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TECHNICAL MEMORANDUM

TO: Adell Heneghan, P.E., Marathon Oil Company **DATE:** June 30, 2008
FR: Randy March, P.E., P.G., Golder Associates Inc. **OUR REF:** 083-81544B.0001
RE: PAD 23X REMEDIATION STATUS AND RECOMMENDATIONS

Golder Associates Inc. (Golder) was retained by Marathon Oil Company (Marathon) to assist in conducting a spill release investigation at Pad 23X, which is located above the McKay Gulch drainage in Sec 23, T 6 S, R 97 W (Figures 1 and 2). Golder assistance has also included ongoing monitoring and oversight of a Marathon contractor during remediation of diesel contaminated materials at Pad 23X.

After the remediation is completed, Golder will issue a detailed report on the investigatory activities and results, and will document the site remediation with analytical laboratory reports, data tables, photographs and figures. The ultimate detailed report will also document the sampling locations and will provide survey results for the excavated areas. As an interim submittal, this Technical Memorandum briefly describes project status and recommendations to date.

SUMMARY OF INVESTIGATIONS

Two Pad 23X waste characterization samples were collected by Marathon on June 7, 2008. The corresponding Total Petroleum Hydrocarbon (TPH) laboratory analyses confirmed diesel-range contamination in the northern portion of Pad 23X. This area of diesel contamination, which is reportedly located near a former diesel fuel storage tank, is described herein as Area B (Figure 3).

Subsequent Pad 23X work by G.M. Stewart Corp. (GMS) encountered additional diesel contamination in the central portion of Pad 23X, described herein as Area A. GMS personnel reported that another diesel fuel storage tank was located in Area A in connection with nearby well drilling operations.

Marathon and Golder performed additional investigations at the site on June 19 and 20, including the following:

- Seven trenches/test pits (Appendix A) were excavated to determine the extent of contamination in Areas A and B;
- Screening of the pad material, comprised of soil and shale, was performed using a photo-ionization detector (PID);

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- 28 waste characterization samples were collected by Golder, and 18 of these samples were submitted for analytical testing; and
- Split samples were collected by LT Environmental Inc. on behalf of Petroleum Development Corporation.

Investigatory trenching and sampling fully characterized the waste, which is a mixture of soil and shale rock containing diesel fuel, and is mostly rock. In addition to the characterization samples collected on June 19 and 20, representative samples were collected in connection with removal of contaminated materials at Pad 23X. Associated waste characterization analytical testing included:

- BTEX – Method 8020
- TPH DRO and GRO – Method 8015
- PAH - Method 8310 or 8270
- Ignitability – Method 1010
- Electrical Conductivity
- Sodium Adsorption Ratio
- pH
- Total Metals – Method 3050 (As, Ba, Bo, Cd, Cr, Co, Pb, Hg, Mo, Ni, Se, Ag, and Zn)

In addition, the following supplemental TCLP analyses (extractions using Method 1311) are being performed on one of the composite samples:

- RCRA Metals (As, Ba, Cd, Cr, Pb, Hg, Se, Ag) – Methods 6010B ICP and M7471 CVAA
- VOCs – Method 8260
- SVOCs – Method 8270
- PAHs – Method 8270 or 8310
- Semi-Volatile Herbicides and Pesticides – Method 8270

To date, a total of 28 investigatory and confirmatory samples have been assigned for analytical testing. Presentation and detailed discussion of the analytical results are not within the scope of this interim document. However, it is noted that the waste is not ignitable based on flash point determination, and does not contain free liquids. Other analytical results pertinent to evaluation of remediation criteria are noted below.

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PAD 23X REMEDIATION CRITERIA

Information collected during the June 19 and 20 investigations resulted in estimation of waste volumes at the site. Without knowing the ultimate site remediation criteria, it was estimated that approximately 662 cubic yards (cy) of waste would be excavated if a PID reading of 150 parts per million (ppm) was used for waste screening.

Analytical results available as of June 23 were compared to applicable standards, including:

- Colorado Oil and Gas Conservation Commission (COGCC) allowable concentrations for Exploration and Production waste; and
- Acceptable contaminant concentrations for West Garfield County Landfill (WGC Landfill) – 2007.

Based on this comparison, it was concluded that: 1) the diesel contaminated materials could remain in place based on COGCC standards; and 2) contaminant concentrations are acceptable for WGC Landfill disposal. Although Pad 23X theoretically would not need to be remediated based on applicable standards, it was agreed that site remediation would be performed in accordance with more stringent Marathon expectations.

Pad 23X is designated as a non-sensitive area based on COGCC standards. The COGCC TPH cleanup level is 10,000 ppm for non-sensitive areas and 1,000 ppm for sensitive areas. The highest TPH reading recorded during the Pad 23X investigation was less than 2,400 ppm. In addition, it was determined that a PID screening level of 150 ppm would provide a cleanup level that would meet the TPH criteria for sensitive areas (1,000 ppm TPH). This conclusion was based on the following data.

Initial PID and TPH Results

Sample No.	Lab Sample No.	TPH Result (ppm)	Golder PID Reading (ppm)	LT Env. PID Reading (ppm)
4-18	08-1658	0	0	1.6
6-5	08-1659	0	6	3.5
9-4	08-1662	0	11	3.6
15-20	08-1667	0.1	2	0.9
16-9	08-1668	1.4	4.8	0
11-4	08-1663	1.5	20.3	14.9
3-23	08-1657	6.6	54	64
15-9	08-1664	311.1	260	135
15-12	08-1666	516.9	221	62.6
8-3	08-1661	1276	287	193
7-3	08-1660	2393.4	598	407

