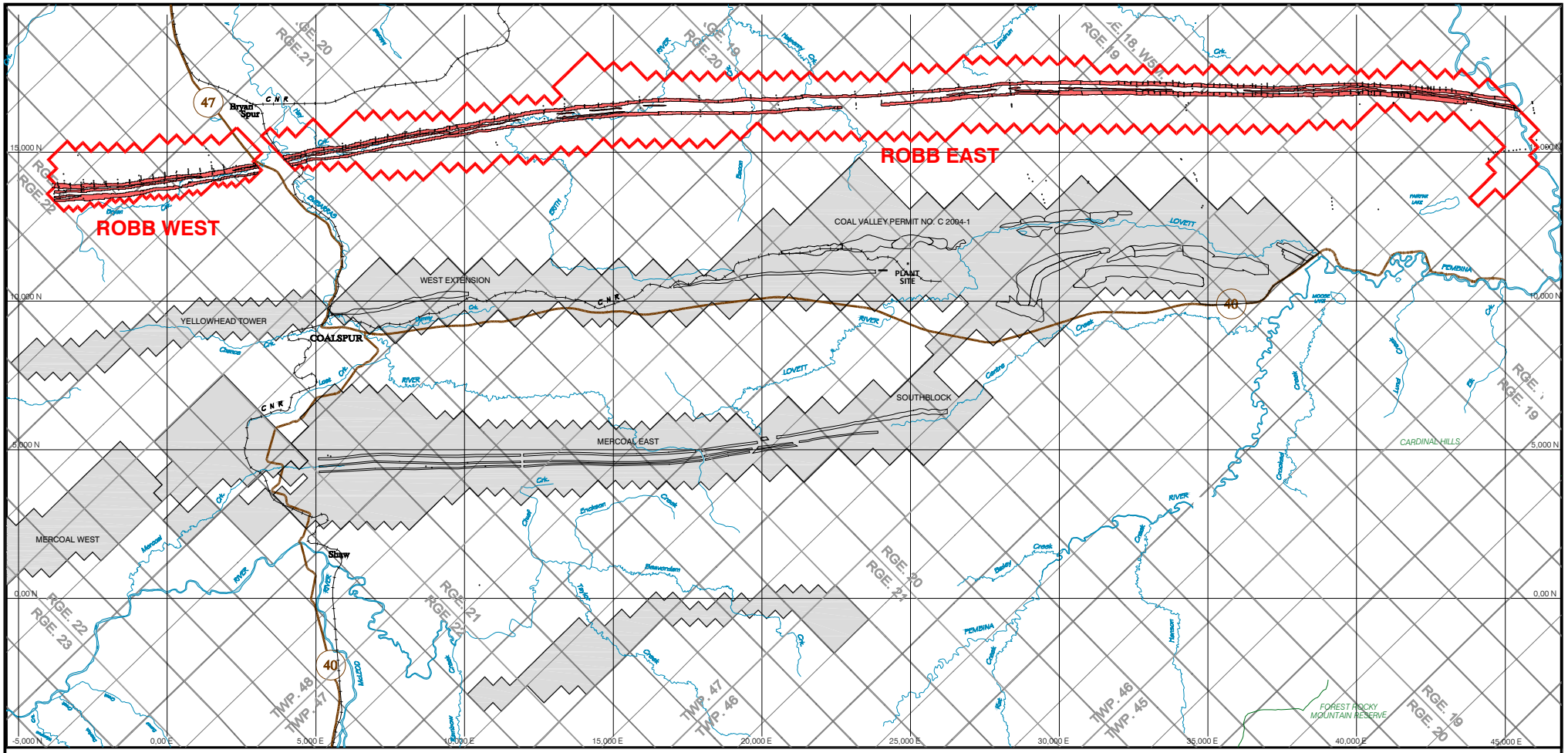


PROJECT AREA
DRILL HOLE
RESOURCE LIMIT
RESOURCE AREA

0 2000 4000 6000
Metres

"Original signed and sealed by Author"

sherritt

Technical Report - Robb Trend Coal Property

RESOURCE AREAS

FIGURE 19-2

DRAWN BY: MLE CHK'D BY: G.R.J. DATE: 10 10 14	FILE: Resource Areas.dwg 10-4882\Report\Technical Report\ Figures	NORWEST APEGGA Permit P05015

Appendix 31

SP & P: Old Underground Mining Areas

sherritt coal
Coal Valley Mine

STANDARD PRACTICES AND PROCEDURES MANUAL

CVM D.01.17

SECTION:	SUBJECT:
MINE OPERATIONS	**OLD UNDERGROUND MINING AREAS**

1. POLICY

When mining in old underground mining areas:

1.1. Engineering shall mark boundaries of underground workings on all operational plans such as pit status maps, drilling plans, soil salvage plans.

1.2. Engineering shall cause the survey crew to mark off with flagging the boundaries of the underground workings.

1.3. Engineering shall inform the Mine Manager of the location and extent of the underground workings in advance of operations approaching the area.

