the Upper and Lower Piceance Basin aquifers are

approximately 500 feet and 600 feet, respectively, in the project area. Robson and Banta (1995) show a potentiometric surface elevation contour of 8,000 feet in the project area, indicating that the saturated zone of the Upper Piceance Basin aquifer is greater than 300 feet below the site but is closer to the land surface in the valley bottoms of Little Creek and House Log Gulch.

Underlying the Upper and Lower Piceance Basin aquifers is a confining unit upwards of 4,000 feet in thickness that includes the lower members of the Green River Formation, the Wasatch Formation and the Fort Union Formation. Beneath this major confining unit is the Cretaceous Mesa Verde Group, which approaches 7,000 feet in thickness near the center of the basin. The Mesa Verde is comprised of inter-layered sandstone, shale, siltstone and coal. The aquifer portions of the group create composite saturated thicknesses of less than 500 to 2,000 feet.

Water Wells within the Site Boundary (Rule 908.b (7).B.iii)

No water wells are present within one mile of the proposed storage facility. The nearest wells, designated for monitoring, are approximately 1.5 miles southeast of the project site in the SE 1/4 SE 1/4 of Section 2, T6S, R97W. The three wells, with permit numbers 115873, 115879, 115881, were installed in the Green River Formation in 1980 to depths of 316 feet, 935 feet, and 809 feet below ground level (bgl), respectively. No static water levels from these wells are available. These wells have all since been abandoned and abandonment records are available from the Colorado Division of Water Resources (Colorado Division of Water Resources online Map Viewer, accessed October 4, 2012).

Hydrologic Properties of Shallow Groundwater and Major Aquifers (Rule 908.b (7).B.iv)

The permeability of the major formations in the Piceance Basin aquifers is relatively low. Hydraulic conductivity of the Uinta Formation and upper Parachute Creek Member ranges from less than 0.2 feet per day to 1.6 feet per day and a transmissivity of 4,563 to 5,760 gallons per day per foot (gpd/ft). In the lower Piceance Basin aquifer, hydraulic conductivity ranges from less than 0.1 to over 1 foot per day and a transmissivity of 1,945 to 2,842 gpd/ft. Yields in both aquifer units can range from about 1 gallon per minute (gpm) to over 900 gpm. The aquifer units of the Mesa Verde are typically not developed on the Roan Plateau due to economic factors of deep well installation and the availability of water in the overlying Tertiary units (Glover and others, 1998). Permeability of aquifers within the Mesa Verde Group is typically quite low, as hydraulic conductivity values range from 0.0001 to 0.001 ft/d in the project area (Topper and others, 2003).

As described in section (7).B.ii, shallow groundwater movement likely follows the surface topography towards the east/northeast where the surface drainages empty off the Roan Plateau and into the valley of West Parachute Creek. Local groundwater movement near the proposed facility is likely to the north and south towards Little Creek and House Log Gulch, respectively. From these points, groundwater movement shifts northeastward towards the rim of the plateau.

Groundwater movement in the Piceance Basin aquifers (upper and lower) is generally from south to north across the northern province of the Piceance Basin towards the White River

drainage. As previously mentioned, the southern rim of the Roan Plateau has been defined as an area of natural recharge. Groundwater levels (potentiometric surface) in the recharge areas of the Piceance Basin aquifers range from 8,000-8,400 feet and drop to around 6,000 feet on the northern end of the basin in the discharge area of the White River. Across the basin, the flow gradient varies significantly. In the recharge area, the gradient in both the upper and lower aquifer units is generally flat. The gradient steepens north of the project site in southern Rio Blanco County, and it is evident that the Piceance Creek drainage exerts influence on the flow regime as an area of discharge, particularly in the upper aquifer. This gradient pattern indicates upward movement of flow from the lower aquifer upward through the Mahogany zone and the upper aquifer in the drainage area of the Piceance Creek. In other areas where both aquifer units sit above area drainages in elevation, the units emit water via springs that feed tributary streams to the main-stem drainages, such as in the Roan and Parachute Creek valleys (Glover and others, 1998). The project site is included in an area defined by Glover and others (1998) as having "substantial natural recharge" in the northern province of the Piceance Basin. According to the Robson and Banta (1995), the Uinta-Animas aquifer, which contains the geologic units described in the previous section, receives approximately 24,000 acre-feet of recharge annually, and that discharge to surface water features down-gradient in the Piceance Basin approximately equals the annual aquifer recharge rate (Robson and Banta, 1995).

Site Location in Relation to Nearby Floodplains (Rule 908.b (7).B.v)

The facility is not within a FEMA flood hazard zone and there are no surface waters subject to COGCC Rule 317B located in the vicinity of the project.

Existing Shallow Groundwater Quality (Rule 908.b (7).B.vi)

Baseline groundwater quality sampling should occur prior to facility construction or modification to document pre-development conditions at the project site, as data in the area is currently not available. Regionally, water quality is variable in the Piceance aquifers across the northern province of the basin. The primary water quality concern is dissolved solids, which can exceed 10,000 milligrams (mg/l) per liter in some areas. In the upper aquifer, total dissolved solids (TDS) ranges from less than 500 mg/l in the south (including the proposed disposal site) to over 1,000 mg/l in the northern extent of the basin. In the lower aquifer, TDS values range from less than 1,000 mg/l in the south to over 10,000 mg/l near the White River Basin. Geochemical conditions in the recharge areas of the Tertiary aquifers typically enhance dissolution of calcite and dolomite, a process that enhances loading of TDS as groundwater moves down-gradient towards areas of discharge. TDS values in both aquifers at the project site are typically 1,000 mg/l or less, which are levels still suitable for potable use (Glover and others, 1998).

Potential for Impacts to Nearby Surface Water and Groundwater (Rule 908.b (7).B.vii)

As previously described, the proposed storage facility is not located in an area identified as a floodplain and as mentioned in the Geologic Hazards section, is not considered a flood hazard by FEMA. No surface waters subject to COGCC Rule 317B are located near the proposed disposal site, and the area surrounding the proposed disposal facility contains no identifiable

wetlands. The flow status of two nearby drainages (Little Creek and House Log Gulch) are not known as information from USGS Topographic Maps conflicts with evidence from recent aerial imagery in the project area. However, as with most watersheds in the arid west with moderate slopes, heavy runoff events can temporarily create surface flow conditions and an elevated shallow water table at and down-gradient of the proposed facility.

Potential impacts to groundwater would likely involve shallow subsurface flow in the soil and colluvium above the competent underlying bedrock formations at the project site. This local flow would likely follow the pattern of surface topography drainages which orient towards the north and south before ultimately flowing northeast. In a regional sense, the proposed facility exists in a recharge area for the Piceance Basin aquifers that underlie the Roan Plateau. Based on the depth to the water table, the presence of restrictive confining units, the length of travel to regional discharge areas, and the limited domestic/public use of water from these aquifers on the Roan Plateau, very little risk potential exists to the bedrock aquifers from the proposed disposal facility.

The water storage facility has been designed with features that considerably reduce the potential for the facility to impact nearby surface and groundwater. The proposed ponds will have 2- 60 mil synthetic liners that will cover the bottom and interior sides of the pit with edges secured around the pit perimeter. Monitoring wells will also be installed to monitor for any releases from the facility.

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Attachment M
Air Quality Permit

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

STATE OF COLORADO

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
AIR POLLUTION CONTROL DIVISION
TELEPHONE: (303) 692-3150

CONSTRUCTION PERMIT

PERMIT NO: **09GA0337**

DATE ISSUED: SEP 1 1 2012 **Issuance 1**

ISSUED TO: **Marathon Oil Company**

THE SOURCE TO WHICH THIS PERMIT APPLIES IS DESCRIBED AND LOCATED AS FOLLOWS:

A wastewater management facility designed to accept produced water and flowback water located in Section 32, Township 5 South, Range 96 West, in Garfield County, Colorado.

THE SPECIFIC EQUIPMENT OR ACTIVITY SUBJECT TO THIS PERMIT INCLUDES THE FOLLOWING:

Facility Equipment ID	AIRS Point	Description
Wastewater Ponds	001	Wastewater evaporation/storage ponds. The wastewater passes through an enclosed gun barrel separator tank prior to discharge into the ponds.

THIS PERMIT IS GRANTED SUBJECT TO ALL RULES AND REGULATIONS OF THE COLORADO AIR QUALITY CONTROL COMMISSION AND THE COLORADO AIR POLLUTION PREVENTION AND CONTROL ACT C.R.S. (25-7-101 et seq), TO THOSE GENERAL TERMS AND CONDITIONS INCLUDED IN THIS DOCUMENT AND THE FOLLOWING SPECIFIC TERMS AND CONDITIONS:

REQUIREMENTS TO SELF-CERTIFY FOR FINAL AUTHORIZATION

1. **YOU MUST notify the APCD no later than fifteen days after commencement of the permitted operation or activity by submitting a Notice of Startup (NOS) form to the APCD**. The Notice of Startup (NOS) form may be downloaded online at www.cdphe.state.co.us/ap/downloadforms.html. Failure to notify the APCD of startup of the permitted source is a violation of AQCC Regulation No. 3, Part B, Section III.G.1 and can result in the revocation of the permit.

2. Within one hundred and eighty days (180) after issuance of this permit, compliance with the conditions contained on this permit shall be demonstrated to the Division. It is the permittee's responsibility to self-certify compliance with the conditions. Failure to demonstrate compliance within 180 days may result in revocation of the permit. (Reference: Regulation No. 3, Part B, III.G.2).

3. This permit shall expire if the owner or operator of the source for which this permit was issued: (i) does not commence construction/modification or operation of this source within 18 months after either, the date of issuance of this construction permit or the date on which such construction or activity was scheduled to commence as set forth in the permit application associated with this permit; (ii) discontinues construction for a period

Attachment N
Wetlands Assessment

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

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Marathon Oil Company (Marathon) has contracted Olsson Associates to conduct a jurisdictional determination and assessment for potential wetlands that may have been impacted during the construction of the 32C Centralized E&P Waste Management Facility. The facility has been utilized as a storage facility since August 2010. The location of the facility is approximately 11 miles northwest of Parachute, and approximately 4.4 miles from County Road 215, in the SE 1/4 of the SW 1/4 of Section 32, Township 5 South, Range 96 West, 6th Principal Meridian, Garfield County, Colorado. The site consists of an existing 0.7 acre water impoundment pond graded into mountainous terrain that is located on a 3.5 acre pad site. A preliminary desktop review for potential wetlands was peformed using available data including: USGS topographic maps, National Wetlands Inventory (NWI) maps, NRCS soil maps and aerial photography. The preliminary determination was conducted by following the guidelines set forth by the regional supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. According to these guidelines, in order for an area to be considered a wetland, the site must include hydrologic features, hydrophytic vegetation must be dominant, and the soil must be hydric.

The hydrology of the project site was evaluated based upon consultation of USGS topographic maps, NWI maps, and aerial photography prior to construction of the site. The USGS topographic map (Figure V-1) and the Surface Water Map (Figure SW-1) depicts the area of impact to be approximately 1050 feet away from the likely jurisdictional drainage Little Creek (solid blue line). At this distance, it is not expected that the construction of the facility had any impact to riparian vegetation associated with the drainage. Additionally, the NWI map (Figure NWI-1) identifies four potential Palustrine Emergent wetland areas along the likely jurisdictional drainage House Log Gulch (solid blue line). The existing water impoundment location is approximately 2150 feet away from this drainage. Any impact to potential wetland areas is considered to be minimal. Olsson staff analysis of the given data has determined that it is unlikely any hydrology required to support wetlands exists within the project boundaries.

The vegetation within the project boundaries was determined by reviewing photographs from the site, as well as a Wildlife Assessment performed by Westwater Engineering included in the Form 28 application package. The shrub stratum within the area is dominated by Wyoming big sagebrush (*Artemesia tridentata wyomingensis*). The herbaceous stratum is dominated by Needlegrass (*Stipa spp.*). The dominant vegetation within the area is not indicative of hydrophytic vegetation. The report also identifies stands of Aspen (*Populus tremuloides*) woodlands adjacent to the project boundaries along ridge tops and pockets in hillside depressions typical of a riparian corridor. Olsson staff analysis of available data has determined that hydrophytic vegetation is not expected to be found within the project boundaries.