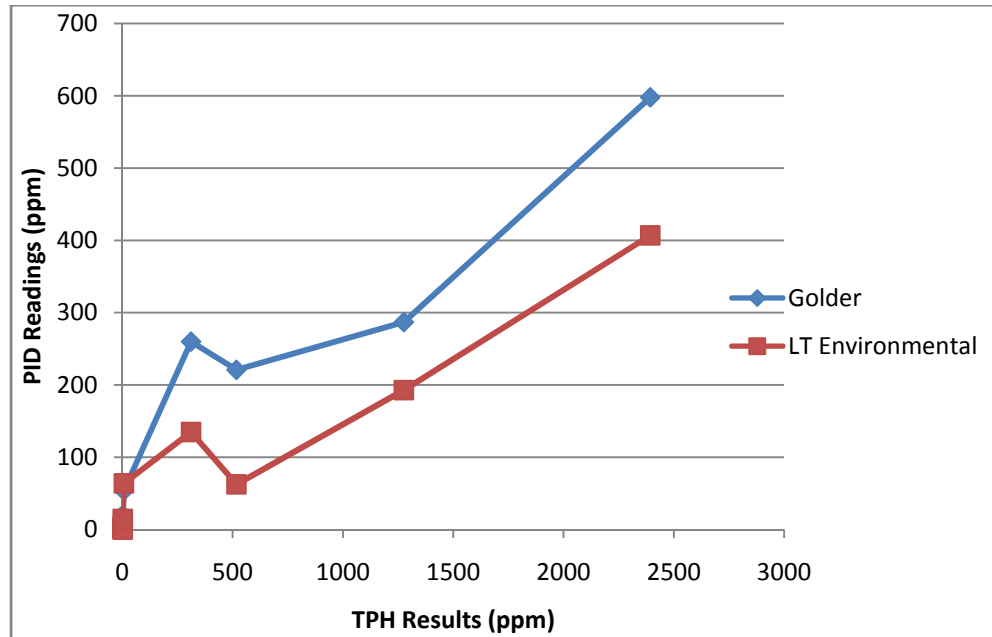
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PID and TPH Correlation



As an even more conservative safeguard, Marathon targeted 50 ppm PID levels for waste screening at the site.

PAD 23X REMEDIATION

On June 25, 662 cy of this waste was authorized for disposal in the West Garfield County Landfill. Remediation of Pad 23X began on June 26, and was in accordance with the Site Investigation and Remediation Workplan (COGCC Form 27) submitted by Marathon. The Area B waste excavation was completed on June 26, and most of the Area A waste excavation was completed on June 27. To date, Area A has been excavated to a depth of approximately 36 feet.

On June 30, West Garfield County Landfill personnel issued a revised waste acceptance letter authorizing a total of 1,500 cy of waste disposal from Pad 23X. Waste excavation, processing, hauling, and disposal are scheduled to resume on July 1.

RECOMMENDATIONS

All available data support the conclusion that Marathon has excavated more Pad 23X waste than would be required based on COGCC standards for non-sensitive areas, and has even gone beyond COGCC requirements for sensitive areas. In addition, Golder has considered Colorado Department of Public Health and Environment (CDPHE) guidance provided in the October 2003 document titled *Information Regarding the Management of Petroleum Contaminated Soil*.

Although it is currently assumed that COGCC standards are applicable to the Pad 23X diesel spills, CDPHE cleanup standards for petroleum contaminated soils are 500 ppm TPH, 0.26 ppm benzene, 200 ppm ethylbenzene, 170 ppm toluene, and 1900 ppm total xylene. Verification sampling and analysis indicate that residual contaminant concentrations beyond the Area A and B excavations are

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well below both COGCC and CDPHE requirements. Therefore, it is concluded that Marathon's remediation of Pad 23X is protective of human health and the environment. Based on this conclusion, we recommend the following.

- Finish excavating waste in the northwestern portion of Area A, where stockpiled waste is currently located.
- Collect a verification sample in the deepest portion of Area A, at an approximate depth of 36 feet.
- Collect verification samples in other portions of Area A that have not been tested to confirm that Pad 23X remediation conforms to applicable requirements and meets Marathon's expectations.
- Survey the final Area A and B excavations, then backfill these areas to provide a functional working surface for future operations.
- Evaluate potential monitoring well locations that would allow verification that Pad 23X diesel releases will not encroach upon possible downgradient receptors.

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LIST OF FIGURES

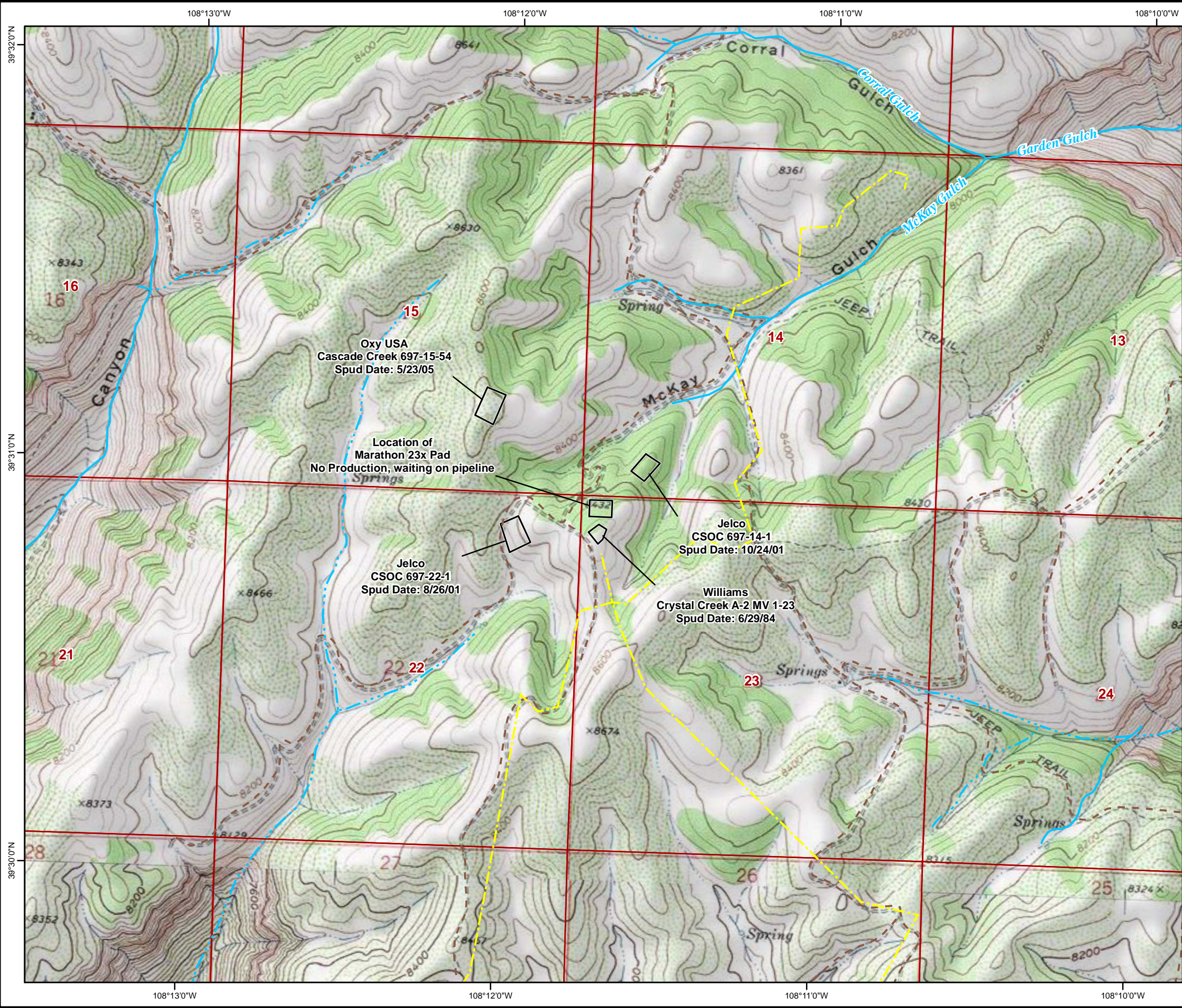
Figure 1 – Pad 23X Site Vicinity Map
Figure 2 – Pad Locations in Site Vicinity
Figure 3 – Pad 23X Area