1.4. When unknown underground workings are encountered:

1.5. The location and probable extent of the workings will be surveyed and handled as above.

1.6. When mining within the area of underground workings:

1.7. All employees working in the area shall be notified on the presence and location of the workings.

1.8. A Hazard Assessment of work in the area will be completed.

1.9. Mine Safety and Mine Rescue personnel will be informed of the advance into areas of underground workings and response plans and equipment availability must be reviewed.

1.10. No equipment will be allowed into the underground area unless designated by the foreman. Work permitted will be limited to soil salvage, preparation of drill pad and drilling and blasting equipment. The primary objective is to undertake blasting equipment. The primary objective is to undertake blasting in order to ‘close’ any underground openings.

1.11. Any evidence of underground workings found during soil salvage, drill pad preparation or drilling will be communicated to Engineering which will readjust mapping and boundaries as necessary.

1.12. The drill must be equipped with a 'sniffer' device to detect combustible gases.

1.13. Blast 'loading' instructions will be adjusted accordingly.

1.14. After blasting the survey will re-establish the boundary of the underground working area.

1.15. In these areas backhoes will load subcrop coal from a position on the footwall until the excavation can advance into blasted material.

2. RESPONSIBILITES

2.1. SUPERVISORS

2.1.1. Will take extra care when working in these areas.

2.1.2. Make daily entries in the log book and communicate to all employees any potential hazards in the underground area.

2.2. EMPLOYEES

2.2.1. Will take extra care when working in these areas.

2.2.2. Will immediately notify their supervisor if they observe anything that is questionable.

2.3. ENGINEERING

2.3.1. Maintain records of underground workings.

2.3.2. Communicate locations of workings to operations in advance of work in the area.

ACKNOWLEDGEMENT – PLEASE PRINT AND SIGN

Appendix 37

Piteau & Associates: Denison Mines Ltd – Engineering Geology at 32, 500 W and Recommended West Wall Slope Design

RECOMMENDED DESIGN FOR WEST WALL SLOPE

BENCH HEIGHT: 40m
BERM FACE ANGLE: 67°
BERM WIDTH: 21m
OVERALL SLOPE ANGLE: 50°

BENCH HEIGHT: 40m
BENCH FACE ANGLE: 67°
BERM WIDTH: 10-21m
OVERALL SLOPE ANGLE: 58-50°

BENCH HEIGHT: 40m
BENCH FACE ANGLE: 67°
BERM WIDTH: 10m
OVERALL SLOPE ANGLE: 58°

24 900 N | 25 000 N | 25 100 N | 25 200 N | 25 300 N | 25 400 N | 25 500 N | 25 600 N | 25 700 N | 25 800 N | 25 900 N

TRANSITION ZONE

B A

SOUTH WALL (FOOTWALL)

NORTH WALL (HANGING WALL)

1200 1100 1000 900 800

ELEVATION, m

A B

MYNHEER MARKER 1 UPPER SILKSTONE McPHERSON MacLEOD ARBOUR VAL D'OR

5 4B 4A 3 2B 2A 1

LEGEND

- STRUCTURAL DOMAIN BOUNDARY
- 3 STRUCTURAL DOMAIN
- A I A GEOLOGIC SECTION CONSTRUCTED NORMAL TO WEST WALL
- PROPOSED ULTIMATE PIT

NOTES

1. GEOLOGIC SECTIONS A-A AND B-B WERE USED FOR DEEP SEATED FAILURE ANALYSIS AND ARE SHOWN IN FIGS. 7-13 AND 7-14 RESPECTIVELY.
2. GEOLOGICAL INTERPRETATION PROVIDED BY DENTHERM RESOURCES LIMITED, APRIL 1982

GEOLOGICAL SECTION (32 500 W)
LOOKING WEST

NORTH ARROW | PROFESSIONAL ENGINEER SEAL

KEY PLAN | SCALE

FIG. 7-11

	DATE	NAME
DESIGNED	FEB 82	P.M.H
DRAWN BY	FEB 82	V.G.
APPROVED CONSULTANT	MAR 82	
APPROVED DENTHERM		

CONSULTANT
PITEAU & ASSOCIATES
GEOTECHNICAL CONSULTANTS
VANCOUVER CALGARY

DENTHERM RESOURCES LIMITED
DENISON MINES LIMITED-MANAGER
COALSPUR PROJECT

AREA | CATEGORY

DRAWING TITLE
ENGINEERING GEOLOGY AT 32,500 W AND RECOMMENDED WEST WALL SLOPE DESIGN

DENTHERM DWG. NO. | CONSULTANT DWG. NO. 293C-030 | REV.

Appendix 44-1

MDH Engineered Solutions Corp.: Geological and Geotechnical Core Logging at CVRI Robb Trend Project

MDH Engineered Solutions Corp.