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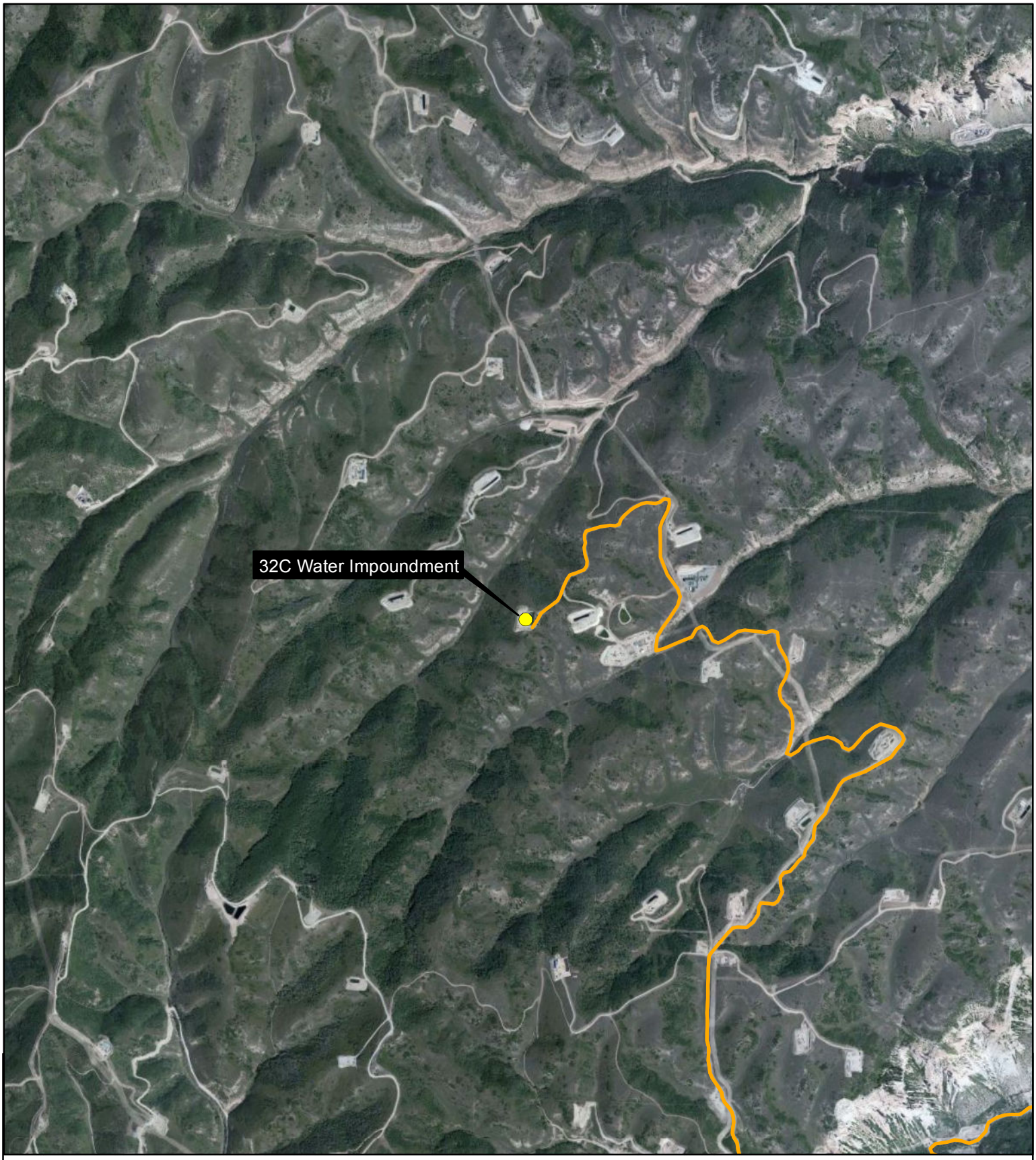
www.oaconsulting.com

The Hydric Soils list for Garfield County, Colorado was consulted for the presence of hydric soils within the project area. None of the soil map units on the project site are identified as being hydric soils or containing inclusions of hydric soils. The most current mapping from the Natural Resources Conservation Service (NRCS) Web Soil Survey shows the project site contains the following soil series (Figure S-1):

1. Northwater-Adel complex, 5 to 50 percent slopes.
2. Parachute-Irigul complex, 5 to 30 percent slopes.
3. Parachute-Irigul-Rhone association, 25 to 50 percent slopes.
4. Parachute-Rhone loams, 5 to 30 percent slopes.
5. Silas loam, 1 to 12 percent slopes.

All of these soils are considered to be well drained, with a depth to water of 42 inches or greater. Therefore, it is unlikely that hydric soils or saturation to the surface will be found within the project boundaries.

This report represents a preliminary wetland assessment and jurisdictional determination for the Marathon 32C Centralized E&P Waste Management Facility. Analysis of the most current data available was used to identify the hydrology, vegetation and soils located within the project boundaries. As a result of this analysis, Olsson staff has determined that it is unlikely that the facility had any impacts to wetlands or any other sensitive areas when it was constructed in 2010. However, it is recommended that an onsite investigation be conducted during the growing season to confirm these findings.



Legend

- 32C Water Impoundment
- Route to Facility

0 0.225 0.45 0.9 Miles

N W E S

PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	6/17/2013

AERIAL MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

AER - 1

NWI data provided by the United States Fish and Wildlife Service

Legend

- 32C Water Impoundment
- Route to Facility

USFWS NWI

- Aquatic Bed
- Emergent
- Forested or Scrub Shrub
- Unconsolidated Bottom/Shore

0 245 490 980 Feet

N W E S

PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	6/17/2013

NATIONAL WETLANDS INVENTORY MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE; SUITE 102
GRAND JUNCTION, CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

NWI - 1

Legend

- 32C Water Impoundment

Soil Type

- 52 - Northwater-Adel complex, 5-50% slopes
- 55 - Parachute-Irigul complex, 5-30% slopes
- 56 - Parachute-Irigul-Rhone association, 25-50% slopes
- 57 - Parachute-Rhone loams, 5-30% slopes
- 63 - Silas loam, 1-12% slopes

0 125 250 500 Feet

N W E S

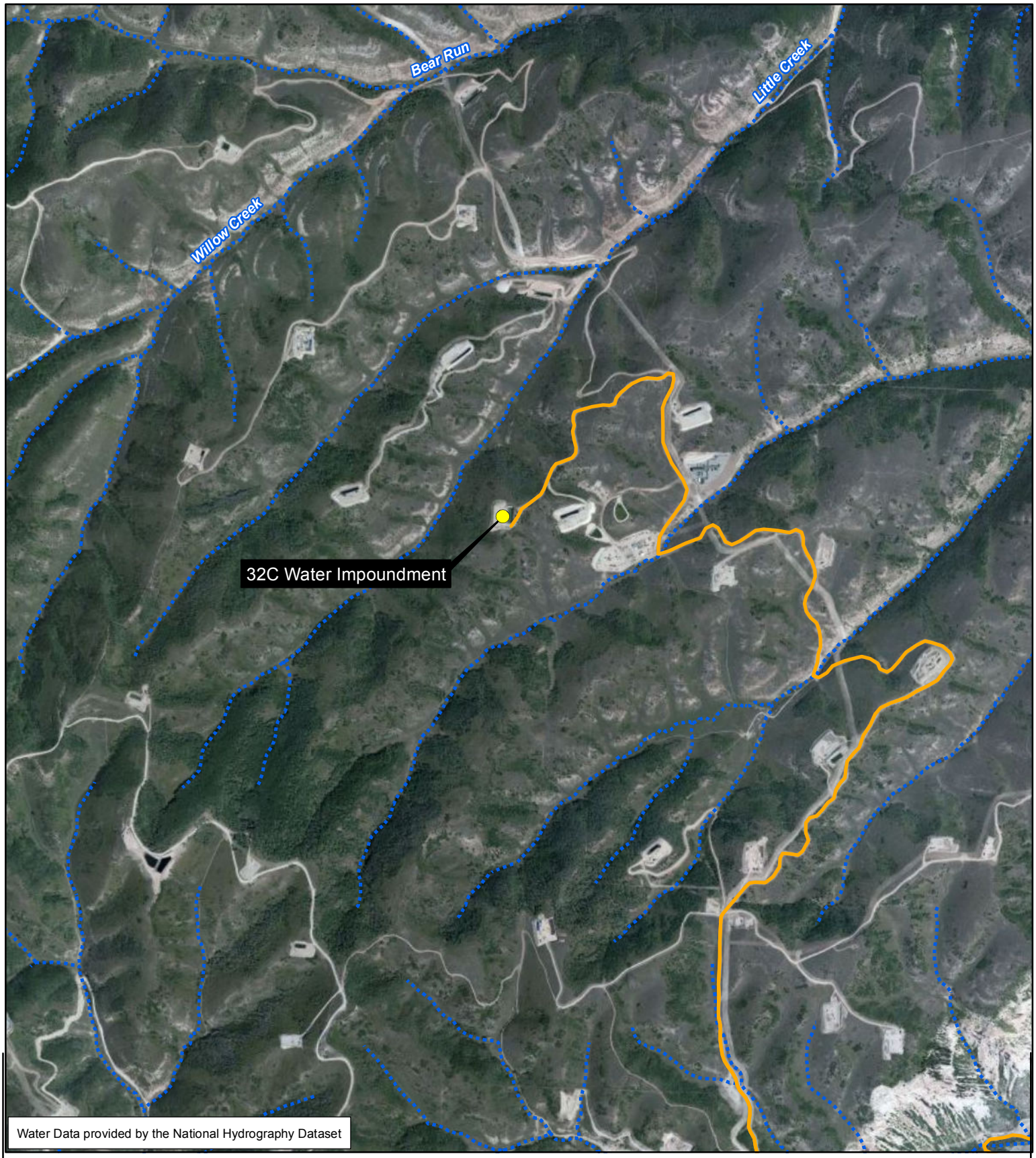
PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	7/18/12

SOILS MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

S - 1



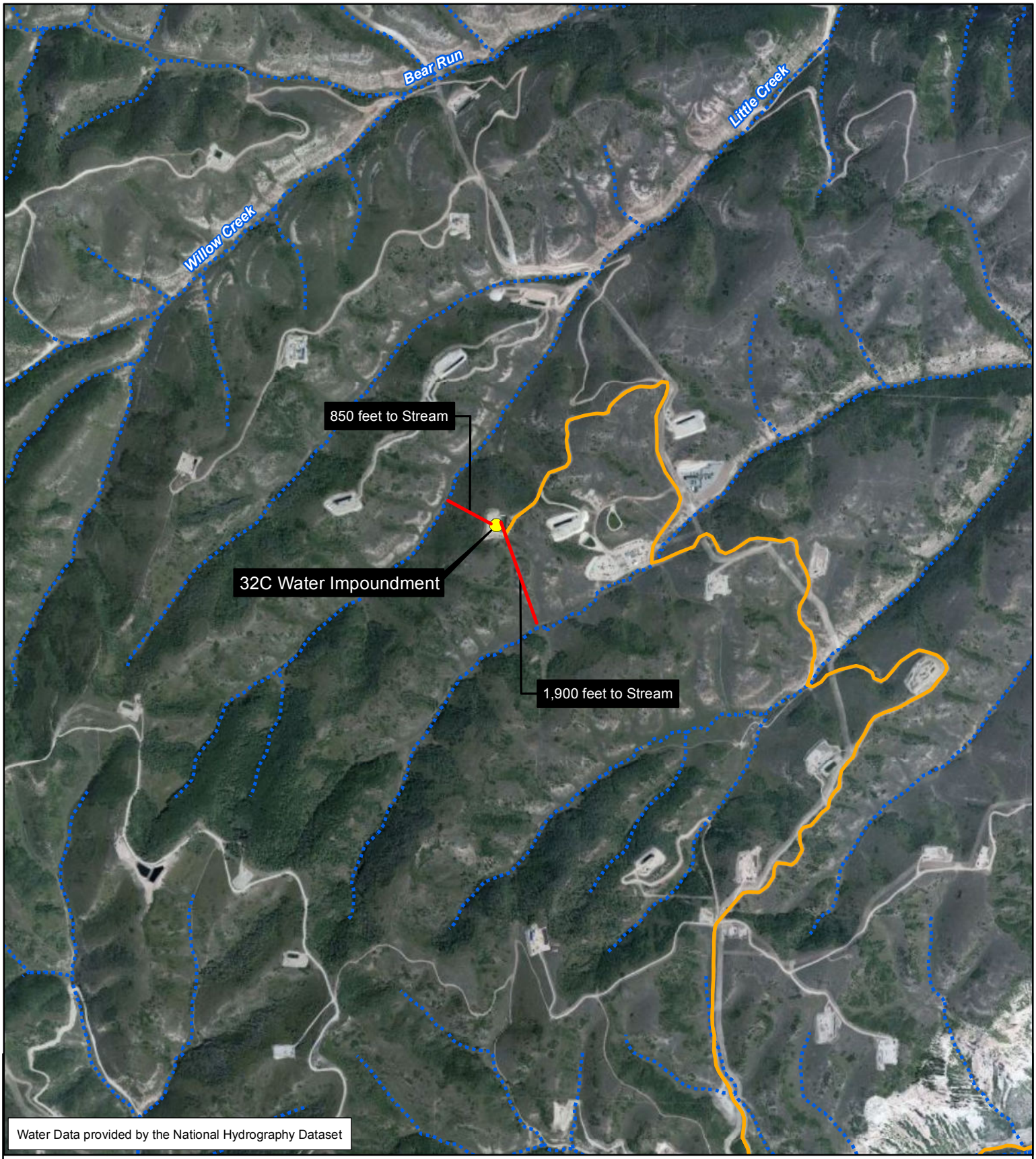
Legend

- 32C Water Impoundment
- Route to Facility
- Perennial Creeks
- Surface Water

0 625 1,250 2,500 Feet

N W E S

PROJECT NO: 012-1372	SURFACE WATER MAP 32C WATER IMPOUNDMENT MARATHON OIL COMPANY GARFIELD COUNTY, COLORADO	OLSSON ASSOCIATES 760 HORIZON DRIVE; SUITE 102 GRAND JUNCTION, CO 81506 TEL 970.263.7800 FAX 970.263.7456	FIGURE
DRAWN BY: Jenna Muhlbach			SW - 1
DATE: 6/17/2013			