LIST OF APPENDICES

Appendix A – Test Pit Logs

FIGURES

\\DEN1-S-FS2\gis2\Marathon\ArcMap\PadInvestigation\11x17_Marathon_PadLocs_Quad.mxd | AReither | 7/7/2008 8:39:04 AM



- LEGEND**
- Pad Location
 - Utility Line
 - Trail
 - Perennial Stream
 - Intermittent Stream
 - Public Land Survey System Section

REFERENCES


Pad Locations: Marathon, 6/9/2008.
All Base Data: Garfield County, 2008.
USGS. Various dates. Topo Quad (7.5') drawn from National Geographic TOPO! 4.0 [software] 2005: Circle Dot Gulch, Forked Gulch, Grand Valley, Red Pinnacle
Projection: UTM, Zone 13, NAD27, Meters.

ALL LOCATIONS ARE APPROXIMATE

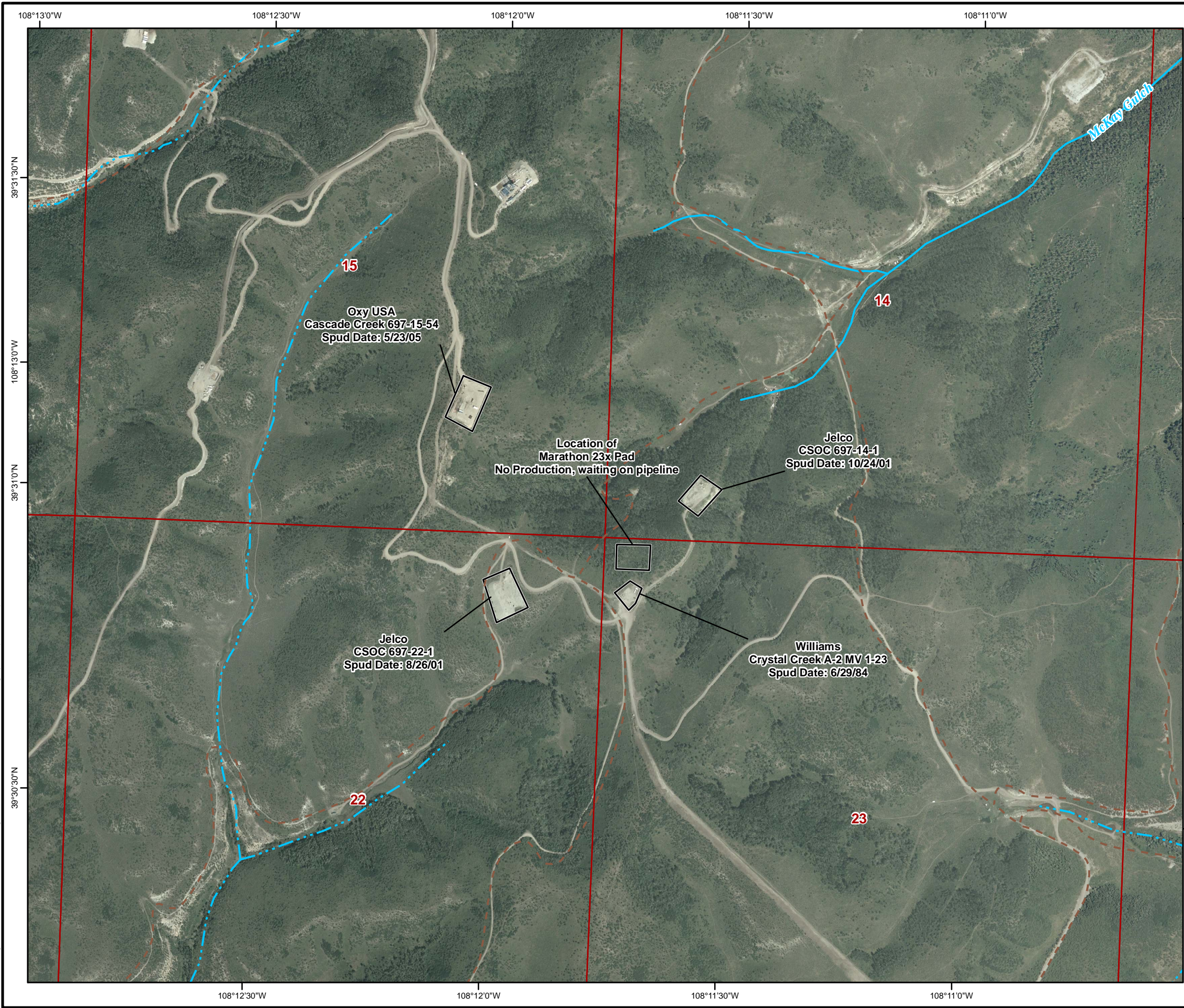
1,500 750 0 1,500
FEET

SCALE 1:18,000 1 INCH EQUALS 1,500 FEET
WHEN PRODUCED AT SIZE 11X17IN

N

PROJECT		MARATHON OIL COMPANY PAD 23X INVESTIGATION GARFIELD COUNTY, CO			
TITLE		PAD 23X SITE VICINITY MAP			
 Golder Associates Denver, Colorado	PROJECT No.	083-81544B	FILE No.	PadLocs_Quad.mxd	
	DESIGN	IJH	02/28/2008	SCALE	AS SHOWN
	GIS	AJR	06/17/2008	FIGURE 1	
	CHECK	ANH	06/16/2008		
	REVIEW	RSM	06/16/2008		

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LEGEND

- Pad Location
- Trail
- Perennial Stream
- Intermittent Stream
- Public Land Survey System Section

REFERENCES

Surface Water Sampling Locations: Marathon, 6/16/2008.
All Base Data: Garfield County, 2008.
Aerial Photography: National Agriculture Imagery Program, 2005.
Projection: UTM, Zone 13, NAD27, Meters.