MDH ENGINEERED SOLUTIONS
Member of the SNC-LAVALIN Group

HEAD OFFICE: 232-111 Research Drive, Saskatoon, SK, S7N 3R2	Telephone: (306) 934-7527	Fax: (306) 934-7528
LABORATORY: #1-320 Jessop Avenue, Saskatoon, SK, S7N 1Y6	Telephone: (306) 955-2735	Fax: (306) 651-3676
EDMONTON OFFICE: 201 8915 - 51st Avenue, Edmonton AB T6E 5J3	Telephone: (780) 436-9400	Fax: (780) 438-0549
REGINA OFFICE: 202-1911E Truesdale Drive, Regina, SK S4V 2N1	Telephone: (306) 546-4220	Fax: (306) 546-4262
PRINCE ALBERT OFFICE: 104-2805 6th Avenue East, PA, SK S6V 6Z6	Telephone: (306) 763-1495	Fax: (306) 763-1495
ESTERHAZY OFFICE: 418 Main Street, Esterhazy, SK S0A 0X0	Telephone: (306) 745-2164	Fax: (306) 745-2192

June 1, 2012

Stephen Love
Exploration Supervisor
Sherritt Coal
Mountain Operations
Coal Valley Resources Inc. (CVRI)

Attention: Stephen Love

Re: GEOLOGICAL AND GEOTECHNICAL CORE LOGGING AT CVRI ROBB TREND PROJECT (MDH PROJECT FILE NUMBER A3368)

Introduction

This letter report provides the geological and geotechnical core logging from seventeen boreholes drilled at the Coal Valley Resources Inc. (CVRI) Robb Trend Project located east of Robb, Alberta.

The work completed is summarized as follows:

- Geological and geotechnical core logging for seventeen drill holes;
- Drilling was carried out by Rocky Mountain Drilling (RMD), Hinton, Alberta;
- Target for the core logging was the main coal seams and hard rock matrix;
- The core logging of these boreholes was conducted in March 2012 in the logging shack at the site by MDH geologists;
- RMD transported the core in plastic tubes, by truck, to the core shack;
- Core tubes were cut open using a grinder;
- Each core run was labelled, measured, and photographed;
- Each core run was logged for detailed geology (type, texture, colour, hardness, bedding, etc.),
- Rock Mass Classification on each core run included: total core recovery (%), rock quality designation (RQD), Rock Mass Rating (RMR-Values), and modified Q-Values (Q');

- Collection of core samples of the main local rock units (i.e. mudstone, siltstone, silty mudstone, and sandstone) for unconfined compressive strength (UCS) testing;
- UCS testing conducted at the MDH Laboratory in Saskatoon;
- Collection of coal samples, from the main coal seams, for coal quality testing;
- Coal quality testing conducted by CVRI;
- CVRI conducted the geophysical logging (gamma and density, in g/cm^3) and provided a copy of the logs to MDH;
- Compilation of geophysical logs and core photographs of the completed drill holes; and
- CVRI provided the coordinates for each borehole.

The map of the borehole locations and coordinates are provided in Appendix A. Detailed Core Logs are provided in Appendix B. Core pictures and associated geophysical logs are provided in Appendix C. UCS test results are provided in Appendix D. The terms, symbols, and abbreviations utilized on the core logs are provided in Appendix E.

Results

The main rock types identified from the core logging and geophysical logs are sandstone, siltstone, mudstone, silty mudstone, and coal of the lower Coalspur Formation. The Coalspur Formation is Upper Cretaceous to Tertiary in age and lies directly below the Paskapoo Formation. A brief description of the main rock types within the Coalspur Formation is provided below:

- Sandstone encountered in this rock sequence is moderately grey, silty, fine to medium grained, weak to medium strong rock (R2-R3), massive, laminated, and cross-laminated. Bedding is at $55\text{-}65^0$.The sandstone is moderately to weakly fractured.
- Siltstone is light to dark grey, massive to laminated, indurated, and weak to medium strong rock (R2-R3).
- The mudstone is mostly dark grey to dark brown, carbonaceous, massive, highly plastic, and very weak to weak (R1-R2). Some intervals are extremely weak (R0), highly fractured with rough fracture surfaces, and slickensides. Some small coal seams are inter-bedded with the mudstone.
- The silty mudstone is mostly dark grey to dark brown, has a high silt content, carbonaceous, massive to laminated, and weak to medium strong (R2-R3). Some coal seams are inter-bedded with the silty mudstone.
- Coal is very weak to weak, massive to blocky, bedding dip angle 50º-65º fractured to fissile, and black.
- Some thin beds of high plasticity bentonite were intersected by the core holes. These clay beds are correlatable across much of Robb Trend and are used as stratigraphic markers for the lower portion of the Coalspur Formation.

More detailed information is provided in the logs in Appendix B.

The dominant joint sets identified were bedding joints (J1) at 55-65^0 and cross-joints (J2) at 10-20^0 and 40-80^0. T hese joints are generally moderately open (<1mm aperture), rough, persistent, and widely-spaced. Silt and coal filled joints and calcite stringers were occasionally noted. A ll angles of the core bedding and j oints have been measured according to the assumption that the core axis is at 0^0 (vertical).