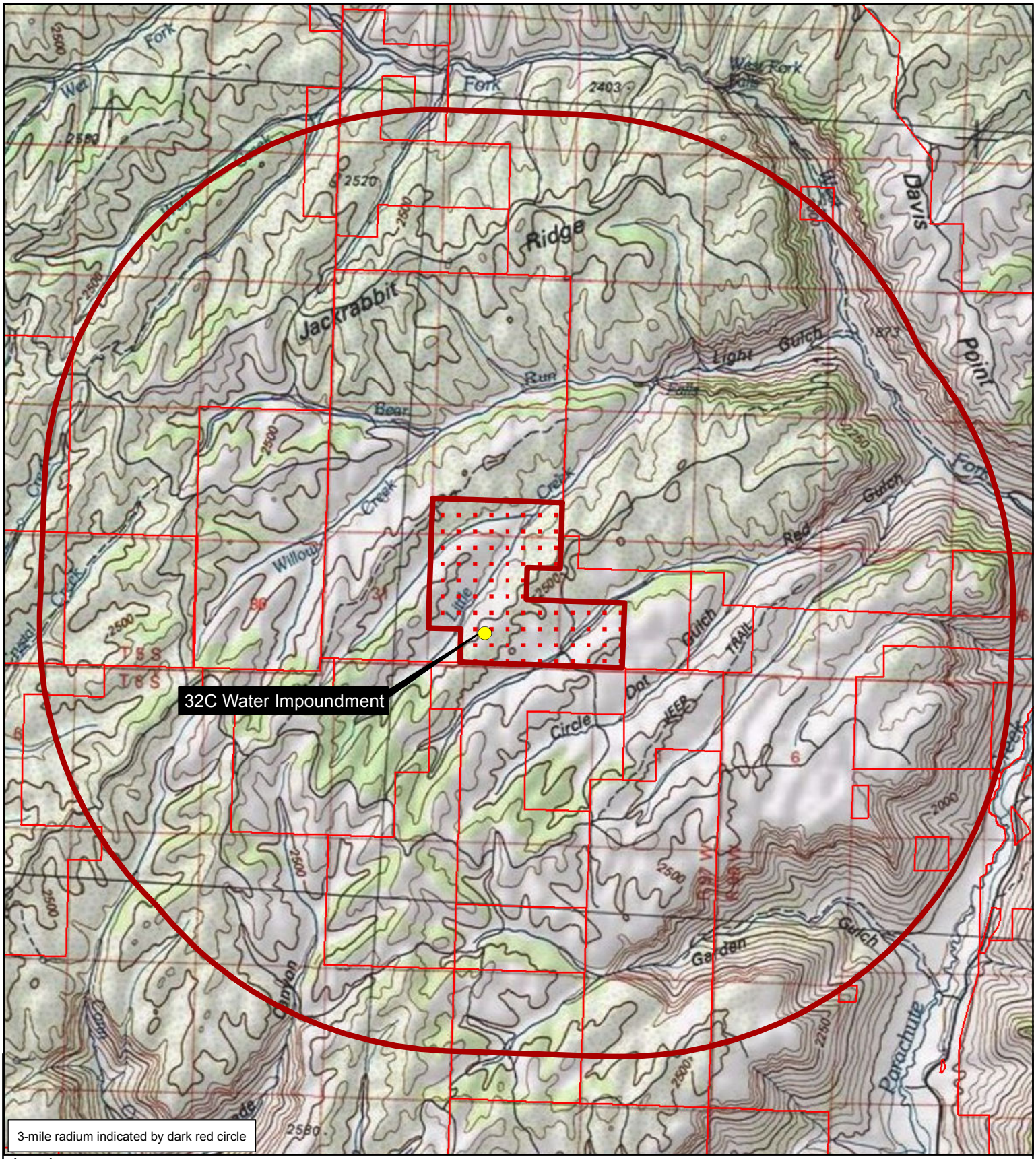
Legend

- 32C Water Impoundment
- Route to Facility
- Surface Water
- Perennial Creeks

0 625 1,250 2,500 Feet

N W E S

PROJECT NO:	012-1372	SURFACE WATER MAP 32C WATER IMPOUNDMENT MARATHON OIL COMPANY GARFIELD COUNTY, COLORADO	OLSSON ASSOCIATES	FIGURE
DRAWN BY:	Jenna Muhlbach		760 HORIZON DRIVE; SUITE 102 GRAND JUNCTION, CO 81506 TEL 970.263.7800 FAX 970.263.7456	SW - 2
DATE:	6/17/2013			



PROJECT NO:	012-1372
DRAWN BY:	Jenna Muhlbach
DATE:	7/18/12

VICINITY MAP
32C WATER IMPOUNDMENT
MARATHON OIL COMPANY
GARFIELD COUNTY, COLORADO

OLSSON ASSOCIATES
760 HORIZON DRIVE;
SUITE 102
GRAND JUNCTION,
CO 81506
TEL 970.263.7800
FAX 970.263.7456

FIGURE

V - 1

Variance Request

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

FORM 4 Rev 04/13

State of Colorado
Oil and Gas Conservation Commission

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

DE	ET	OE	ES

Document Number:

SUNDRY NOTICE

Submit a signed original. This form is to be used for general, technical and environmental sundry information. For proposed or completed operations, describe in full in Comments or provide as an attachment. Identify Well by API Number; identify Oil and Gas Location by Location ID Number; identify other Facility by Facility ID Number.

OGCC Operator Number: 53650 Contact Name Eric Ward

Name of Operator: Marathon Oil Company Phone: 970.244.5735

Address: 743 Horizon Court, Suit 220 Fax: 970.245.6287

City: Grand Junction State: CO Zip: 81506 Email:

Complete the Attachment Checklist

OP OGCC

API Number : 05- OGCC Facility ID Number: 421284

Well/Facility Name: Marathon Water Storage Facility - Pond 32C Well/Facility Number:

Location QtrQtr: SESW Section: 32 Township: 5S Range: 96W Meridian: 6 PM

County: Garfield Field Name:

Federal, Indian or State Lease Number:

Survey Plat		
Directional Survey		
Srfc Eqpmt Diagram		
Technical Info Page		
Other		

CHANGE OF LOCATION OR AS BUILT GPS REPORT

☐ Change of Location * ☐ As-Built GPS Location Report ☐ As-Built GPS Location Report with Survey

* Well location change requires new plat. A substantive surface location change may require new Form 2A.

SURFACE LOCATION GPS DATA Data must be provided for Change of Surface Location and As Built Reports.

Latitude 39.56780 PDOP Reading Date of Measurement

Longitude -108.19393 GPS Instrument Operator's Name

LOCATION CHANGE **(all measurements in Feet)**

Well will be: (Vertical, Directional, Horizontal)

		FNL/FSL		FEL/FWL		
Change of **Surface** Footage **From** Exterior Section Lines:						
Change of **Surface** Footage **To** Exterior Section Lines:						
Current **Surface** Location **From**	QtrQtr	Sec	Twp	Range	Meridian	
New **Surface** Location **To**	QtrQtr	Sec	Twp	Range	Meridian	
Change of **Top of Productive Zone** Footage **From** Exterior Section Lines:						
Change of **Top of Productive Zone** Footage **To** Exterior Section Lines:						**
Current **Top of Productive Zone** Location **From**		Sec	Twp	Range		
New **Top of Productive Zone** Location **To**		Sec	Twp	Range		
Change of **Bottomhole** Footage **From** Exterior Section Lines:						
Change of **Bottomhole** Footage **To** Exterior Section Lines:						**
Current **Bottomhole** Location		Sec	Twp	Range		
New **Bottomhole** Location		Sec	Twp	Range		

** attach deviated drilling plan

Is location in High Density Area?

Distance, in feet, to nearest building , public road: , above ground utility: , railroad: ,

property line: , lease line: , well in same formation:

Ground Elevation feet Surface owner consultation date

CHANGE OR ADD OBJECTIVE FORMATION AND/OR SPACING UNIT

Objective Formation	Formation Code	Spacing Order Number	Unit Acreage	Unit Configuration

OTHER CHANGES

☐ **REMOVE FROM SURFACE BOND** **Signed surface use agreement is a required attachment**

☐ **CHANGE OF WELL, FACILITY OR OIL & GAS LOCATION NAME OR NUMBER**

From: Name _____ Number _____ Effective Date: _____

To: Name _____ Number _____

☐ **ABANDON PERMIT: Permit can only be abandoned if the permitted operation has NOT been conducted. Field inspection will be conducted to verify site status.**

☐ WELL:Abandon Application for Permit-to-Drill (Form2) – Well API Number _____ has not been drilled.

☐ PIT: Abandon Earthen Pit Permit (Form 15) – COGCC Pit Facility ID Number _____ has not been constructed (Permitted and constructed pit requires closure per Rule 905)

☐ CENTRALIZED E&P WASTE MANAGEMENT FACILITY: Abandon Centralized E&P Waste Management Facility Permit (Form 28) – Facility ID Number _____ has not been constructed (Constructed facility requires closure per Rule 908)

OIL & GAS LOCATION ID Number: _____

☐ Abandon Oil & Gas Location Assessment (Form 2A) – Location has not been constructed and site will not be used in the future.

☐ Keep Oil & Gas Location Assessment (Form 2A) active until expiration date. This site will be used in the future.

Surface disturbance from Oil and Gas Operations must be reclaimed per Rule 1003 and Rule 1004.

☐ **REQUEST FOR CONFIDENTIAL STATUS**

☐ **DIGITAL WELL LOG UPLOAD**

☐ **DOCUMENTS SUBMITTED** Purpose of Submission: _____

RECLAMATION

INTERIM RECLAMATION

☐ Interim Reclamation will commence approximately _____

Per Rule 1003.e.(3) operator shall submit Sundry Notice reporting interim reclamation is complete and site is ready for inspection when vegetation reaches 80% coverage.

☐ Interim reclamation complete, site ready for inspection.
Per Rule 1003.e(3) describe interim reclamation procedure in Comments below or provide as an attachment and attach required location photographs.

Field inspection will be conducted to document Rule 1003.e. compliance

FINAL RECLAMATION

☐ Final Reclamation will commence approximately _____

Per Rule 1004.c.(4) operator shall submit Sundry Notice reporting final reclamation is complete and site is ready for inspection when vegetation reaches 80% coverage.

☐ Final reclamation complete, site ready for inspection. Per Rule 1004.c(4) describe final reclamation procedure in Comments below or provide as an attachment.

Field inspection will be conducted to document Rule 1004.c. compliance

Comments:

ENGINEERING AND ENVIRONMENTAL WORK

☐ NOTICE OF CONTINUED TEMPORARILY ABANDONED STATUS

Indicate why the well is temporarily abandoned and describe future plans for utilization in the COMMENTS box below or provide as an attachment, as required by Rule 319.b.(3).

Date well temporarily abandoned _____ Has Production Equipment been removed from site? _____

Mechanical Integrity Test (MIT) required if shut in longer than 2 years. Date of last MIT _____

☐ SPUD DATE: _____

TECHNICAL ENGINEERING AND ENVIRONMENTAL WORK

Details of work must be described in full in the COMMENTS below or provided as an attachment.

☐ NOTICE OF INTENT Approximate Start Date _____

☐ REPORT OF WORK DONE Date Work Completed _____

☐ Intent to Recomplete (Form 2 also required)	☐ Request to Vent or Flare	☐ E&P Waste Mangement Plan
☐ Change Drilling Plan	☐ Repair Well	☐ Beneficial Reuse of E&P Waste
☐ Gross Interval Change	☐ Rule 502 variance requested. Must provide detailed info regarding request.	
☐ Other _____	☐ Status Update/Change of Remediation Plans for Spills and Releases	

COMMENTS:

CASING AND CEMENTING CHANGES

Casing Type	Size	Of	/	Hole	Size	Of	/	Casing		Wt/Ft	Csg/LinTop	Setting Depth	Sacks of Cement	Cement Bottom	Cement Top

H2S REPORTING

Data Fields in this section are intended to document Sample and Location Data associated with the collection of a Gas Sample that is submitted for Laboratory Analysis.

Gas Analysis Report must be attached.

H2S Concentration: _____ in ppm (parts per million) Date of Measurement or Sample Collection _____

Description of Sample Point:

Absolute Open Flow Potential _____ in CFPD (cubic feet per day)

Description of Release Potential and Duration (If flow is not open to the atmosphere, identify the duration in which the container or pipeline would likely be opened for servicing operations.):

Distance to nearest occupied residence, school, church, park, school bus stop, place of business, or other areas where the public could reasonably be expected to frequent: _____

Distance to nearest Federal, State, County, or municipal road or highway owned and principally maintained for public use: _____

COMMENTS:

BMP

Type	Comment

GROUND WATER SAMPLING

Uses of Ground Water Sampling Section

Request an Exception to Ground Water Sampling Requirements in Greater Wattenberg Area Rule 318A.e(4) or in Statewide Rule 609.c. Request a Previously Sampled Water Source in the COGIS database be used to meet sampling requirements as described in Rule 609.d.(3).

NOTE: If this Sundry Notice is being submitted to request a Ground Water Sampling Exception it cannot be used for any other purpose except requesting the use of a Previously Sampled Water Source in the COGIS database.

☐ Request an Exception to Ground Water Sampling Requirements per Greater Wattenberg Area Rule 318A.e(4):There are no Available Water Sources located within the governmental quarter section or within a previously unsampled governmental quarter section within a ½-mile radius of this proposed Oil and Gas Well, Multi-Well Site, or Dedicated Injection Well.

☐ Request an Exception to Ground Water Sampling Requirements per Statewide Rule 609.c.