ALL LOCATIONS ARE APPROXIMATE

1,000 500 0 1,000
FEET

SCALE 1:12,000 1 INCH EQUALS 1,000 FEET
WHEN PRODUCED AT SIZE 11X17IN

N


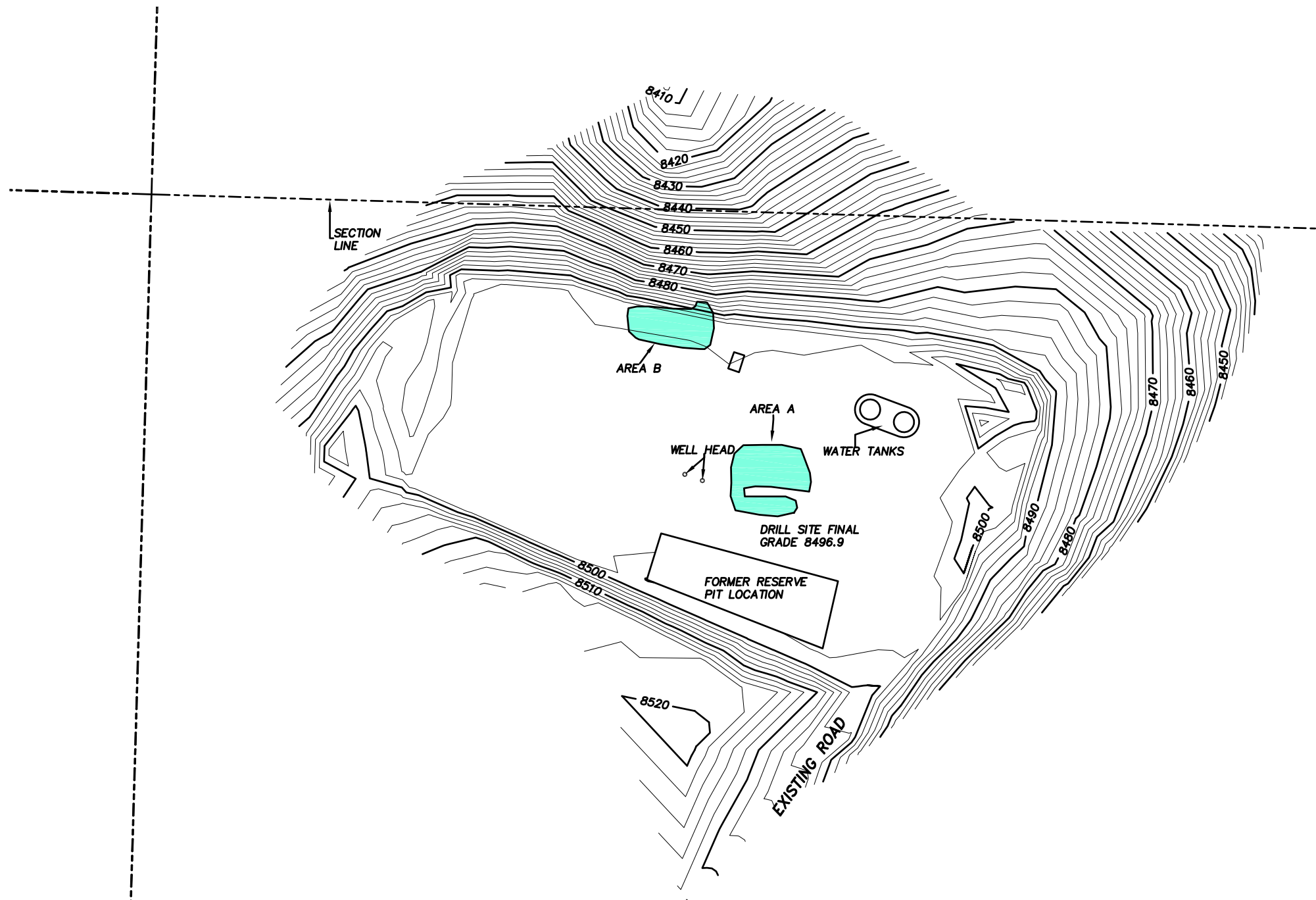
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TITLE					
PAD LOCATIONS IN SITE VICINITY					
 Golder Associates Denver, Colorado	PROJECT No.	083-81544B	FILE No.	PadLocs_Imagery.mxd	
	DESIGN	IJH	02/28/2008	SCALE	AS SHOWN
	GIS	AJR	06/17/2008		
	CHECK	ANH	06/16/2008		
	REVIEW	RSM	06/16/2008		

FIGURE 2

Dwg Name: N:\08\083-81544\08381544BA001.dwg
Layout Name: 11x17 Landscape Machine: DENT-W-MARKS1
Last Update: Jun 30, 2008 15:05 By: MMarkis
Last Plot: Jul 07, 2008 11:15 By: MMarkis



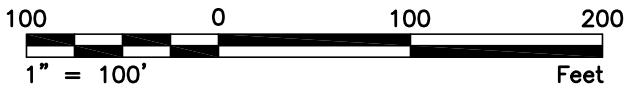
LEGEND

	PLSS Section
	Contour - 10 Foot Interval
	Contour - 2 Foot Interval
	Extent of Excavations as of June 30, 2008.

REFERENCES

- ASBUILT FEATURES AND CONTOURS: MARATHON, 06/18/2008
- AERIAL PHOTOGRAPHY: NATIONAL AGRICULTURE IMAGERY PROGRAM, 2005
- PROJECTION: STATE PLANE, COLORADO CENTRAL, NAD83, FEET

ALL LOCATIONS ARE APPROXIMATE



1 INCH EQUALS 100 FEET
WHEN PRODUCED AT 11 X 17 IN



PROJECT		MARATHON OIL COMPANY PAD 23X INVESTIGATION GARFIELD COUNTY, CO			
TITLE		PAD 23X AREA			
	PROJECT No.	083-81544B	FILE No.	08381544BA001	
	DESIGN	I/JH	02/28/2008	SCALE	AS SHOWN
	CADD	AJR	06/17/2008	REV.	1
	CHECK	ANH	06/16/2008	FIGURE 3	
REVIEW		RSM	06/16/2008		