Table 1 provides a summary of the UCS, RMR-Values, and Q'-Values for the different rock types. The RMR-Values were calculated using the UCS values obtained from the completed core sampling and laboratory testing program. A total of thirty two (32) rock core samples were collected from the drill holes for UCS testing using ASTM D7012. The adjustment for joint orientation was not considered for the RMR-Value calculation. The Joint Water (Jw) and Stress Reduction Factor (SRF) input parameters were not considered in the Q'-Value calculation.

Table 1 – UCS, RMR-Values and Q'-Values.

Rock Type	Number of Samples	Q' - Value	RMR	UCS (Mpa) Average
Mudstone	3	3.6-124	69	19.9
Sandstone	13	10.9-144.0	68	46.8
Siltstone	7	12.0-43.0	65.5	35.8
Silty Mudstone	1	4.8-25.3	52	19.0

Closure

The statements made in this report are based solely on the information obtained to date as part of the above referenced study. MDH Engineered Solutions Corp. (MDH), Member of the SNC-Lavalin Group, has used its professional judgment in assessing this information and formulating its opinion and recommendations. New information may result in a change in this opinion. The mandate at MDH is to perform the tasks prescribed by the Client with the due diligence of the profession. No other warranty or representation, expressed or implied, as to the accuracy of the information or recommendations is included or intended in this report. MDH disclaims any liability or responsibility to any person or party, other than the party to whom this report is addressed, for any loss, damage, expense, fine, or penalty which may arise or result from the use of any information or recommendations contained in this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the sole responsibility of the third party.

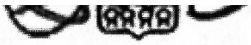
Sincerely,

MDH Engineered Solutions Corp.

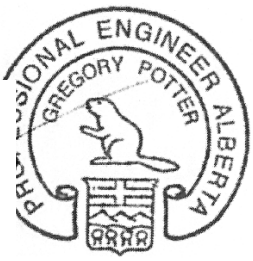
Association of Professional Engineers
Geologists, and Geophysicists of Alberta
Permit to Practice 7607

Coal Valley Geological and Geotechnical Core Logging at CVRI Robb Trend
(A3368-1750012) 28 June 2012

<original signed by>



Andrew Smorschok, P. Geol.



Greg Potter, M.Sc., P.Eng., P.Geo

References

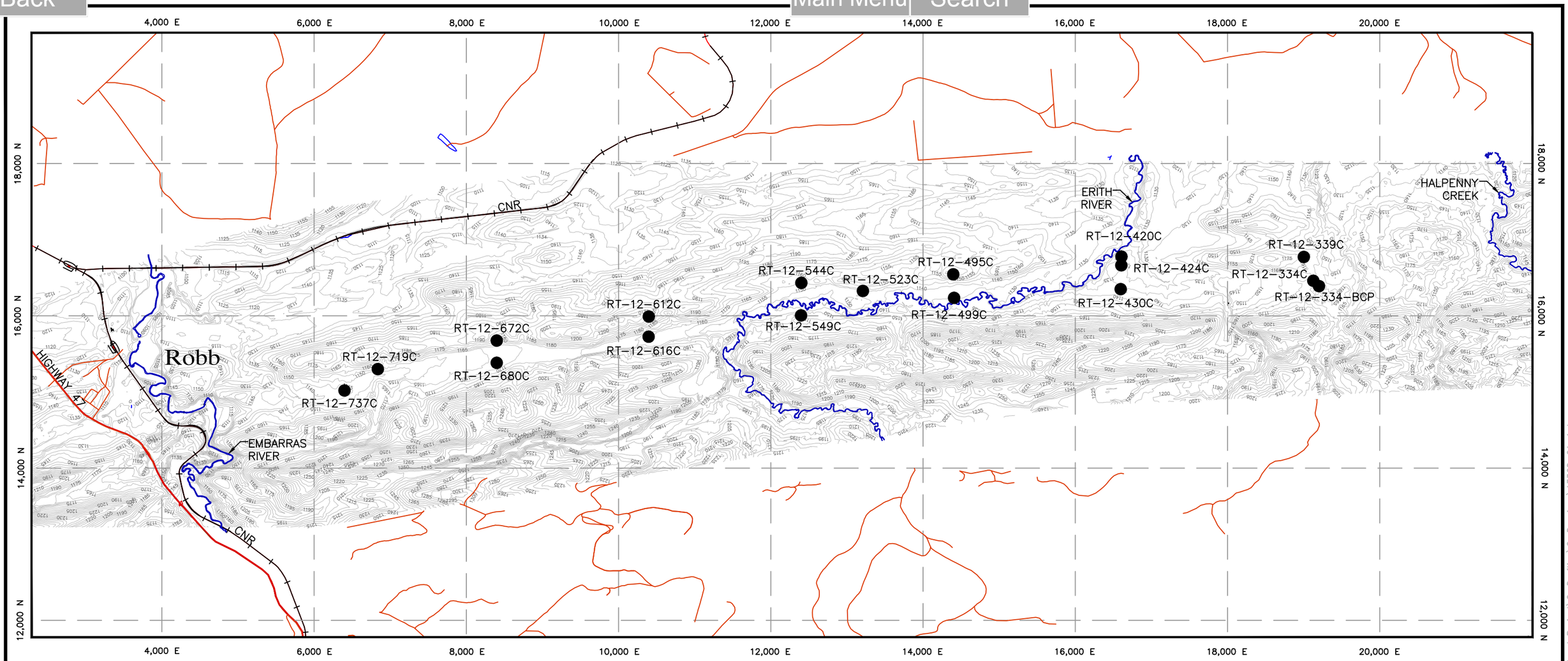
ASTM D 7012-07, Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures, July 2007.