_____ Number of Water Sources located within one-half (1/2) mile of a proposed Oil and Gas Well, Multi-Well Site, or Dedicated Injection Well.

_____ Number of Water Source Exceptions requested per Rule 609.c.

_____ Number of Water Sources determined to be unsuitable. **The condition of these Water Sources MUST be documented in the comments below or in an attachment.**

_____ Number of Water Sources suitable for testing whose owners refused to grant access despite an operator's reasonable good faith efforts to obtain consent to conduct sampling.
The reasonable good faith efforts used to obtain access from the owners of these Water Sources MUST be documented in the comments below or in an attachment.

☐ Request a Previously Sampled Water Source in the COGIS database be used to meet sampling requirements as described in Rule 609.d(3)

_____ Type of Sample Substitution Request

Enter Sample ID Number from COGIS Maps for each Previous Water Sample:

Sample ID	Facility ID	Sample Date	Sample Purpose

COMMENTS

Operator Comments:

See Attachment A

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

Signed: _____ Print Name: Eric Ward

Title: Operations Manager Email: erward@marathonoil.com Date: 6/28/2013

Based on the information provided herein, this Sundry Notice (Form 4) complies with COGCC Rules and applicable orders and is hereby approved.

COGCC Approved: _____ Date:

Attachment A

This Sundry Notice is intended to request a variance from the requirements in Rule 908.b.5.D for Marathon Oil Company's Water Storage Facility 32C.

"Centralized facilities shall have a fire lane of at least ten (10) feet in width around active treatment areas and within the perimeter fence. In addition, a buffer zone of at least ten (10) feet shall be maintained within the perimeter fire lane."

The facility's pond was previously constructed on a pad site and Marathon is currently in the process of permitting it as a Centralized E & P Waste Management Facility. Marathon is concurrently submitting a Form 28 application to support the request to change the status of this existing pond. The pond was originally constructed on the edge of a pad location to allow room for wells and other activities. This existing situation makes compliance with Rule 908.b.5.D extremely difficult.

Marathon has familiarized Grand Valley Fire Protection District (GVFPD), the local fire protection agency, with the location, terrain, and any access issues that may be associated with the 32C facility. Please see attached email from GVFPD. The District does not have any issues with the variance request. They have the proper equipment to respond to an emergency at this facility.

The district is familiar with the location, terrain and conditions and is confident that the facility location is easily accessible using any of the departments brush units, or other four-wheel or all-wheel drive equipment vehicles. The brush units are Ford F550 4WD trucks, which are similar to Ford vehicles in Marathon's fleet. Marathon personnel access this facility via the access roads and parking areas with these vehicles routinely.

Chemicals are not stored at this facility and fire is highly unlikely due to the lack of flammable materials. However, a fire is the most likely emergency scenario. In any event when GVFPD vehicles could not directly accessing the facility, the District has sufficient hoses to travel the short distance from the pad location to the pond. While the water storage facility does not the full ten (10) feet of emergency access zone and ten (10) feet of buffer zone, all areas of the facility are accessible using hoses.

Marathon has also submitted a copy of our Emergency Response Plan with the Form 28 application, detailing how emergencies are managed by Marathon.

Marathon respectfully submits this information in order to provide the COGCC the information required to grant a variance of Rule 908.b.5.D.

GRAND VALLEY FIRE PROTECTION DISTRICT
0124 STONE QUARRY RD
PARACHUTE, CO 81635
PHONE: 285-9119, FAX (970) 285-9748

December 18, 2012

Zach Toellner
Marathon Oil Company
970-244-5743

Re: Emergency Access – marathon's 596-32C Pond.

Mr. Toellner;

This letter is to clarify the access to the 596-32C pond area. We do have the necessary equipment needed to access this property and around all pond. The 25 foot wide road is assessable by our brush units and the 10 to 12 feet is ok for a buffer zone. This project is within our response district and I am very knowledge about the project area. All of our brush units, tenders and one structure type engine are all four wheel drive or all wheel drive. I also have the site plan and proposed changes to the location and I do not have any objections with this project. The 569-32C pond area is protected on the two sides with high vertical dirt areas there is no need for a buffer zone at these points. Our Fire District is complemented with all necessary equipment for this location as well as certified personnel to handle the incident if/when it arises. If you should have any further questions please feel free to contact me at the number in the letterhead. It was nice working with you this morning about this project and look forward to working together on future projects.

Sincerely,

Rob Ferguson
Deputy Fire Chief – Operations
GVFPD

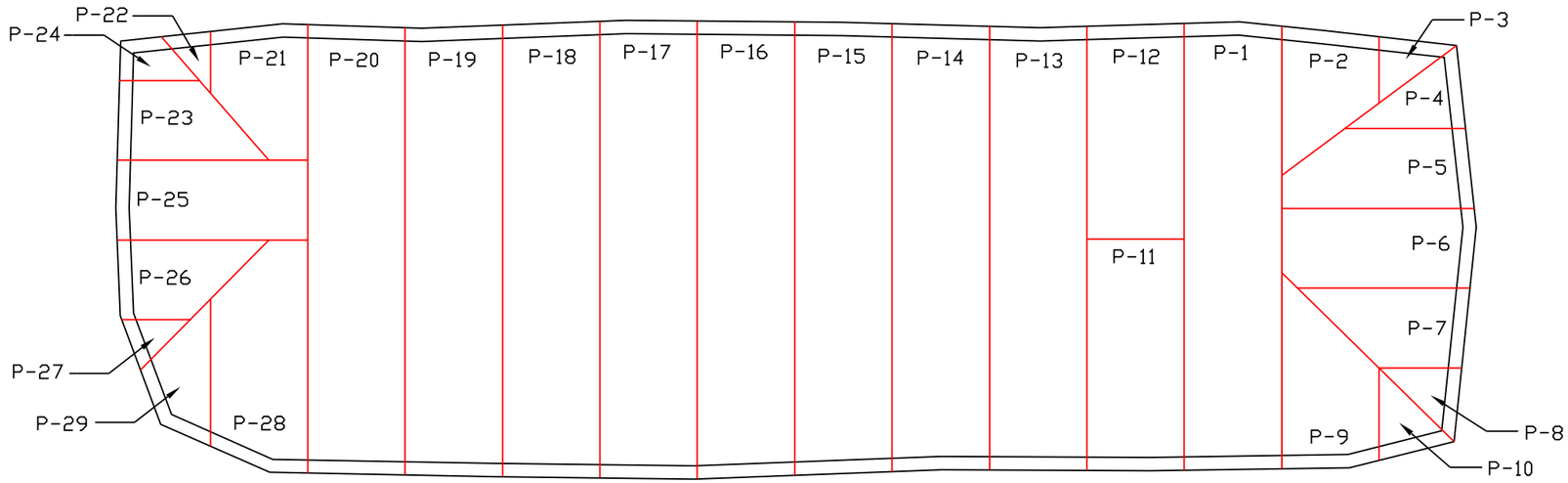
As Builts

Marathon Oil Company
32C Produced Water Pond

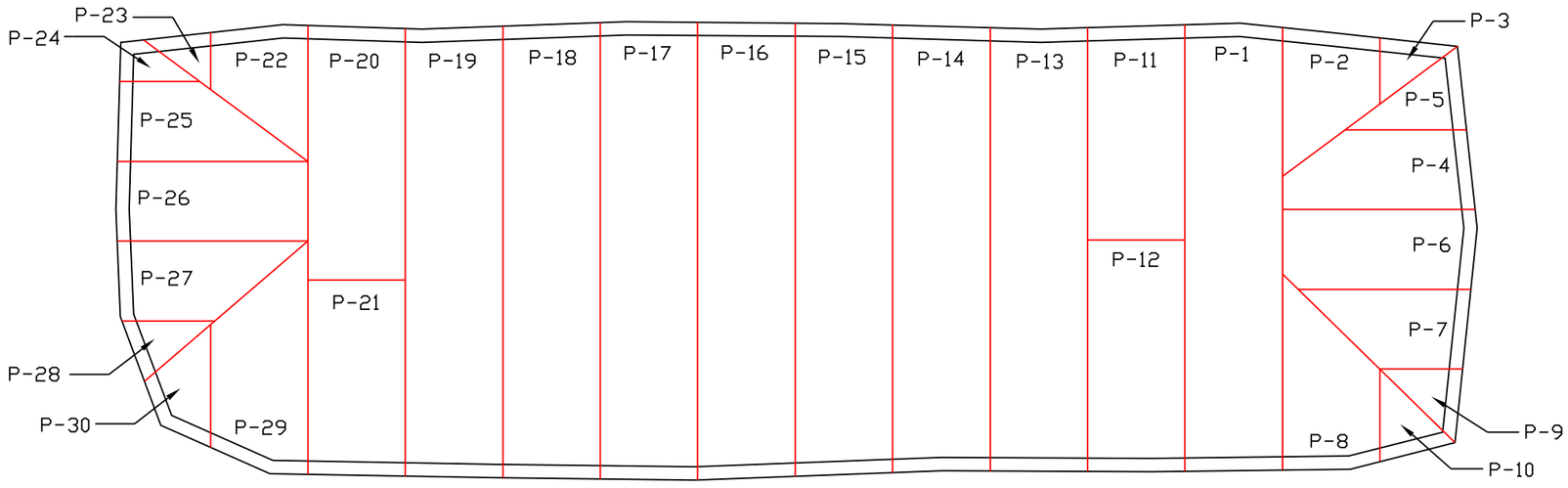
OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

HDPE Smooth Layout



HDPE Textured Layout



Notes :

COLORADO LINING INTERNATIONAL	Marathon Oil 596-32C 60mil HDPE / HDT As-Built
Submitted By: COLORADO LINING INTERNATIONAL	DATE: September 10, 2010 · Contractor: Marathon Oil · REV 1
Scale:	Drawn By: Y.Davis · Drawing Name: Marathon Oil As-Built

COLORADO LINING
INTERNATIONAL

Installation Reports

for

Marathon 596-32C

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/26/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We went to the safety meeting. Then we went out and filled some sand bags and moved some rolls around.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/27/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed about 4 rolls of Geocomposite before it started raining. Spent about 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/28/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/28/10	1:30	85	800		11.0	130/133		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	128/129		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	128/137		R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/	154	R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/	155	R.G	1527	Pass
7/28/10	1:30	85	800		11.0	/		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	128/124		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	131/115		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	129/130		J.L	1630	Pass
7/28/10	1:30	85	800		11.0	/	158	J.L	1630	Pass
7/28/10	1:30	85	800		11.0	/	160	J.L	1630	Pass
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed about 8 rolls of Geocomposite and one roll of HDPE. Spent 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/29/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** _____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/29/10	9:25		800		10.5	123/127		J.L	1630	Pass
7/29/10	9:25		800		10.5	127/119		J.L	1630	Pass
7/29/10	9:25		800		10.5	112/128		J.L	1630	Pass
7/29/10	9:25		800		10.5	/	159	J.L	1630	Pass
7/29/10	9:25		800		10.5	/	158	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing
	Raining		

Comments: We headed toward the site but the road was down. It took about 2 hours before we got to the job site because of the rain from the day before. We didn't get all the liner in because it was raining on and off all day. Spent 1 hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/30/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ____x____ **Extrusion Weld** ____x____

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/30/10	8:00	70	475	425		88/		B.V	1606	Pass
7/30/10	8:00	70	475	425		/85		B.V	1606	Pass
7/30/10	8:00	70	475	425		89/		B.V	1606	Pass
7/30/10	8:00	70	475	425		/	145	B.V	1606	Pass
7/30/10	8:00	70	475	425		/	142	B.V	1606	Pass
7/30/10	8:10	70	800		10	135/130		J.L	1630	Pass
7/30/10	8:10	70	800		10	127/131		J.L	1630	Pass
7/30/10	8:10	70	800		10	131/129		J.L	1630	Pass
7/30/10	8:10	70	800		10	/	180	J.L	1630	Pass
7/30/10	8:10	70	800		10	/	184	J.L	1630	Pass
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed the rest of the liner. We started to test and patch all the seams. Spent ½ an hour on safety.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 7/31/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld ___x___ **Extrusion Weld** ___x___

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
7/31/10	8:00	70	800		10	127/133		J.L	1630	Pass
7/31/10	8:00	70	800		10	138/125		J.L	1630	Pass
7/31/10	8:00	70	800		10	131/139		J.L	1630	Pass
7/31/10	8:00	70	800		10	/	169	J.L	1630	Pass
7/31/10	8:00	70	800		10	/	159	J.L	1630	Pass
						./				
7/31/10	8;00	70	475	425		102/		R.C	1606	Pass
7/31/10	8;00	70	475	425		102/		R.C	1606	Pass
7/31/10	8;00	70	475	425		/97		R.C	1606	Pass
7/31/10	8;00	70	475	425		/	165	R.C	1606	Pass
7/31/10	8;00	70	475	425		/	171	R.C	1606	Pass
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We completed the testing and patching and installed all of the net. Monday we will start on the HDT.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/2/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _x___**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/2/10	8:00		850		9.5	129/133		J.L	1630	Pass
8/2/10	8:00		850		9.5	138/125		J.L	1630	Pass
8/2/10	8:00		850		9.5	131/139		J.L	1630	Pass
8/2/10	8:00		850		9.5	/	169	J.L	1630	Pass
8/2/10	8:00		850		9.5	/	159	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We installed the 2 pipes and filled in the sump. Then we installed about 2 rolls before it started to rain.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/3/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/3/10	8:30		850		9.0	140/132		J.L	1630	Pass
8/3/10	8:30		850		9.0	138/134		J.L	1630	Pass
8/3/10	8:30		850		9.0	135/138		J.L	1630	Pass
8/3/10	8:30		850		9.0	/	170	J.L	1630	Pass
8/3/10	8:30		850		9.0	/	165	J.L	1630	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We arrived on site and had to pump water. Then we installed all of the HDT .