APPENDIX A

TEST PIT LOGS

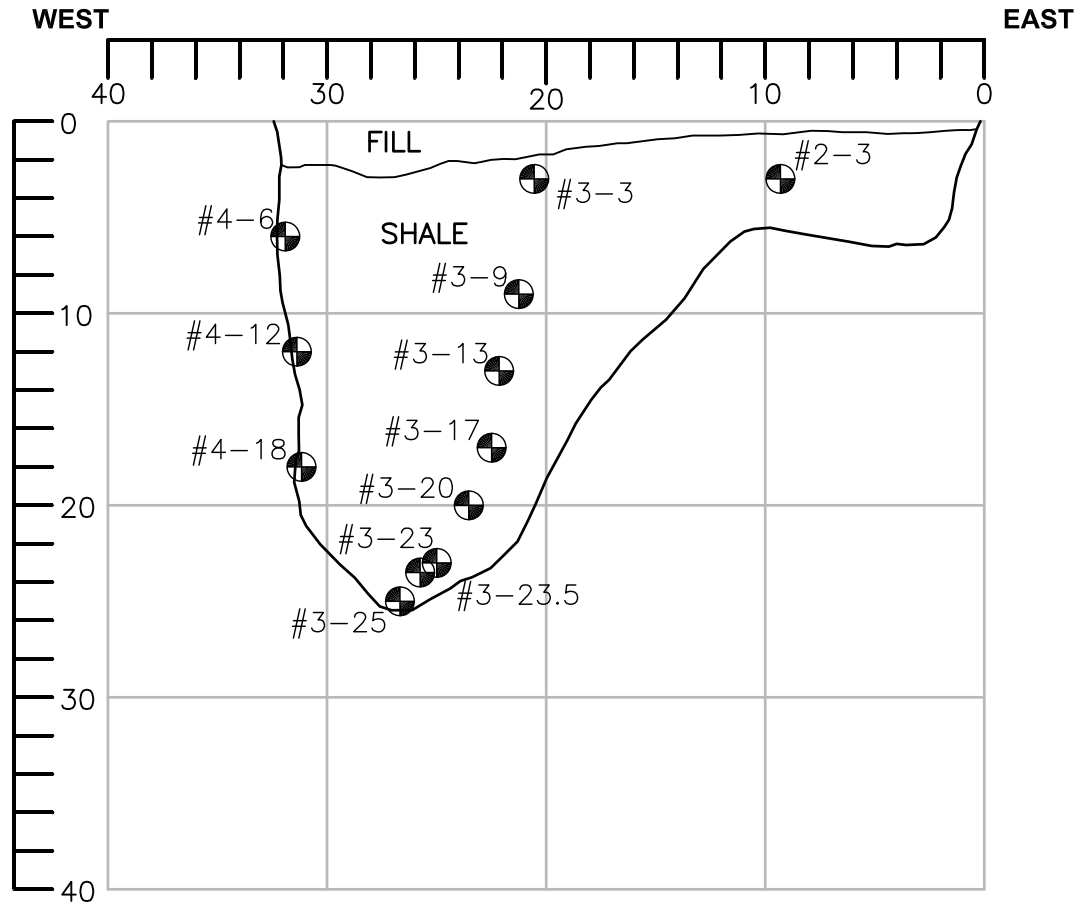


FIELD TEST PIT LOG

Temp.: 75°F Weather: Sunny Engineer: R. Mahan/ Lee Operator: R. March Craighead Test Pit: TP-1

Equipment: Link-Belt 330LX Contractor: G. M. Stewart Corp. Date: 6/19/08

Location: Pad 23x Elevation: — Datum: — Job No.: 083-81544B



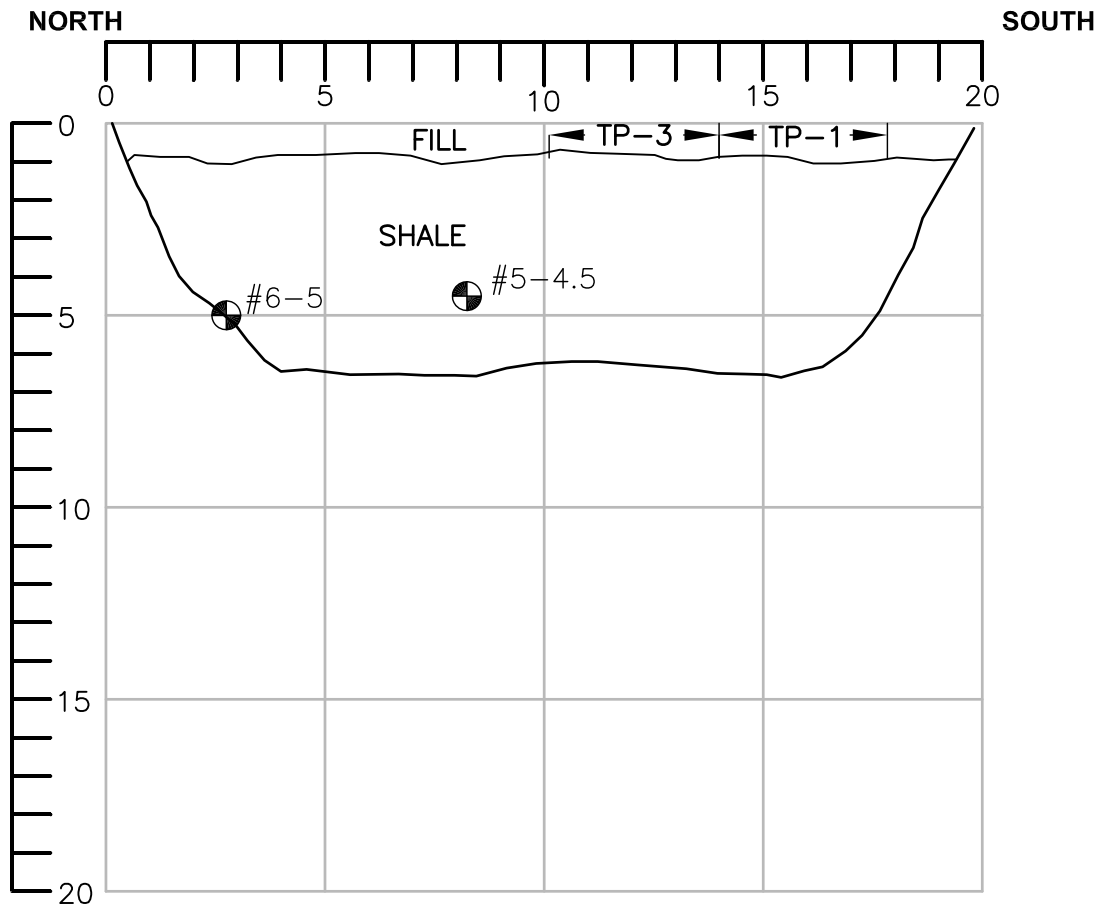
Samples	
No.	Depth
2-3	3'
3-3	3'
3-9	9'
3-13	13'
3-17	17'
3-20	20'
3-23	23'
3-23.5	23.5'
3-25	25'
4-6	6'
4-12	12'
4-18	18'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
Special Notes:			