Bieniawski, Z.T. 1989. Engineering rock mass classifications. New York: Wiley.

Bieniawski, Z.T. 1976. Rock mass classification in rock engineering. In: Exploration for rock engineering, proc. of the symp., (ed. Z.T. Bieniawski) 1, 97-106. Cape Town: Balkema.

Barton, N.R., Lien, R. and Lunde, J. 1974. Engineering classification of rock masses for the design of tunnel support. Rock Mech. 6(4), 189-239.

APPENDIX A
Borehole Locations Map

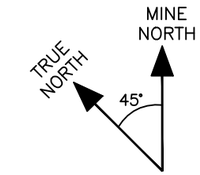


BOREHOLE #	NORTHING	EASTING	ELEVATION
RT–12–334–BCP	16387.70	19202.20	1160.50
RT–12–334C	16459.00	19202.40	1158.60
RT–12–339C	16772.00	19002.60	1167.10
RT–12–420C	16776.10	16608.10	1128.40
RT–12–424C	16660.90	16605.20	1133.50
RT–12–430C	16349.20	16597.40	1136.10
RT–12–495C	16543.20	14397.00	1167.60
RT–12–499C	16233.80	14407.90	1135.80
RT–12–523C	16325.00	13210.00	1146.20
RT–12–544C	16430.80	12401.70	1154.80
RT–12–549C	16004.40	12397.50	1155.80
RT–12–612C	15988.20	10398.30	1206.10
RT–12–616C	15723.40	10394.90	1164.30
RT–12–672C	15673.50	8399.60	1176.50
RT–12–680C	15380.40	8398.70	1166.00
RT–12–719C	15378.90	6798.70	1172.20
RT–12–737C	15018.10	6398.40	1144.60

LEGEND

- RAILWAY
- HIGHWAY
- BOREHOLE
- ROAD

0 0.5 1 1.5 2 km



NOTE: 1. COORDINATES ARE IN LOCAL MINE GRID AND IN METERS (m).
2. ELEVATIONS ARE METERS ABOVE SEA LEVEL (masl).
3. BASED ON DRAWING SUPPLIED BY COAL VALLEY RESOURCES INCORPORATED (cvri).
4. SURVEY SUPPLIED BY cvri.

No.	REVISION

SCALE 1:50,000		DATE
DESIGN BY	A. SMORSCHOK, P.Geol.	04–MAY–12
DRAWN BY	P. BIRNIE / C. WU	07–JUN–12
APPROVED BY	R. NORMAN, P.Geo.	14–NOV–12

CLIENT cvri

PRODUCED BY MDH ENGINEERED SOLUTIONS Member of the SNC-LAVALIN Group

TITLE
ROBB TREND
BOREHOLE LOCATIONS

PROJECT No.	A3368–1750012	FIG. No. A1
DRAWING No.	A3368–61–1	REV.