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/4/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld __x__**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/4/10	8:00		450	425		106/		J.C	1606	Pass
8/4/10	8:00		450	425		/110		J.C	1606	Pass
8/4/10	8:00		450	425		108/		J.C	1606	Pass
8/4/10	8:00		450	425		/	126	J.C	1606	Pass
8/4/10	8:00		450	425		/	128	J.C	1606	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We started testing and patching. We got all of the air testing done but only completed the floor patching because it started to rain.

COLORADO LINING INTERNATIONAL

Daily Installation Report

Date: 8/5/10
Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Installation Supervisor: Mark Lucero
Material: 60 Mil HDPE

Fusion Weld _____ **Extrusion Weld _____**

DAILY SEAM STRENGTH TEST

Date of Test	Time of Test	Ambient Air Temp.	Unit Temp.	Pre-Heat Temp.	Unit Speed	Peel Value Inside/Outside	Sheer Value	Welding Tech.	Unit No.	Pass/ Fail
8/5/10	8:00		450	425		132/		J.L	1606	Pass
8/5/10	8:00		450	425		134/		J.L	1606	Pass
8/5/10	8:00		450	425		131/		J.L	1606	Pass
8/5/10	8:00		450	425		/	152	J.L	1606	Pass
8/5/10	8:00		450	425		/	155	J.L	1606	Pass
						/				
						/				
						/				
						/				
						/				
						/				
						/				

DAILY RECAP

Quantity Installed	Weather	Contract Labor Hours	Equipment Maintenance / Greasing

Comments: We completed all of the patching and got the 2 pipe boots done.

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
7/30/10	2:00	2:05	1	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:00	2:05	2	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	3	44'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:00	2:05	4	60'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	5	44'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:12	2:17	6	24'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:30	2:35	7	20'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:35	2:40	8	56'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:42	2:47	9	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	2:42	2:47	10	22'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:00	3:05	11	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:10	3:15	12	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:25	3:30	13	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:25	3:30	14	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:32	3:37	15	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:46	3:51	16	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	3:50	3:55	17	126'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:15	4:20	18	124'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:25	4:30	19	125'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:35	4:40	20	22'	X				Pass	Jaime L	1630	10.5	800
7/30/10	4:40	4:45	21	125'	X				Pass	Jaime L	1630	10.5	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
7/30/10	4:50	4:55	22	54'	X				Pass	Jaime L	1630	10	800
7/30/10	4:50	4:55	23	39'	X				Pass	Jaime L	1630	10	800
7/30/10	5:00	5:05	24	25'	X				Pass	Jaime L	1630	10	800
7/30/10	5:00	5:05	25	79'	X				Pass	Jaime L	1630	10	800
7/30/10	5:10	5:15	26	58'	X				Pass	Jaime L	1630	10	800
7/30/10	5:12	5:17	27	56'	X				Pass	Jaime L	1630	10	800
7/30/10	5:20	5:25	28	22'	X				Pass	Jaime L	1630	10	800
7/30/10	5:20	5:25	29	41'	X				Pass	Jaime L	1630	10	800
7/30/10	5:25	5:30	30	74'	X				Pass	Jaime L	1630	10	800
7/31/10			31t						pass	Jaime L	1630	10	800

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

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COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
8/4/10	8:10	8:15	1	24'	X				Pass	Jaime L	1630	7	850
8/4/10	8:10	8:15	2	34'	X				Pass	Jaime L	1630	7	850
8/4/10	8:10	8:15	3	48'	X				Pass	Jaime L	1630	7	850
8/4/10	8:20	8:25	4	48'	X				Pass	Jaime L	1630	7	850
8/4/10	8:22	8:27	5	46'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	6	17'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	7	20'	X				Pass	Jaime L	1630	7	850
8/4/10	8:45	8:50	8	62'	X				Pass	Jaime L	1630	7	850
8/4/10	9:12	9:17	9	63'	X				Pass	Jaime L	1630	7	850
8/4/10	9:05	9:10	10	117'	X				Pass	Jaime L	1630	7	850
8/4/10	9:45	9:50	11	22'	X				Pass	Jaime L	1630	7	850
8/4/10	10:00	10:05	12	118'	X				Pass	Jaime L	1630	7	850
8/4/10	10:00	10:05	13	120'	X				Pass	Jaime L	1630	7	850
8/4/10	10:25	10:30	14	120'	X				Pass	Jaime L	1630	7	850
8/4/10	10:35	10:45	15	120'	X				Pass	Jaime L	1630	7	850
8/4/10	11:00	11:05	16	122'	X				Pass	Jaime L	1630	7	850
8/4/10	11:15	11:20	17	122'	X				Pass	Jaime L	1630	7	850
8/4/10	11:30	11:35	18	125'	X				Pass	Jaime L	1630	7	850
8/4/10	11:45	11:50	19	125'	X				Pass	Jaime L	1630	7	850
8/4/10	11:45	11:50	20	125'	X				Pass	Jaime L	1630	7	850
8/4/10	12:00	12:05	21	40'	X				Pass	Jaime L	1630	7	850

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

COLORADO LINING INTERNATIONAL

Quality Control Air Testing

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 mil HDPE

Date of Test	Start Time	End Time	Seam No.	Seam Length	A C	A L	V B	S T	Pass/Fail	Welding Technician	Welder No.	Welder Speed	Welder Temp.
8/4/10	12:05	12:10	22	26'	X				Pass	Jaime L	1630	7	850
8/4/10	12:05	12:10	23	54'	X				Pass	Jaime L	1630	7	850
8/4/10	12:10	12:35	24	63'	X				Pass	Jaime L	1630	7	850
8/4/10	12:30	12:35	25	45'	X				Pass	Jaime L	1630	7	850
8/4/10	12:30	12:35	26	38'	X				Pass	Jaime L	1630	7	850
8/4/10	12:35	12:40	27	69'	X				Pass	Jaime L	1630	7	850
8/4/10	12:40	12:45	28	66'	X				Pass	Jaime L	1630	7	850
8/5/10	8:00	8:05	29	125'	X				Pass	Jaime L	1630	7	850

AC=Air Channel Test AL=Air Lance Test VB=Vacuum Box Test ST=Spark Test

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COLORADO LINING INTERNATIONAL

Field Seam Destructive Test

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 Mil HDPE

Destruct No.	Date of Test	Welder No.	Welder Temp.	Welder Speed	Seam No.	Time of Test	Welder's Name	Peel Value Inside/Outside	Sheer Value	(Pass/Fail)
1	7/31/10	1630	800	10	13	1:00	Jaime L	104/122	157	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	110/120	156	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	110/119	146	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	112/123	158	Pass
1	7/31/10	1630	800	10	13	1:00	Jaime L	109/120	142	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	114/118	148	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	119/115	145	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	114/112	152	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	112/111	155	Pass
2	7/31/10	1630	800	10	17	1:20	Jaime L	120/111	154	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	119/120	152	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	115/116	154	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	115/121	155	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	118/120	152	Pass
3	7/31/10	1630	800	10	30	1:32	Jaime L	11/6/118	158	Pass

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COLORADO LINING INTERNATIONAL

Field Seam Destructive Test

Project: Marathon 596-32C
Owner: Marathon Oil
Engineer:
Contractor: Marathon Oil
Supervisor: Mark Lucero
Material: 60 Mil HDPET

Destruct No.	Date of Test	Welder No.	Welder Temp.	Welder Speed	Seam No.	Time of Test	Welder's Name	Peel Value Inside/Outside	Sheer Value	(Pass/Fail)
1	8/4/10	1630	850	7	10	10:00	Jaime L	135/132	141	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	138/131	145	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	136/134	146	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	132/138	147	Pass
1	8/4/10	1630	850	7	10	10:00	Jaime L	133/134	143	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	142/138	150	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	138/140	151	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	136/142	153	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	138/141	154	Pass
2	8/4/10	1630	850	7	15	10:00	Jaime L	137/139	152	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	130/133	138	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	134/131	140	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	130/134	135	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	129/133	138	Pass
3	8/4/10	1630	850	7	19	10:00	Jaime L	132/134	139	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	130/139	145	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	140/129	149	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	137/128	152	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	138/132	150	Pass
4	8/4/10	1630	850	7	29	10:00	Jaime L	130/137	150	Pass

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COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPE**

Panel No.	Roll Number	Date	Material Type	Width	Length
1	Client provided material	7/28/2010	60 Mil HDPE	22'	126'
2	"	7/28/2010	60 Mil HDPE	22'	44'
3	"	7/28/2010	60 Mil HDPE	22'	24'
4	"	7/28/2010	60 Mil HDPE	22'	44'
5	"	7/28/2010	60 Mil HDPE	22'	24'
6	"	7/28/2010	60 Mil HDPE	22'	44'
7	"	7/28/2010	60 Mil HDPE	22'	44'
8	"	7/28/2010	60 Mil HDPE	22'	41'
9	"	7/28/2010	60 Mil HDPE	22'	24'
10	"	7/28/2010	60 Mil HDPE	22'	20'
11	"	7/29/2010	60 Mil HDPE	22'	49'
12	"	7/29/2010	60 Mil HDPE	22'	78'
13	"	7/29/2010	60 Mil HDPE	22'	126'
14	"	7/29/2010	60 Mil HDPE	22'	126'
15	"	7/29/2010	60 Mil HDPE	22'	126'
16	"	7/29/2010	60 Mil HDPE	22'	126'
17	"	7/29/2010	60 Mil HDPE	22'	126'
18	"	7/29/2010	60 Mil HDPE	22'	126'
19	"	7/29/2010	60 Mil HDPE	22'	126'
20	"	7/30/2010	60 Mil HDPE	22'	78'
21	"	7/30/2010	60 Mil HDPE	22'	49'
22	"	7/30/2010	60 Mil HDPE	22'	54'
23	"	7/30/2010	60 Mil HDPE	22'	39'
24	"	7/30/2010	60 Mil HDPE	22'	25'
25	"	7/30/2010	60 Mil HDPE	22'	58'

COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPET**

Panel No.	Roll Number	Date	Material Type	Width	Length
1	104143108	8/2/10	60 Mil HDPET	22	118'
2	104143108	8/2/10	60 Mil HDPET	22	48'
3	104143108	8/2/10	60 Mil HDPET	22	24'
4	104143108	8/2/10	60 Mil HDPET	22	34'
5	104143108	8/2/10	60 Mil HDPET	22	48'
6	104143108	8/2/10	60 Mil HDPET	22	49'
7	104143108	8/2/10	60 Mil HDPET	22	47'
8	104143108	8/2/10	60 Mil HDPET	22	17'
9	104143108	8/2/10	60 Mil HDPET	22	38'
10	104143108	8/2/10	60 Mil HDPET	22	20'
11	104143108	8/2/10	60 Mil HDPET	22	69'
12	103176821	8/2/10	60 Mil HDPET	22	48'
13	103176821	8/3/10	60 Mil HDPET	22	123'
14	103176821	8/3/10	60 Mil HDPET	22	123'
15	103176821	8/3/10	60 Mil HDPET	22	124'
16	103176821	8/3/10	60 Mil HDPET	22	125'
17	108151138	8/3/10	60 Mil HDPET	22	126'
18	108151138	8/3/10	60 Mil HDPET	22	126'
19	108151138	8/3/10	60 Mil HDPET	22	127'
20	108151138	8/3/10	60 Mil HDPET	22	127'
21	104143105	8/3/10	60 Mil HDPET	22	53'
22	104143105	8/3/10	60 Mil HDPET	22	40'
23	104143105	8/3/10	60 Mil HDPET	22	55'
24	104143105	8/3/10	60 Mil HDPET	22	27'
25	104143105	8/3/10	60 Mil HDPET	22	65'

COLORADO LINING INTERNATIONAL

Panel Placement Log

Project: **Marathon 596-32C**
Owner: **Marathon Oil**
Engineer:
Contractor: **Marathon Oil**
Supervisor: **Mark Lucero**
Material: **60 Mil HDPET**

Panel No.	Roll Number	Date	Material Type	Width	Length
26	104143105	8/3/10	60 Mil HDPET	22'	45'
27	104143105	8/3/10	60 Mil HDPET	22'	25'
28	104143105	8/3/10	60 Mil HDPET	22'	51'
29	104143105	8/3/10	60 Mil HDPET	22'	38'

COLORADO LINING INTERNATIONAL

Sub grade Acceptance

Date:_____

Project:	**Marathon 596-32C**
Owner:	**Marathon Oil**
Engineer:	
Contractor:	**Marathon Oil**
Installation Supervisor:	**Mark Lucero**
Material:	**60 mil HDPE**

Is surface acceptable for placement of geomembranes? Yes X No___

Comments _____

_____

Date: 8-5-10

Accepted By Representative of Owner/Owner (Signature) Gary Starks

I certify that I am a representative with the authority to provide this acceptance and recognize that if this is not a true statement that I will be held personally responsible for the integrity of the inspection.