FIELD TEST PIT LOG

Temp.: 75°F Weather: Sunny Engineer: R. Mahan/ Lee Operator: R. March Test Pit: TP-2
 Equipment: Link-Belt 330LX Contractor: G. M. Stewart Corp. Date: 6/20/08
 Location: Pad 23x Elevation: — Datum: — Job No.: 083-81544B



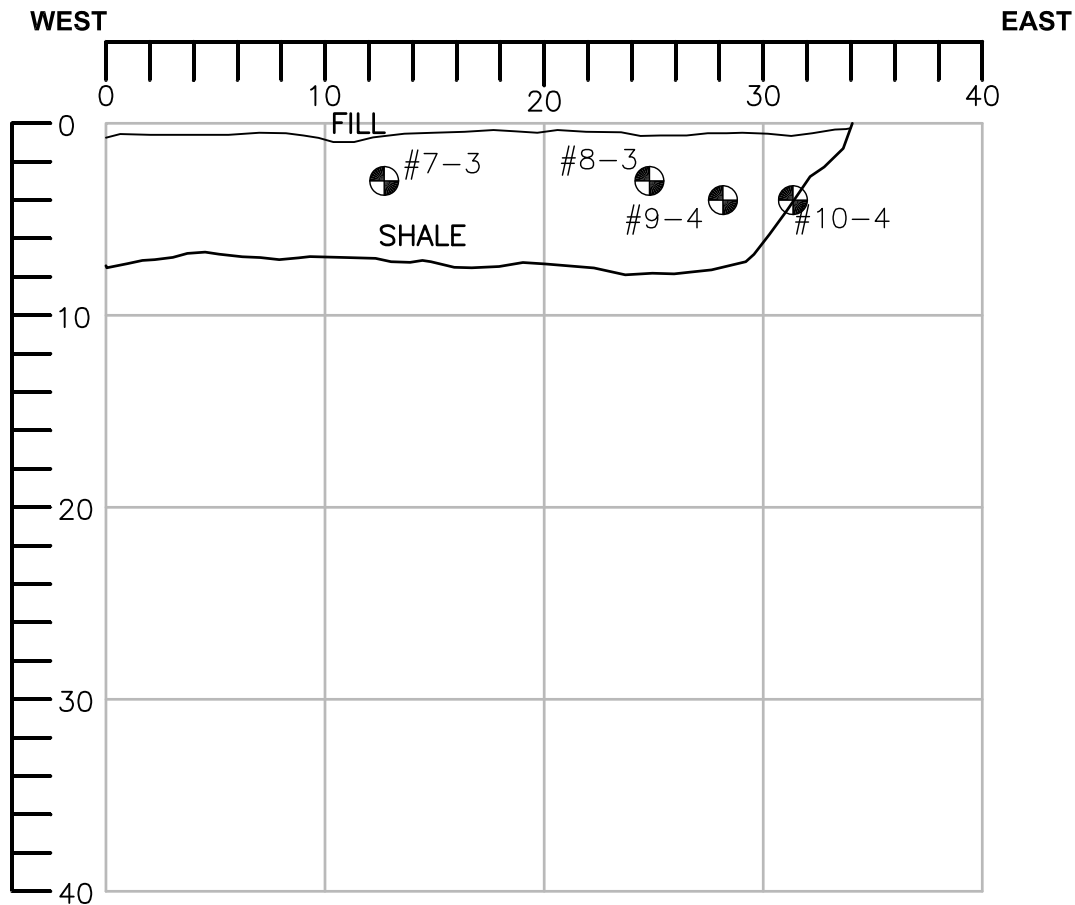
Samples	
No.	Depth
5-4.5	4.5'
6-5	5'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
Special Notes:			



FIELD TEST PIT LOG

Temp.: 75°F Weather: Sunny Engineer: R. Mahan/ Lee Operator: Craighead Test Pit: TP-3
Equipment: Link-Belt 330LX Contractor: G. M. Stewart Corp. Date: 6/20/08
Location: Pad 23x Elevation: — Datum: — Job No.: 083-81544B



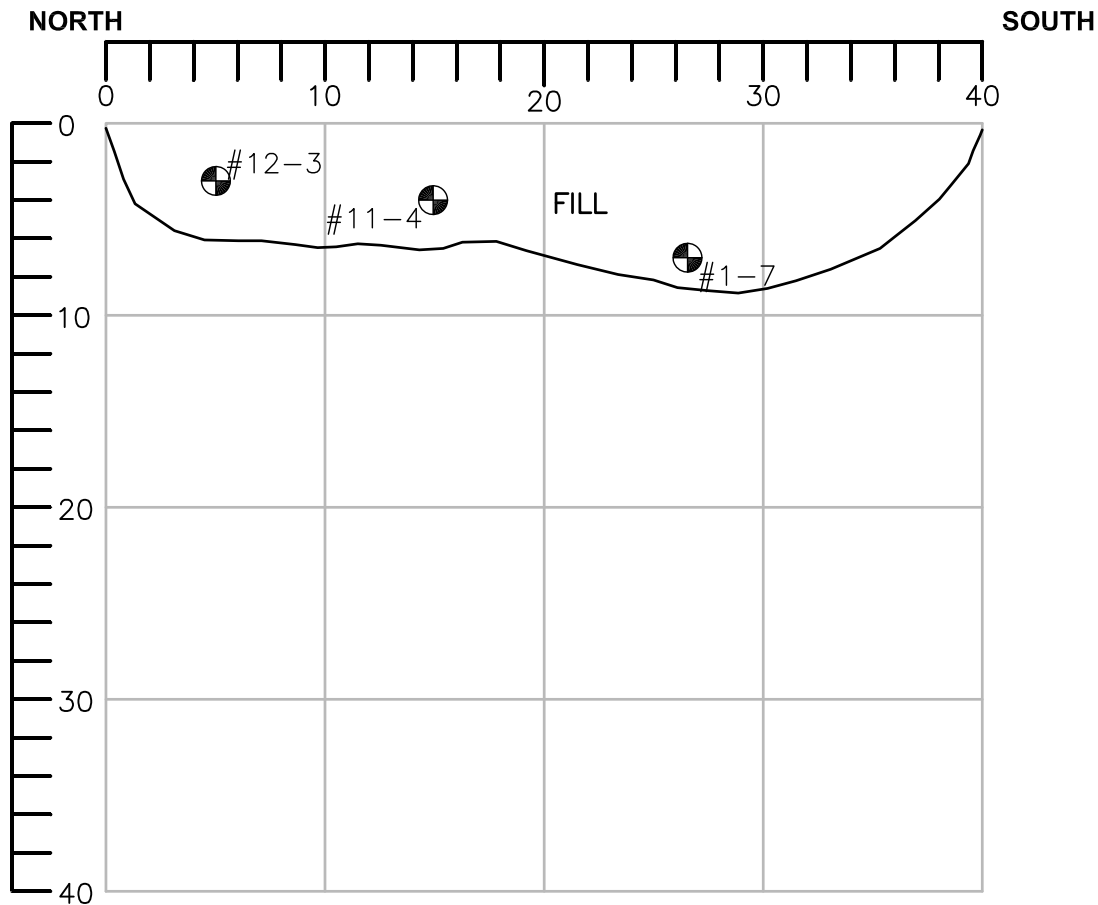
Samples	
No.	Depth
7-3	3'
8-3	3'
9-4	4'
10-4	4'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
Special Notes:			