APPENDIX B
Detailed Core Logs

Back | Main Menu | Search

ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1160.5 | **Northing (m):** 16387.70 | **Date Logged:** 16-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 19202.20 | **Start Date:** 16-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 16-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																	DISCONTINUITY INFORMATION															
													UCS Test			Spacing (m)				CSIR Rating						Q (Barton et al., 1974)				Notes
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
52.4				No CORE					**No CORE** @ 52.4 - 52.7 m **SILTSTONE** @ 52.7 - 52.8 m very weak, massive, grey **COAL**																							
55.1	1	100	37		coal SltSt	blk gr	blocky mass		@ 52.8 - 59.0 m blocky, slightly fractured, black, occasional thin beds of mudstone, bedding @ 40 -60°, @ 53.1 m mudstone 1 cm thick	55	C1	R1										8									
55.1									**COAL** same as above									55.45	J	25			20	25	10			3	1		rough, planar, coal infill < 5mm
56.6	2	93	50		coal	blk	blocky		@ 53.2 m mudstone 5 cm thick mix with coal @ 53.5 m mudstone 1 cm thick @ 55.1 m hard coal with calcite streaks 2 cm thick @ 56.0 m mudstone with coal, 5 cm thick	65	C1	R1						55.60	J	25		8	10	20	10	56	2	3	3	37.5	slightly rough, clay infill < 5 mm
56.6									@ 56.6 m mudstone with coal, 2 cm thick @ 58.9 m mudstone carbonaceous, 10 cm thick **MUDSTONE** @ 59.0 - 59.5 m carbonaceous with coal seams 1-5 cm,																						
59.7	3	90	45		coal MS clay	blk gr, br	blocky mass		**CLAY** @ 59.5 - 60.0 m bentonitic,hard, high plastic, trace coal thin	65	C1	R1									8									
59.7									**CLAY** same as above									61.20	J	43			25	25	10			3	1		very rough, silt coating
62.7	4	100	57		coal SltSt	blk gr, gr	blocky mass		**COAL** @ 60.0 - 60.9 m blocky, slightly fractured, black, occasional thin beds of mudstone @ 60.5 -60.6 m, bentonitic mudstone, firm, high plactic, light brown **SILTSTONE** @ 60.9- 62.1 m weak, massive, dark grey	65	C1	R2						62.10	C	45		13	20	25	10	71	2	3	1	85.5	rough, planar
62.7									**SANDSTONE** @ 62.1 - 65.8 m massive, weak, fine - medium grained, grey				64.7-65.0	40.2						4									
65.8	5	100	100		SS	gr	mass			65	C1	R2									20									

MDH ENGINEERED SOLUTIONS
Member of the SNC-LAVALIN Group

NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-334B
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1158.6 | **Northing (m):** 16459.00 | **Date Logged:** 9-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 19202.40 | **Start Date:** 9-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 9-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																							
																DISCONTINUITY INFORMATION																	
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)					
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
25									**COAL** @ 25.0 - 26.1 m black, blocky, slightly fractured									26.10	C	50			20	25	10			3	3			very rough, silt infill < 5 mm
																		26.10	J	0			10	6	10			1.5	1			very rough, wavy, slickensided
																		26.30	J	60			10	25	10			3	3			rough, planar, coal coating
									MUDSTONE @ 26.1 - 32.3 m massive, very weak, dark grey, trace coal laminae @ 62 -65°, silt infilled burrows																									
	1	97	10		coal MS	blk gr	blocky mass			63	C1	R1			3							3					3				3.6	
26.5																																	
26.5									**MUDSTONE** @ 26.1 - 32.3 m massive, very weak, dark grey, trace coal laminae @ 62 -65°, silt infilled burrows from 28.0 to 29.0 m increased silt content, laminated @ 62 -68°									27.25	J	63			20	6	10			1.5	3			very rough, slickensided, coal coating
																		27.50	J	17			20	6	10			1.5	3			slightly rough, planar, silt infill < 5mm