Print Name/Title: Moc. rep Gary Starks

Company: _____

Witnessed By Representative of CLC (Signature) _____

Print Name/Title Mark Lucero

This document only applies to the acceptability of the surface conditions for the installation of the geosynthetic products. Colorado Lining Construction (CLC) does not accept responsibility for anchor trench elevation or design, elevation points for construction, sub-grade compaction, moisture content of neither the sub-grade nor the surface maintenance during deployment. The structural integrity of the sub-grade and maintenance of these conditions are the responsibility of the owner, engineer or contractor. Furthermore, any incidental damage to the liner or seams (e.g. groundwater, gases, cover soil placement and sub-grade movement) during or after the installation is not covered by any warranty expressed or implied and the design, engineering and construction are the responsibility of the owner, engineer and/or contractor.

CORPORATE OFFICE
1062 Singing Hills Road Parker, Colorado 80138 800 524 8672 303 841 2022 Fax 303 841 5780 www.coloradolining.com

COLORADO LINING INTERNATIONAL

Geomembrane Installation Approval

Project:	**Marathon 596-32C**
Owner:	**Marathon Oil**
Engineer:	
Contractor:	**Marathon Oil**
Supervisor:	**Mark Lucero**
Material:	**60 mil HDPE**

The Geomembrane on this project has been installed, inspected and tested in accordance with Industry Standards and Manufacturer recommendations.

Date: 8-5-10

Accepted By: (Signature) Gary Starks

Print Name/Title: Mgr. Rep. Gary Starks

Company: _____

Comments: _____

_____

_____

All warranties to begin on the date of completion.
Warranties to be issued upon receipt of final payment

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Project History

Marathon Oil Company
32C Produced Water Pond

OA Project No. 012-1372

760 Horizon Drive, Suite 102 | Grand Junction, CO 81506 | TEL 970.263.7800 | FAX 970.263.7456

FORM 15 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

EARTHEN PIT REPORT/PERMIT

This form is to be used for both reporting and permitting pits. Rule 903 describes when a Permit with prior approval, or a Report within 30 days, is required for pits. Submit required attachments and forms.

Complete the Attachment Checklist

	Oper	OGCC
Detailed Site Plan	X	
Topo Map w/ Pit Location	X	
Water Analysis (Form 25)	X	
Source Wells (Form 26)	X	
Pit Design/Plan & Cross Sect	X	
Design Calculations	X	
Sensitive Area Determ.	X	
Mud Program		
Form 2A	X	

FORM SUBMITTED FOR:

☐ Pit Report ☒ Pit Permit

OGCC Operator Number: 53650
Name of Operator: Marathon Oil Company
Address: 743 Horizon Court, Suite 220
City: Grand Junction State: CO Zip: 81506

Contact Name and Telephone:
Chris Hudson
No: 970-640-4823
Fax: 970-245-6287

API Number (of associated well): _____ OGCC Facility ID (of other associated facility): _____
Pit Location (QtrQtr, Sec, Twp, Rng, Meridian): SW 1/4 Sec 32, T5S, R96W, 6th P.M.
Latitude: 39.56780° Longitude: 108.19393° County: Garfield
Pit Use: ☐ Production ☐ Drilling (Attach mud program) ☒ Special Purpose (Describe Use): Temporary Water Storage
Pit Type: ☒ Lined ☐ Unlined Surface Discharge Permit: ☐ Yes ☐ No
Offsite disposal of pit contents: ☐ Injection ☐ Commercial Pit/Facility Name: N/A Pit/Facility No: N/A
Attach Form 26 to identify Source Wells and Form 25 to provide Produced Water Analysis results.

Existing Site Conditions

Is the location in a "Sensitive Area?" ☐ Yes ☒ No **Attach data used for determination.**
Distance (in feet) to nearest surface water: ~1320 ft ground water: ~319 ft water wells: ~6100 ft

LAND USE (or attach copy of Form 2A if previously submitted for associated well) Select one which best describes land use:

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

SOILS (or attach copy of Form 2A if previously submitted for associated well)

Soil map units form USNRCS survey: Sheet No: _____ Soil Complex/Series No: _____
Soils Series Name: _____ Horizon thickness (in inches): A: ; B: ; C:
Soils Series Name: _____ Horizon thickness (in inches): A: ; B: ; C:

Attach detailed site plan and topo map with pit location.

Pit Design and Construction

Size of pit (feet): Length: 301' Width: 85' Depth: 15'
Calculated pit volume (bbls): 40,607 max Daily inflow rate (bbls/day): 44 bbl/day annual ave
Daily disposal rates (attach calculations): Evaporation: N/A bbls/day Percolation: N/A bbls/day
Type of liner material: Reinforced Polyethylene (RPE) or similar Thickness: bottom 24 mils, top 36 mils or greater
Attach description of proposed design and construction (include sketches and calculations).
Method of treatment of produced water prior to discharge into pit (separator, heater treater, other): Separation, see Process Flow Diagram
Is pit fenced? ☒ Yes ☐ No Is pit netted? ☐ Yes ☒ No

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

Print Name: Chris Hudson Signed: _____
Title: Facilities Engineer Date: _____

OGCC Approved: Chris Canfield, P.G. Title: Digitally signed by Chris Canfield, P.G. DN: cn=Chris Canfield, P.G., o=COGCC, ou=EPS - NW Region, email=chris.canfield@state.co.us, c=US Date: 2009.11.12 12:37:28 -07'00' Date: _____

CONDITIONS OF APPROVAL, IF ANY:

FACILITY NUMBER: 421284

NAPO GAS ASSET TEAM
PICEANCE OPERATIONS
Weekly Report for September 5, 2010– September 11, 2010
September 15, 2010

Produced Water Management:

Short Term

- 32C Pond
  - MB completing construction of the wildlife fence & netting.
  - Remaining I&E, pond level gauge and leak detection instrument, are still 1-2 weeks out
  - Planning to initiate unloading produced water via trucks starting approx 9/15.

- Water loading site at 18A
  - Met with P&CD to review the design on 9/7. No major changes to design.
  - Received a response from Chevron regarding our pad pumps and water loading proposal. They had numerous operations questions. A reply from Marathon is nearly ready.

- Water handling – continuing weekly strategy sessions with the goal to minimize the water volumes going to Utah disposal.

Long Term

- Pond Complex – Laydown Yard
  - County Special Use Permit (SUP) - **Nothing New to Report**
    - A plan to move forward and address the GarCo issues has been discussed. Olsson to prepare response. The new plan will be presented to the Board 11/1.
  - COGCC E&P Waste Facility - **Nothing New to Report**
  - CDPHE Air Quality Permit - **Nothing New to Report**

- Water Treatment Technology - **Nothing New to Report**

- Water Handling - **Nothing New to Report**
  - Pad pump
    - The first natural gas unit from Jet Lift is tentatively planned to be shipped 9/9.
    - Solar Pump is being assembled and shop tested. Plan to install at the 11X the week of 9/20.
  - Additional rental pumps are on the mesa and being fit with controls and piping.

Marathon Water Infrastructure

- Valve can upgrades: **Nothing New to Report**
  - Receive the all of the AutoCAD as built drawings for 92 of the valves cans. Drawings are about 75% reviewed.
  - Valve can insulation has been completed.
- Laydown Yard - **Nothing New to Report**
  - Received initial plans from P&CD to complete the phase 1 of the laydown yard water infrastructure. This includes the pond manifolds, pumps, piping and associated buildings.
- Other – Bob Nickola will be assisting the Piceance Ops team serving as Project Manager for the Produced Water Management team. Bob plans to make his first trip to the Piceance this week.

Calendar Items

- 9/7 – 18A loading facility design review
- 9/7 – Viewpoint review with Brett Scodova
- 9/8 – Construction Update with Jacob's and BHI

NAPO GAS ASSET TEAM
PICEANCE OPERATIONS
Weekly Report for September 12, 2010– September 18, 2010
September 22, 2010

Pit Closure and Pad Reclamation

- 18C – The soil samples from the underside of the liner have been returned and we have approval to close the pit. Bolton Construction will be back filling the reserve pit starting this week.
- 18A - Bolton Construction has started to remove cuttings from the reserve pit.

Produced Water Management:

Short Term

- 32C Storage Pond
  - Remaining I&E, pond level gauge and leak detection instrument, are still 1-2 weeks out
  - On 9/13 operations began unloading produced water into the storage pond.
- Water loading site at 18A
  - Waiting on a response from Chevron to progress testing of our pad pumps and begin installation of the water loading site..

Long Term

- Pond Complex – Laydown Yard
  - County Special Use Permit (SUP) -
    - The Amended application for the lay down yard use was submitted to the county on 9/17. This was to allow material handling vs. material storage in the lay down yard (to allow tanks to be set for use as water clarification)
  - COGCC E&P Waste Facility - **Nothing New to Report**
  - CDPHE Air Quality Permit - **Nothing New to Report**
- Water Treatment Technology - **Nothing New to Report**
- Water Handling
  - Pad pump
    - The first natural gas unit from Jet Lift was shipped on Thursday 9/9 to the laydown yard.
      - A MOCR was initiated to set the unit at the 33C pad.
    - Solar Pump package is planned for delivery and installation the week of the 27th and to be installed at the 11X pad.
      - A MOCR was initiated for the solar unit.

Marathon Water Infrastructure

- Documentation:
  - Pipeline System Documentation – working on compiling operating procedures, pictures, drawings and maps of the pipeline system.
    - Reviewed approximately 50% of the valve can drawings.
- Laydown Yard
  - Reviewed the initial plans from P&CD to complete the phase 1 of the laydown yard water infrastructure. Reviewing inventory of parts and will order any additional parts needed to complete the valve manifold and pump piping.
- Valley Pump Station
  - A MOCR to relocate a pressure transmitter was initiated. Transmitter will allow Marathon to monitor the pipeline pressure while the VPS is shutdown.

Melissa Velasquez
HES Professional

Marathon Oil Company
743 Horizon Ct., Ste 220
Grand Junction, Colorado 81506
Telephone 970.244.5743 Mobile 970.462.8096
Fax 970.245.6872
mrvelasquez@marathonoil.com

June 8, 2012

Mr. Chris Canfield
Environmental Protection Specialist, NW Region
Colorado Oil & Gas Conservation Commission
707 Wapiti Court, Suite 204
Rifle, CO 81650

Re: 596-32C Pond, Facility ID 421284
Marathon Oil, Garfield County, Colorado

Dear Mr. Canfield,

Enclosed are a Form 19 Spill/Release Report and Form 27 Site Investigation and Remediation Workplan, as requested, to document Marathon's activities in response to discovering damage to the liner at the above referenced 596-32C Pond (Pond). As we discussed, these reports are submitted in an abundance of caution. Based on the information currently available, we cannot confirm that any amount of produced fluid was released to the environment. As explained below, we have taken soil samples in the area of the potential release in an effort to understand whether any produced fluid was released to the environment. We will provide the results of those samples to you promptly once we receive them.

Marathon discovered visible damage to the upper liner of the double lined, six-layer liner system on Friday, 5/25/2012. After discovery, the produced fluid level in the pond was lowered to several inches below the lowest damage point. At that time, personnel onsite were unable to determine if the upper liner had been breached. A professional liner company (Colorado Liner) was contacted and scheduled for an immediate assessment. The assessment took place on Tuesday, 5/30/2012 following an extended holiday weekend. During the three-day weekend, Marathon had personnel onsite to monitor the Pond's leak detection system. The assessment revealed that the upper and lower HDPE liners had been damaged. The damage to the lower liner consisted of three small (<1 mm) holes. It could not be determined whether produced fluid had breached the lower liner and impacted the soil below. There are three additional layers to the liner system between the lower HDPE liner and the soil (ground). These three layers did not show signs of damage.

Soil samples were collected from the exposed area and sent to Energy Labs in Gillette, WY for analysis. Upon receipt, the results will be analyzed to determine whether produced fluid likely came into contact with the soil due to the liner damage. If the results indicate that additional remediation efforts are needed, those efforts will be commenced as outlined in the attached Forms 19 and 27.

While it has not been determined that Marathon released any amount of produced fluid, I placed a courtesy notification to the COGCC on Wednesday, 5/30/2012. The attached reports and field reconnaissance conducted 5/31/2012 resulted from the discussion between you and me.

The liner was repaired by Colorado Liner on 5/31/2012 and the pond is currently being maintained at a level below the repair work.

The cause of the damage is likely due to a use of a tool to break ice on the Pond surface by a contractor performing water disposal work. The contractor was not working at the time the damage was discovered or in the days following. On 6/4/2012, Marathon met with the contractor to discuss the incident, suspected causes and potential impacts to current operations, including reduced Pond storage capacity. The contractor will no longer be working from the Pond, but will pull fluid from a frac tank onsite.

If you have any questions or require additional information, please contact me at 970-244-5743, or by e-mail at mrvelasquez@marathonoil.com.

Regards,

Melissa Velasquez

Melissa Velasquez
HES Professional

Enclosures

FORM 19 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

Spill report taken by:

FACILITY ID:

SPILL/RELEASE REPORT

This form is to be submitted by the party responsible for the oil and gas spill or release. Any spill or release which may impact waters of the State must be reported as soon as practicable; any spill over 20 bbls must be reported within 24 hours and all spills over five bbls must be reported within ten days. Submit a Site Investigation and Remediation Workplan (Form 27) when requested by the Director.