FIELD TEST PIT LOG

Temp.: 75°F Weather: Sunny Engineer: R. Mahan/ Lee Operator: R. March Test Pit: TP-4
 Equipment: Link-Belt 330LX Contractor: G. M. Stewart Corp. Date: 6/20/08
 Location: Pad 23x Elevation: — Datum: — Job No.: 083-81544B



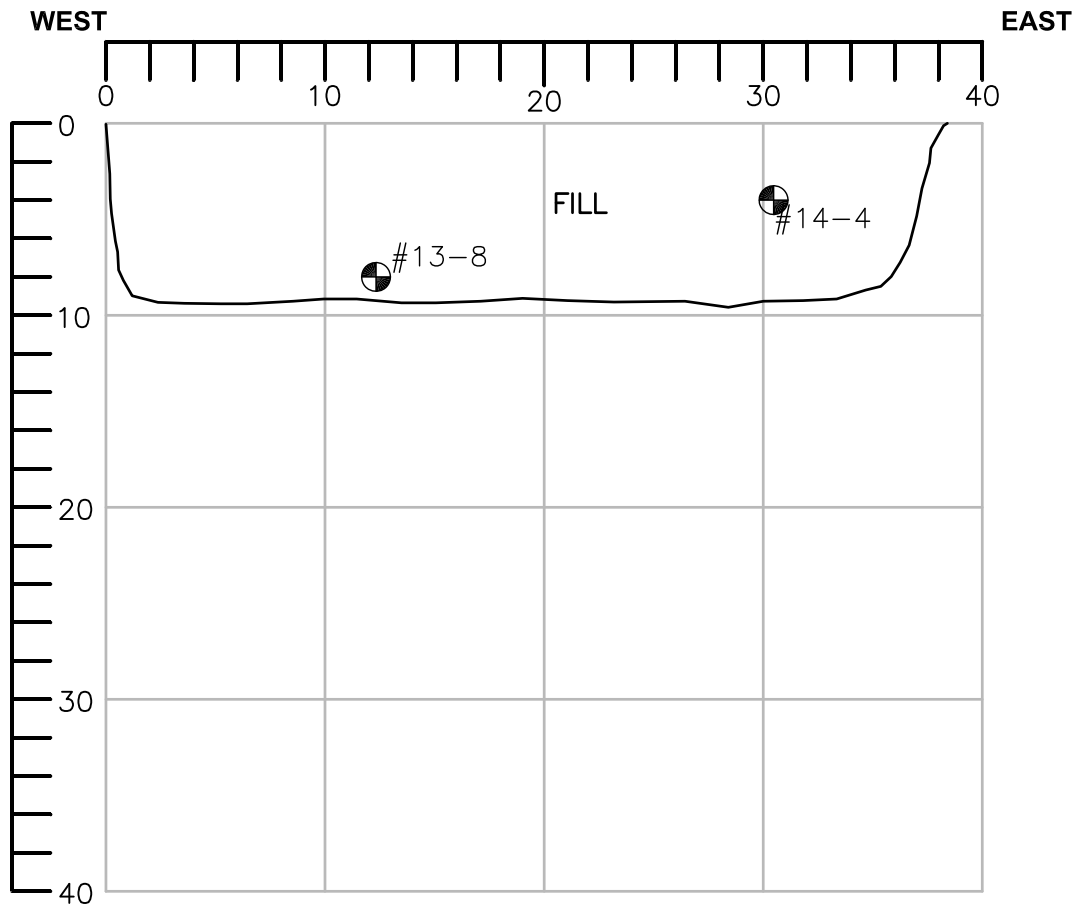
Samples	
No.	Depth
1-7	7'
11-4	4'
12-3	3'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
Special Notes:			



FIELD TEST PIT LOG

Temp.: 75°F Weather: Clear, breezy Engineer: R. Mahan/ Lee Operator: R. March Craighead Test Pit: TP-5
Equipment: Link-Belt 330LX Contractor: G. M. Stewart Corp. Date: 6/20/08
Location: Pad 23x Elevation: — Datum: — Job No.: 083-81544B