																		27.80	J	68			20	20	10			3	3			rough, coal infill > 5 mm
																		28.20	J	45			20	20	10			3	1			crossing bedding, very rough,
																		28.60	J	60			20	20	10			3	1			slightly rough, planar, coal infill < 5mm
																		28.80	J	33			10	20	10			3	1			slightly rough, wavy
	2	100	67		MS	dr.gr	mass			65	C1	R1			7			29.25	J	38		13	20	20	10		6	3	3	13.4		slightly rough, wavy
29.5																																	
29.5									**MUDSTONE** @26.1 - 32.3 m									29.75	J	68			20	20	10			3	1			slightly rough, planar, coal infill < 5mm
																		29.85	J	60			10	20	10			3	3			slightly rough, silt infill < 5 mm
									SANDSTONE @32.3 - 33.0 laminated, weak									30.25	J	40			20	6	10			1	1			smooth, planar
																		30.30	J	10			10	6	10			1	1			smooth, planar
																		30.75	J	18			20	6	10			1	1			smooth, planar
	3	100	56		MS SS	blk gr, br	mass lam			65	C1	R1			5							13					6			12.0		
32.6																																	
32.6									**SANDSTONE** @ 32.3 - 33.0 m laminated, weak **MUDSTONE** @ 33.0 - 38.9 m massive, very weak, dark grey, trace coal laminae @ 62 -65°, silt infilled burrows, shell fragments									32.75	J	50			25	6	10			1.5	3			slickensided, stepped, wavy, silt and coal infill
																		32.80	J	33			10	6	10			1.5	3			slickensided, stepped, wavy, silt and coal infill
																		32.90	J	38			10	6	10			1.5	3			slickensided, stepped, wavy, silt and coal infill
																		32.90	J	78			5	6	10			1.5	3			slickensided, stepped, wavy, silt and coal infill
																		33.05	J	7			10	20	10			1	1			smooth, planar
	4	100	63		SS MS	blk gr, gr	mass			65	C1	R1			10			33.50	J	85		13	20	20	10		12	1.5	3	4.1		slightly rough, coal coating
																		33.55	J	28			5	6	10			1.5	1			slickensided, stepped, wavy,
																		33.95	J	40			10	6	10			1.5	1			slickensided, stepped, wavy,
																		34.30	J	43			20	6	10			1.5	3			slickensided, stepped, wavy, silt infill < 5 mm
																		34.40	J	42			10	6	10			1.5	3			slickensided, stepped, wavy, silt and coal infill
35.6																		34.65	J	58			10	25	10			3	1			rough, coal, coating
																		34.75	J	42			10	0	10			3	1			slightly rough, coal coating, open > 5 mm
35.6									**MUDSTONE** @ 33.0 - 38.9 m massive, very weak, dark grey, trace coal laminae @ 62 -65°, silt infilled burrows, shell fragments @ 35.6 - 36.3 m greish grey, below 36.6 m dark brown, carbonaceous, some coal lamina @ 36.3 - 36.3 m bentonitic MS									35.45	J	25			20	25	10			3	6			very rough, clay infill < 5 mm
																		35.45	J	0			5	6	10			1.5	6			slickensided, rough
																		35.50	J	5			5	6	10			1.5	6			slickensided, rough
																		35.60	J	40			10	6	10			1.5	3			slickensided, wavy
																		35.65	J	55			5	6	10			1.5	3			slickensided, wavy
																		36.00	J	53			20	6	10			1.5	1			slickensided, wavy
																		36.20	J	0			10	6	10			1.5	1			slickensided, wavy
																		36.30	J	60			10	6	10			1	1			slickensided, planar, polish
																		36.50	J	60			10	6	10			1	1			slickensided, planar, polish
	5	100	53		MS	br	lam			65	C1	R1			16			36.60	J	40		13	10	20	10		15	3	1	2.7		slightly rough, clay infill < 5 mm
																		37.10	J	50			10	20	10			3	1			slightly rough, coal infill < 5 mm
																		37.55	J	38			20	20	10			1.5	1			rough, coal infill < 5 mm
																		37.90	J	37			20	6	10			1.5	1			slickensided, wavy
																		38.10	J	23			10	6	10			1.5	1			slickensided, wavy
																		38.20	J	67			10	6	10			1.5	1			slickensided, wavy
38.7																		38.50	J	50			10	6	10			1	1			slickensided, planar, smooth