OPERATOR INFORMATION

Name of Operator: Marathon Oil OGCC Operator No: 53650

Address: 743 Horizon Court

City: Grand Junction State: CO Zip: 81506

Contact Person: Melissa Velasquez

Phone Numbers

No: 970-244-5743

Fax: 970-245-6287

E-Mail: mrvelasquez@marathonoil.com

DESCRIPTION OF SPILL OR RELEASE

Date of Incident: 5/29/2012 Facility Name & No.: 596-32C Pond, Facility No. 421284

Type of Facility (well, tank battery, flow line, pit): Special purpose pit - produced water storage pond

Well Name and Number: NA

API Number: NA

County: Garfield

QtrQtr: SESW Section: 32

Township: 5S Range: 96W

Meridian: 6th

Specify volume spilled and recovered (in bbls) for the following materials:

Oil spilled: 0 Oil recov'd: NA Water spilled: See cover letter Water recov'd: NA Other spilled: NA Other recov'd: NA

Ground Water impacted? ☐ Yes ☐ No Surface Water impacted? ☐ Yes ☐ No

Contained within berm? ☐ Yes ☐ No Area and vertical extent of spill: See cover letter x

Current land use: See attached Form 2a Weather conditions: Clear, sunny

Soil/geology description: See attached Form 2a

IF LESS THAN A MILE, report distance **IN FEET** to nearest.... Surface water: ~1320 ft wetlands: NA buildings: NA

Livestock: See cover letter water wells: ~1.2 miles Depth to shallowest ground water: ~319 ft

Cause of spill (e.g., equipment failure, human error, etc.): Human error Detailed description of the spill/release incident:

On 5/29/12, an assessment of visible damage to the upper liner at the 596-32C Pond was conducted by the liner installation company at Marathon's request. Liner damages were likely caused by a contractor's use of a tool to break ice in order to draw water from the pond into a frac tank for use in a water disposal system. The assessment revealed that the lower layer of HDPE liner was punctured resulting in three very small holes (the largest is hole is <1 mm). It was not apparent whether produced fluid from the pond had penetrated the lower liner. Soil samples were collected from the area beneath the liner damage and sent to a lab for analysis to determine if the soil has been impacted impacted. Results will be shared with COGCC

CORRECTIVE ACTION

Describe immediate response (how stopped, contained and recovered):

Monitoring of the leak detection system revealed fluids in the system. These fluids were removed and the pond was drawn down until damage to the upper liner was visible. Since that time no additional fluid was observed to enter the leak detection system. Once visible damage to the liner was revealed, a liner company was called in to do a professional assessment. No visible release of produced fluid occurred. The liner was repaired and tested by the liner company on 5/30/12.

Describe any emergency pits constructed:

NA

How was the extent of contamination determined:

Soil samples were collected 5/29/12 and sent to a lab for analysis of Table 910-1 soil standards. These results are pending and will assist in determining whether produced fluid breached the small openings in the lower liner and impacted the soil.

Further remediation activities proposed (attach separate sheet if needed):

Marathon will work with COGCC to mitigate any impacts to the soil if lab results indicate contamination. The area will be exposed and contaminated soil will be removed and mitigated onsite.

Describe measures taken to prevent problem from reoccurring:

Marathon met with the contractor that may have caused the damage and reviewed the incident before allowing the contractor to continue working at the site. Contractor will only be working from a frac tank onsite and will not be pulling water directly from the pond. Marathon will review the necessity of this type of work during months when the pond surface is frozen.

OTHER NOTIFICATIONS

List the parties and agencies notified (County, BLM, EPA, DOT, Local Emergency Planning Coordinator or other).

Date	Agency	Contact	Phone	Response
5/30/2012	COGCC	Chris Canfield	970-625-2497	Courtesy Notification

Spill/Release Tracking No: _____

FORM 27 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

OGCC Employee:
☐ Spill ☐ Complaint
☐ Inspection ☐ NOAV
Tracking No:

SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

☐ Spill or Release ☐ Plug & Abandon ☐ Central Facility Closure ☐ Site/Facility Closure ☑ Other (describe): Impoundment Liner Damage

OGCC Operator Number: 53650
Name of Operator: Marathon Oil
Address: 743 Horizon Court, Suite 220
City: Grand Junction State: CO Zip: 81506

Contact Name and Telephone:
Melissa Velasquez
No: 970-244-5743
Fax: 970-245-6287

API Number: NA
County: Garfield
Facility Name: 596-32C Pond
Facility Number: 421284
Well Name: NA
Well Number: NA
Location: (QtrQtr, Sec, Twp, Rng, Meridian): SESW Sec 32, T5S, R96W, 6th P.M.
Latitude: 39.56780 Longitude: 108.19393

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): See Cover Letter

Site Conditions: Is location within a sensitive area (according to Rule 901e)? ☐ Y ☑ N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): See attached Form 2a

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: See attached Form 2a

Potential receptors (water wells within 1/4 mi, surface waters, etc.): See attached Form 2a

Description of Impact (if previously provided, refer to that form or document):

Impacted Media (check):	Extent of Impact:	How Determined:
☐ Soils	See cover letter	Soil samples collected 5/29/12, currently awaiting receipt of lab analysis
☐ Vegetation		
☐ Groundwater		
☐ Surface Water		

REMEDIATION WORKPLAN

Describe initial action taken (if previously provided, refer to that form or document):

Marathon monitored the leak detection system daily and lowered the level of water in the pond. Once visible damage to the liner was revealed, a liner company was called in to do a professional assessment. No visible release of produced fluid occurred. The liner was repaired and tested by the liner company on 5/30/12. (See Form 19)

Describe how source is to be removed:

If, upon receipt, lab results from the soil samples collected 5/29/12 indicate that the soil has been impacted by produced fluid from the 596-32C Pond, Marathon will work with COGCC to determine how to assess and address the impact. Sections of liner may be pulled back or removed, and impacted soil will be removed for remediation onsite. Inert material will be added to reduce total concentrations of Table 910-1 constiutents to levels consistent with background and acceptable to COGCC.

Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:

See above. Marathon will work with COGCC to assess and remediate impacts if sample results indicate that produced fluid was released from the 596-32C Pond.

Submit Page 2 with Page 1

FORM 27 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission
1120 Lincoln Street, Suite 801, Denver, Colorado 80203
(303)894-2100 Fax:(303)894-2109

Page 2

REMEDIATION WORKPLAN (Cont.)

Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: _____
Facility Name & No: _____

OGCC Employee:

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

While awaiting lab analysis for soil samples collected 5/29/12 to determine if produced fluid breached the lower liner and impacted the soil below, Marathon dispatched two field technicians on 5/31/12, as requested by COGCC, to walk the areas from the crest to Little Creek and the crest to House Log Gulch in the area of Marathon's 596-32C well pad looking for seeps or springs. No discharges were noted so no samples were collected. In addition, Marathon will be conducting surface water sampling as part of an annual internal program. Results from this effort will be evaluated for any changes to baseline water quality.

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

NA

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? ☐ Y ☐ N If yes, describe:

See cover letter. Marathon is awaiting results from soil samples collected 5/29/12 to determine if a release occurred and impacted the soil below the liner.

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

Any impacted soil will be removed and mitigated onsite. An inert material will be added to reduce total concentrations of Table 910-1 constiutents to levels consistent with background and acceptable to COGCC. The material will be sampled prior to final disposition to ensure compliance with the previously mentioned standards. Once remediation activties are complete the material will be re-used onsite

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: 5/21/2012	Date Site Investigation Completed: on going	Date Remediation Plan Submitted: 6/8/2012
Remediation Start Date: See cover letter	Anticipated Completion Date: See cover letter	Actual Completion Date: See cover letter

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

Print Name: Melissa Velasquez Signed: Melissa Velasquez

Title: HES Professional Date: 6/8/2012

OGCC Approved: _____ Title: _____ Date: _____

FORM 2A Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

02045378

FEB 1 4 2008

COGCC

DRILL SITE/ACCESS ROAD RECLAMATION FORM

This form shall be submitted in duplicate with the application for permit-to-drill (OGCC Form 2) unless a Federal 13-point surface plan is included Also required are a minimum of two photographs (site and access road) Soil and plant community information is from United States Natural Resources Conservation Services (USNRCS)

1. OGCC Operator Number 525380
2. Name of Operator MARATHON OIL COMPANY
3. Address PO BOX 3128

City HOUSTON State TX Zip 77253

4. Contact Name and Telephone ANNA WALLS

No (713) 296-3468

Fax (713) 513-6394

5. Well Name and No 596-32C-12
6. County GARFIELD
7. Location (QtrQtr, Sec, Twp, Rng, Meridian) SESW - 32 - 05S 96W

Complete the Attachment Checklist

	Oper	OGCC
Drillsite and access photographs	✓	
COE Section 404 documentation		

Pre-Drilling Information

Current Land Use

8 Crop Land: ☐ Irrigated ☐ Dry Land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP

9 Non-Crop Land: ☑ Rangeland ☐ Timber ☐ Recreational ☐ Other (describe) ______

10 Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

Attach color photographs of drill site and access road; Identify each photo by date, well name and location

Soils

11 *Soil map units from USNRCS survey: Sheet No* ______ *Soil Complex/Series No* 56

Soils Series Name PARACHUTE-Irigal-Rhone association,25-50%SLOPES Horizon thickness (in inches) A 10-39 B 39-55 C 55-59

Soils Series Name ______ Horizon thickness (in inches) A ______ B ______ C ______

Plant Community

Complete this section only if operations are to be conducted upon non-crop land

12 Plant species from ☐ USNRCS or ☑ Field Observation Date of observation ______

List individual species ______

13 Check one predominant plant community for the drill site

- ☐ Disturbed Grassland (Cactus, Yucca, Cheatgrass, Rye, Thistle)
- ☐ Grassland (Bluestem, Grama, Wheatgrass, Buffalograss, Fescue, Oatgrass, Brome)
- ☑ Shrub and Brush Land (Mahogany, Oak, Sage, Serviceberry, Chokecherry)
- ☐ Plains Deciduous Riparian (Cottonwood, Willow, Aspen, Maple, Poplar, Russian Olive, Tamarisk)
- ☐ Mountain Conifer Riparian (Spruce, Fir, Ponderosa Pine)
- ☐ Evergreen Forest Land (Spruce, Fir, Ponderosa Pine, Lodgepole Pine, Juniper, Pinyon)
- ☐ Aquatic (Bullrush, Sedges, Cattail, Arrowhead)
- ☐ Tundra (Alpine, Willow, Currant, Raspberry)
- ☐ Other (describe) ______

14 Was an Army Corps of Engineers Section 404 Permit filed? ☐ Yes ☑ No If yes, attach appropriate documentation

Comments

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill site and access road, that I am familiar with the conditions which presently exist, that the statements made in this form are, to the best of my knowledge, true, correct, and complete

Print Name ANNA WALLS

Signed Anna Walls Title ENG TECH Date 01/31/08

Melissa Velasquez
HES Professional

Marathon Oil Company
743 Horizon Ct., Ste 220
Grand Junction, Colorado 81506
Telephone 970.244.5743 Mobile 970.462-8096
Fax 970.245.6872
mrvelasquez@marathonoil.com

June 18, 2012

Mr. Chris Canfield
Environmental Protection Specialist, NW Region
Colorado Oil & Gas Conservation Commission
707 Wapiti Court, Suite 204
Rifle, CO 81650

Re: 596-32C Pond, Facility ID 421284
Marathon Oil, Garfield County, Colorado

Dear Mr. Canfield,

Attached are lab analytical results for the sub-liner soil sample collected 5/30/2012. The results are below COGCC Table 910-1 standards and do not indicate that that the soil was impacted by produced water.

Based on these results, Marathon has no reason to believe that produced water breached the lower liner and or that a release occurred. These lab results are being submitted as an addendum to the 6/8/2012 Forms 19 and 27 reports, which were provided at COGCC's request as a result of a courtesy notification regarding liner system damage confirmed during Marathon's 5/30/2012 onsite assessment.

As previously indicated, marathon has already repaired the damaged liner. Accordingly, we seek your confirmation that no further action regarding this matter is needed at Pond 32C.

If you have any questions or require additional information, please contact me at 970-244-5743, or by e-mail at mrvelasquez@marathonoil.com.

Regards,

Melissa Velasquez
HES Professional

Enclosures

Zach Toellner
HES Professional

Marathon Oil Company
743 Horizon Court
Suite 220
Telephone 970.244.5723 Mobile 970.260.0772
Fax 970.245.6287
zjtoellner@*marathonoil*.com

Chris Canfield
Colorado Oil and Gas Conservation Commission
796 Megan Ave., Suite 201
Rifle, CO 81650

Re: 596-32C Pond, Facility ID 421284
Marathon Oil Company, Garfield County, Colorado

April 25, 2013

Dear Mr. Canfield:

Marathon Oil Company would like to take initial steps to report liner damage at our 596-32C pond, currently permitted under a Form 15. This report is submitted as an initial response to discovering damage to the liner at the above referenced 596-32C pond. The 596-32C pond's liner system consists of two 60-mil liners with geonet layers between and below the liners, and an outermost layer consisting of geotextile fabric laid over the prepared sub grade.

Water within the pond's leak detection system was reported to Marathon's local leadership on April 12, 2013 as a result of a monthly inspection. Marathon personnel responded to the water influx on April 12, and collected samples of the water for onsite and laboratory analysis. The water in the leak detection system was confirmed through onsite analysis to be produced water.

Marathon immediately began pumping operations from the 32C pond and from the pond's leak detection system to lower the water level in the pond and understand the recharge rate within the interstitial space between the dual-liner system.