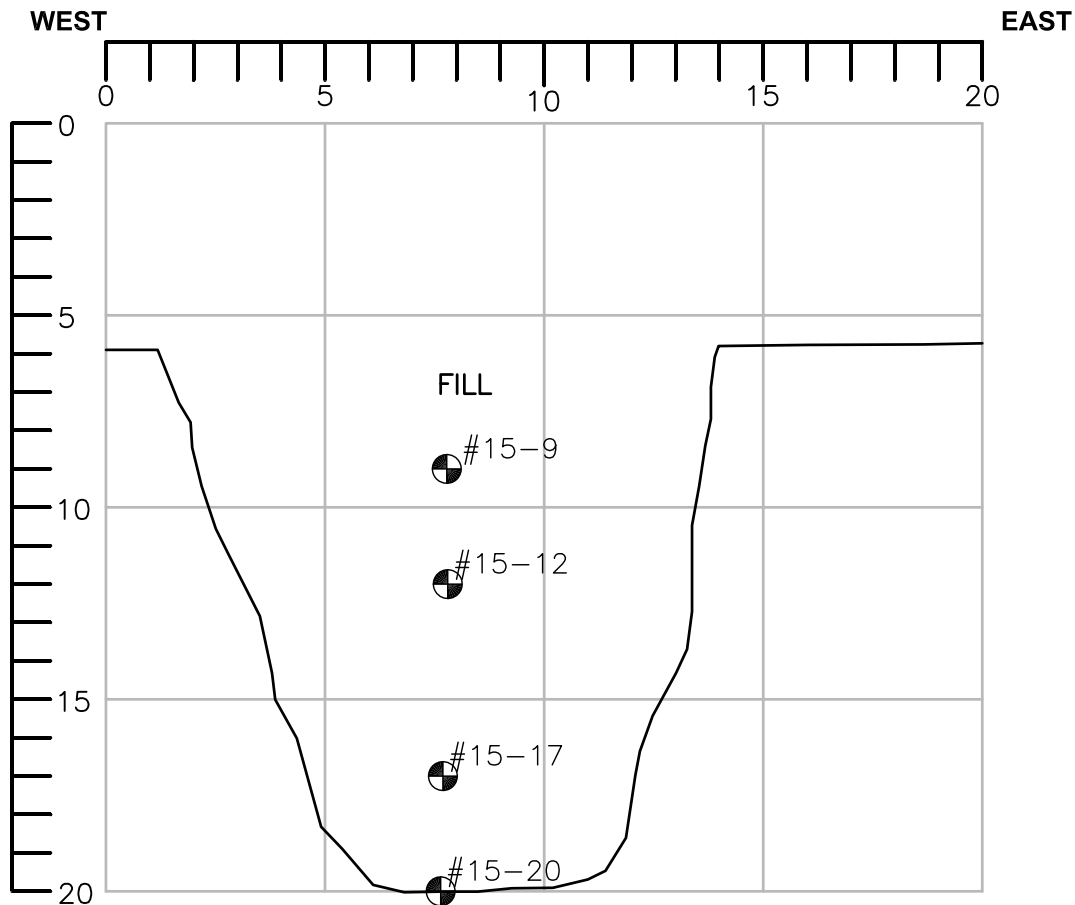
Samples	
No.	Depth
13-8	8'
14-4	4'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
All fill material with areas of higher moisture. No odor. Trench 38' long.			
Special Notes:			



FIELD TEST PIT LOG

Temp.: 75°F Weather: 0-5 breeze Engineer: M. Clear, R. Mahan/ Lee Test Pit: TP-6
 Equipment: Link-Belt 330LX Contractor: R. March Operator: G. M. Stewart Corp. Date: 6/20/08
 Location: Pad 23x Elevation: - Datum: - Job No.: 083-81544B



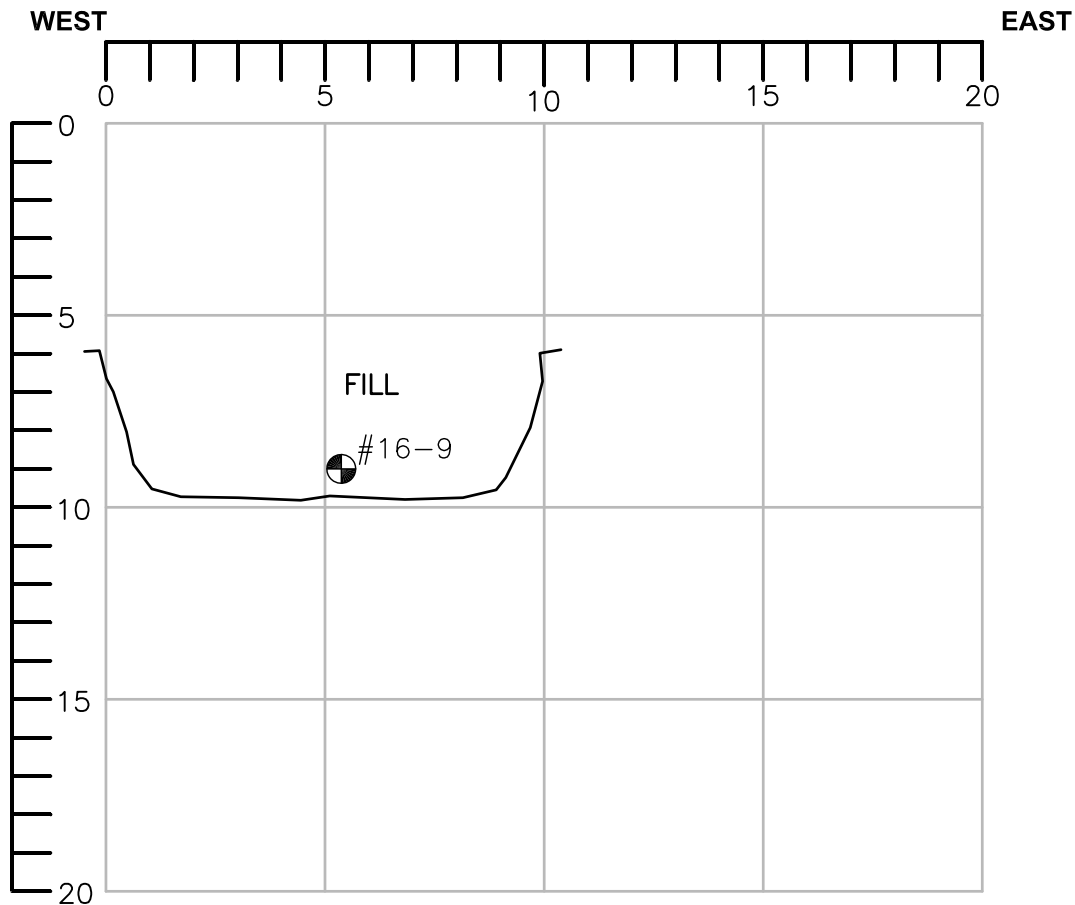
Samples	
No.	Depth
15-9	9'
15-12	12'
15-17	17'
15-20	20'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
1. Test pit in the middle of tarped area to determine vertical extent. All fill material. 2. Regraded area at TP-6 was approximately 6 feet below the adjacent pad area.			
Special Notes:			



FIELD TEST PIT LOG

Temp.: 75°F Weather: P Cloudy Engineer: R. Mahan/ Lee Operator: R. March Test Pit: TP-7
 Equipment: Link-Belt 330LX Contractor: G. M. Stewart Corp. Date: 6/20/08
 Location: Pad 23x Elevation: — Datum: — Job No.: 083-81544B



Samples	
No.	Depth
16-9	9'

Sample Descriptions and Excavation Notes	Time	Depth of Hole	Depth to Waterline
1. Test pit directly to the west of tarped area, on N. end of drill pad (fill material). 2. Test pit was excavated to determine horizontal extent, westward. 3. Regraded area at TP-7 was approximately 6 feet below the adjacent pad area.			
Special Notes:			