On April 23rd, Marathon personnel located several holes in the pond's top liner, and continued pumping operations to reduce the water level below the holes observed. On the afternoon of April 24th, the water level had subsided below the holes and Marathon personnel were able to visually inspect the damage. It was noted that at least one of the nine holes identified punctured through both 60-mil liners of the liner system. Currently, Marathon is not seeing any further recharge in the pond's leak detection system, which has been pumped dry.

Over the next few weeks, Marathon intends to continue pumping from the 32C pond and monitoring the leak detection system for recharge. Once the water level allows for sufficient freeboard, we will schedule a professional liner company to perform an assessment on the integrity of the bottom liner. During the assessment a third party environmental contractor will collect soil samples from below the pond and send them for laboratory analysis.

Zach Toellner
HES Professional

Marathon Oil Company
743 Horizon Court
Suite 220
Telephone 970.244.5723 Mobile 970.260.0772
Fax 970.245.6287
zjtoellner@*marathonoil*.com

Marathon Oil

On April 24th, Marathon personnel worked with a contracted environmental technician to walk the surrounding area looking for seeps or springs, with the intention of sampling if any were found. None were found on the slopes below our 32C pad between Little Creek or House Log Gulch. As a precautionary measure, Marathon requested that the contract environmental technician sample Little Creek both upstream and downstream of our 32C location.

Marathon's local engineering department has begun reviews of historical water volumes in the pond, and compared those volumes to the volumes pumped and disposed of over the past few weeks. Currently, there is no indication that a significant volume of water has been released from the 32C pond.

Marathon has located nine holes in the top liner, all centralized within one area. Currently, we have only been able to verify that one hole breached the bottom liner. The largest hole is about 1" x ½" in size, and all are believed to be the result of a contractor using a tool to gain access to water through ice. The contractor is no longer working on Marathon's location.

Marathon personnel are committed to working diligently to continue to assess the liner breach, and will continue to inform the COGCC of our findings as the situation progresses. Please feel free to contact me directly with any questions or concerns.

Sincerely,

Zach Toellner
HES Professional

Attachments:
Form 19 Spill Report
Form 27 Site Investigation / Remediation Plan
Form 2a Drill Site / Access Road Reclamation Form

FORM 19 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

Spill report taken by:

FACILITY ID.

SPILL/RELEASE REPORT

This form is to be submitted by the party responsible for the oil and gas spill or release. Any spill or release which may impact waters of the State must be reported as soon as practicable; any spill over 20 bbls must be reported within 24 hours and all spills over five bbls must be reported within ten days. Submit a Site Investigation and Remediation Workplan (Form 27) when requested by the Director.

OPERATOR INFORMATION

Name of Operator: Marathon Oil OGCC Operator No: 53650

Address: 743 Horizon Court, Suite 220

City: Grand Junction State: CO Zip: 81506

Contact Person: Zach Toellner

Phone Numbers

No: 970-244-5723

Fax: 970-245-6287

E-Mail: zjtoellner@marathonoil.com

DESCRIPTION OF SPILL OR RELEASE

Date of Incident: 4/4/13 Facility Name & No.: 596-32C Pond, Facility No. 421284

Type of Facility (well, tank battery, flow line, pit): Special purpose pit - produced water storage pond

Well Name and Number: N/A

API Number: N/A

County: Garfield

QtrQtr: SESW Section: 32

Township: 5S Range: 96W

Meridian: 6th

Specify volume spilled and recovered (in bbls) for the following materials:

Oil spilled: 0 Oil recov'd: N/A Water spilled: See cover letter Water recov'd: N/A Other spilled: N/A Other recov'd: N/A

Ground Water impacted? ☐ Yes ☑ No Surface Water impacted? ☐ Yes ☐ No

Contained within berm? ☑ Yes ☐ No Area and vertical extent of spill: See cover letter x

Current land use: See attached form 2A Weather conditions:

Soil/geology description: See attached form 2A

IF LESS THAN A MILE, report distance **IN FEET** to nearest.... Surface water: ~ 1320 ft wetlands: N/A buildings: N/A

Livestock: None, seasonal water wells: ~ 6100 ft Depth to shallowest ground water: ~ 319 ft

Cause of spill (e.g., equipment failure, human error, etc.): Human error Detailed description of the spill/release incident:

Liner damage was likely caused by a contractor's use of tools to break ice in order to draw water from the pond into a frac tank for use in a water disposal system. Visual inspection by Mrarthon personnel has revealed 9 small holes in the top liner, and one has been verified to breach the lower liner. It is not apparent that produced water ahs breached the lower liner. Soil samples will be collected during an assessment of the lower liner and sent to a lab for analysis to determine if the soil has been impacted. results will be shared with the COGCC

CORRECTIVE ACTION

Describe immediate response (how stopped, contained and recovered):

Marathon personnel immediately began pumping water from both the pond and the leak detection system, and have been drawn down until damage was visible above the water line. Currently, all holes appear to be above the water line, and no recharge of the leak detection system or interstitial space between the liners has been observed

Describe any emergency pits constructed:

N/A

How was the extent of contamination determined:

On 4/24, Marathon personnel and a contract environmental technician walked the area surrounding 32C looking for seeps or springs with the intent of sampling any that were found. No active seeps or springs were noted. As a precautionary measure, Marathon personnel requested that the contractor sample Leslie Creek upstream and downstream of the 32C pad and submit the samples to a laboratory for analysis. In the coming weeks, Marathon will schedule a liner company to perform an assessment of the bottom liner, and an environmental contractor will collect soil samples for laboratory analysis at that time.

Further remediation activities proposed (attach separate sheet if needed):

Marathon will work with the COGCC to mitigate any impacts to the soil if laboratory analysis results indicate contamination. The area will be exposed and contaminated soil will be removed and mitigated as appropriate.

Describe measures taken to prevent problem from reoccurring:

Contractor is no longer working on Marathon's location and attempts to reach them have been unsuccesful.

OTHER NOTIFICATIONS

List the parties and agencies notified (County, BLM, EPA, DOT, Local Emergency Planning Coordinator or other).

Date	Agency	Contact	Phone	Response
4/15/2013	COGCC	Chris Canfield	970-625-2497	Awaiting return phone call.

Spill/Release Tracking No: _____

FORM 27 Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

FOR OGCC USE ONLY

OGCC Employee:
☐ Spill ☐ Complaint
☐ Inspection ☐ NOAV
Tracking No:

SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

☐ Spill or Release ☐ Plug & Abandon ☐ Central Facility Closure ☐ Site/Facility Closure ☑ Other (describe): Impoundment Liner Damage

OGCC Operator Number: 53650
Name of Operator: Marathon Oil
Address: 743 Horizon Court, Suite 220
City: Grand Junction State: CO Zip: 81506

Contact Name and Telephone:
Zach Toellner
No: 970-244-5723
Fax: 970-245-6287

API Number: NA
County: Garfield
Facility Name: 596-32C Pond
Facility Number: 421284
Well Name: NA
Well Number: NA
Location: (QtrQtr, Sec, Twp, Rng, Meridian): SESW Sec 32, T5S, R96W, 6th P.M. Latitude: 39.56780 Longitude: 108.19393

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): Produced water, see cover letter.

Site Conditions: Is location within a sensitive area (according to Rule 901e)? ☐ Y ☑ N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): See attached Form 2a

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: See attached Form 2a

Potential receptors (water wells within 1/4 mi, surface waters, etc.): See attached Form 2a

Description of Impact (if previously provided, refer to that form or document):

Impacted Media (check):	Extent of Impact:	How Determined:
☐ Soils	See cover letter	Soil samples will be collected in the near future concurrent with an assessment of the bottom liner
☐ Vegetation		
☐ Groundwater		
☐ Surface Water		

REMEDIATION WORKPLAN

Describe initial action taken (if previously provided, refer to that form or document):

Marathon personnel immediately began pumping water from both the pond and the leak detection system, and both have been drawn down until damage was visible above the water line. Currently, all holes appear to be above the water line, and no recharge of the leak detection system or interstitial space between the liners has been observed. (See Form 19)

Describe how source is to be removed:

If lab results from the soil samples to be collected indicate that the soil has been impacted by produced fluid from the 596-32C Pond, Marathon will work with COGCC to determine how to assess and address the impact. Sections of liner may be pulled back or removed, and impacted soil will be removed for remediation. Inert material will be added to reduce total concentrations of Table 910-1 constiutents to levels consistent with background and acceptable to COGCC.

Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:

See above. Marathon will work with COGCC to assess and remediate impacts if sample results indicate that produced fluid was released from the 596-32C Pond.

Submit Page 2 with Page 1

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Page 2

State of Colorado
Oil and Gas Conservation Commission
1120 Lincoln Street, Suite 801, Denver, Colorado 80203
(303)894-2100 Fax:(303)894-2109

Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: _____
Facility Name & No: _____

REMEDIATION WORKPLAN (Cont.)

OGCC Employee:

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

While awaiting an opportunity to collect soil samples concurrent with an assessment of the lower liner to determine if produced fluid breached the lower liner and impacted the soil below, Marathon dispatched a contract environmental technician and Marathon personnel to walk the areas from the crest to Little Creek and the crest to House Log Gulch in the area of Marathon's 596-32C well pad looking for seeps or springs. No seeps or springs were noted so no samples were collected. In addition, Marathon requested that the environmental technician collect samples from Little Creek both upstream and downstream of the 32C pad and send them to a laboratory for analysis.

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing. Use additional sheet for description if required.

N/A

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? ☑ Y ☐ N If yes, describe:

See cover letter. Marathon is awaiting the collection of soil samples to determine if a release occurred and impacted the soil below the liner.

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

Any impacted soil will be removed and mitigated as appropriate. An inert material will be added to reduce total concentrations of Table 910-1 constiutents to levels consistent with background and acceptable to COGCC. The material will be sampled prior to final disposition to ensure compliance with the previously mentioned standards. Once remediation activties are complete the material will be re-used onsite.

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: 4/12/2013 Date Site Investigation Completed: ongoing Date Remediation Plan Submitted: _____

Remediation Start Date: See cover letter Anticipated Completion Date: _____ Actual Completion Date: _____

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

Print Name: Zach Toellner Signed: Zach Toellner

Title: HES Professional Date: 4/25/2013

OGCC Approved: _____ Title: _____ Date: _____

FORM 2A Rev 6/99

State of Colorado
Oil and Gas Conservation Commission

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

02045378

FEB 1 4 2008

COGCC

DRILL SITE/ACCESS ROAD RECLAMATION FORM

This form shall be submitted in duplicate with the application for permit-to-drill (OGCC Form 2) unless a Federal 13-point surface plan is included Also required are a minimum of two photographs (site and access road) Soil and plant community information is from United States Natural Resources Conservation Services (USNRCS)

1. OGCC Operator Number 525380
2. Name of Operator MARATHON OIL COMPANY
3. Address PO BOX 3128
City HOUSTON State TX Zip 77253
5. Well Name and No 596-32C-12
6. County GARFIELD
7. Location (QtrQtr, Sec, Twp, Rng, Meridian) SESW - 32 - 058 96W

4. Contact Name and Telephone
ANNA WALLS
No (713) 296-3668
Fax (713) 513-6394

Complete the Attachment Checklist

	Oper	OGCC
Drillsite and access photographs	✓	
COE Section 404 documentation		

Pre-Drilling Information

Current Land Use

8 Crop Land: ☐ Irrigated ☐ Dry Land ☐ Improved Pasture ☐ Hay Meadow ☐ CRP

9 Non-Crop Land: ☑ Rangeland ☐ Timber ☐ Recreational ☐ Other (describe) _____

10 Subdivided: ☐ Industrial ☐ Commercial ☐ Residential

Attach color photographs of drill site and access road; identify each photo by date, well name and location

Soils

11 Soil map units from USNRCS survey: Sheet No _____ Soil Complex/Series No 56

Soils Series Name VASALTUTE-Irigul-Rhone association,25-50%SLOPES Horizon thickness (in inches) A 10-39 B 39-55 C 55-59

Soils Series Name _____ Horizon thickness (in inches) A _____ B _____ C _____

Plant Community

Complete this section only if operations are to be conducted upon non-crop land

12 Plant species from ☐ USNRCS or ☑ Field Observation Date of observation _____

List individual species _____

13 Check one predominant plant community for the drill site

- ☐ Disturbed Grassland (Cactus, Yucca, Cheatgrass, Rye, Thistle)
- ☐ Grassland (Bluestem, Grama, Wheatgrass, Buffalograss, Fescue, Oatgrass, Brome)
- ☑ Shrub and Brush Land (Mahogany, Oak, Sage, Serviceberry, Chokecherry)
- ☐ Plains Deciduous Riparian (Cottonwood, Willow, Aspen, Maple, Poplar, Russian Olive, Tamarisk)
- ☐ Mountain Conifer Riparian (Spruce, Fir, Ponderosa Pine)
- ☐ Evergreen Forest Land (Spruce, Fir, Ponderosa Pine, Lodgepole Pine, Juniper, Pinyon)
- ☐ Aquatic (Bullrush, Sedges, Cattail, Arrowhead)
- ☐ Tundra (Alpine, Willow, Currant, Raspberry)
- ☐ Other (describe) _____

14 Was an Army Corps of Engineers Section 404 Permit filed? ☐ Yes ☑ No If yes, attach appropriate documentation

Comments

I hereby certify that I, or persons under my direct supervision, have inspected the proposed drill site and access road, that I am familiar with the conditions which presently exist, that the statements made in this form are, to the best of my knowledge, true, correct, and complete

Print Name ANNA WALLS

Signed Anna Walls Title ENG TECH Date 01/31/08