MDH ENGINEERED SOLUTIONS
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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-334C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1158.6 | **Northing (m):** 16459.00 | **Date Logged:** 9-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 19202.40 | **Start Date:** 9-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 9-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																					
																DISCONTINUITY INFORMATION															
																Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				Notes
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
38.7									**MUDSTONE**				39.3-39.6	5.25				38.90	C	35	1		20	25	10			1.5	3		slitly rough, planar, silt infill < 5 mm
									@ 33.0 - 38.9 m									40.60	J	40			20	6	10			1.5	3		slickensided, wavy, coal infill
									SILTY MUDSTONE									40.80	J	21			10	20	10			3	1		slitly rough, planar, silt infill < 5 mm
									@ 38.9 - 42.4 m									41.20	J	20			20	25	10			3	1		slitly rough, planar, clay infill < 5 mm
									very weak, high silt content, dark grey, mixed with fine graind									41.30	J	38			10	20	10			1.5	1		close joint , <5 mm
									sandstone, some coal and clay laminae @ 45 - 60 °									41.35	J	55			10	6	10			1.5	1		slickensided, wavy, clay coating
	6	100	86		MS SLMS	be gr	blocky mass		below 41.3 m brown, carbonaceous, some coal filled burrows	65	C1	R1			7			41.55	J	55		17	10	6	10	58	9	1.5	1	11.7	slickensided, wavy, clay coating
41.7																															
41.7									**SILTY MUDSTONE**									42.40	C	50			20	6	10			1.5	1		slickensided, rough, planar
									@ 38.9 - 42.4 m									42.50	J	10			10	6	10			1.5	1		smooth, wavy, slickensided
									@ 42.0 - 42.2 m coal seams, blocky, fractured, black									42.60	J	48			10	20	10			1.5	1		smooth, wavy, slickensided
									@ 42.2 - 43.3 m siltstone bed, dark grey, laminated									43.00	J	63			20	25	10			3	1		rough, planar, silt and coal infill < 5 mm
									@ 42.3 - 42.4 m coal seam, fractured									43.20	J	60			10	25	10			3	1		rough, silt and coal infill < 5 mm
									SILTY MUDSTONE									43.70	J	30			20	20	10			3	1		slightly rough,
									@ 42.4 - 47.9 m very weak, laminated, bentonitic, greenish grey									43.85	J	30			10	20	10			3	10		planar, close joint, coal infill > 5 mm
									silt small beds and coal laminae @ 60 -90°, some silt filled									44.00	C	33			10	20	10			3	1		slightly rough
									burrows									44.20	C	55			10	20	10			3	1		slightly rough
									below 46.0 m carbonaceous, very weak, brown, trace thin coal																					
									seams and coal filled burrows																					
									@ 44.0 - 44.2 m coal seam																					
	7	100	47		SLMS	br gr	lam			65	C1	R1			9						8					6			9.8	
44.5																															
44.5									**SILTY MUDSTONE**									44.70	J	32			20	25	10			3	3		very rough, silt infill < 5 mm
									carbonaceous, very weak, brown, trace thin coal seams									45.00	J	48			20	25	10			3	3		very rough, silt infill < 5 mm
									and coal filled burrows									45.10	J	40			10	20	10			3	3		rough, silt infill < 5 mm
									@ 47.1 - 47.4 m coal seam, highly fissile, slickensided with									45.90	J	68			20	20	10			1.5	6		rough, planar, silt infill > 5 mm
									mudstone thin beds @ 55°									46.25	J	38			20	6	10			1.5	1		slickensided, wavy, silt coating
	8	100	53		SLMS	gr, br	lam			55	C1	R1			11			46.40	J	62		13	10	20	10		6	1.5	1	7.7	rough, planar, silt infill < 5 mm
																		46.80	J	55			20	20	10			1.5	1		rough, planar, silt infill < 5 mm
																		46.90	J	23			10	6	10			1.5	3		slickensided, wavy, clay infill < 5 mm
																		47.10	J	38			10	6	10			1.5	1		slickensided, wavy
																		47.40	C	53			10	6	10			1.5	1		slickensided, wavy
																		47.50	J	46			10	6	10			1.5	1		slickensided, wavy
47.5																															
47.5									**SILTY MUDSTONE**									48.55	J	35			20	20	10			1.5	3		slightly rough, planar, silt infill < 5 mm
									same as above									48.80	J	28			10	20	10			1.5	1		slightly rough, planar
									SANDSTONE									49.15	J	60			10	20	10			1.5	1		slightly rough, planar
									@ 47.9 - 49.5 m very weak, fine grained, massive, clayey,									49.20	J	73			10	20	10			1.5	1		slightly rough, planar, silt infill < 5 mm
									dark grey									49.55	C	62			20	20	10			1.5	1		close joint
									MUDSTONE									49.60	J	53			10	20	10			3	10		close joint, coal infill > 5 mm
	9	100	72		SltSt SS MS	br gr, gr	mass		@ 49.5 - 50.7 m very weak, laminated @ 53°, dark grey with	65	C1	R1			9			49.90	C	51		13	20	6	10		3	1.5	3	10.9	slickensided, wavy
									coal and siltstone laminae									50.10	C	63			10	6	10			1.5	3		slickensided, wavy
									@ 49.9 m siltstone bed 20 cm thick									50.15	J	60			5	6	10			1.5	10		slickensided, wavy, coal infill >5 mm
50.6																															
50.6									**SANDSTONE**									51.20	J	50			20	20	10			1	3		smooth, planar, silt coating
									@ 50.7-53.1 m very weak, fine grained, laminated @ 55°,									51.70	J	53			20	20	10			1	3		smooth, planar, silt coating
									dark grey, laminae of carbonaceouse mudstone and coal									52.30	J	59			20	20	10			1	1		slightly rough, planar, silt infill < 5 mm
									@ 52.1-52.4 m strong, fine grained, massive									52.40	C	72			20	20	10			3	10		close joint, coal infill >5 mm
									@ 52.4-52.6 m mudstone, massive, carbonaceous, dark brown									52.65	C	70			20	20	10			3	6		close joint, silt infill >5 mm
																		52.85	J	50			10	25	10			1.5	1		rough, planar, silt infill < 5 mm
									@ 53.1 - 54.2 m massive, carbonaceous, dark brown									53.05	C	65			20	25	10			3	1		close joint
									laminated @ 55-60° with siltstone and sandstone, occasional									53.05	J	28			5	20	10			1	1		smooth, planar
									thin coal seams									53.20	J	40			10	6	10			0.5	1		slickensided, smooth, planar
									@ 53.3-53.6 m coal, fractured with carbonaceous mudstone									53.30	C	62			10	20	10			1	1		smooth, wavy, close joint
	10	100	87		SS MS	gr	mass		beds	50-70	C1	R1			10						17					4			12.4	
53.6																															

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-334C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1158.6 | **Northing (m):** 16459.00 | **Date Logged:** 9-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 19202.40 | **Start Date:** 9-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 9-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																DISCONTINUITY INFORMATION																
													UCS Test			Spacing (m)						CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
53.6																																
	11	100	67		MS SLMS	br gr	blocky mass		@ 53.0-54.2 m massive, carbonaceous, dark brown **SILTY MUDSTONE** @ 54.2- 65.0 m very weak, laminated, high silt content, dark grey grey, mudstone and sandstone small beds and coal laminae @ 55-60°, some silt filled burrows @ 56.3 -56.7 m fissile, slickensided	65	C1	R1			8			53.70	J	42		13	20	6	10		6	1.5	3	8.4	slickensided, wavy, coal infill
																		54.40	J	70			20	20	10			1.5	3		slightly rough, planar, silt and coal infill < 5 mm
																		54.80	J	40			20	20	10			1.5	3		slightly rough, planar, silt infill < 5 mm
																		55.60	J	23			20	6	10			1.5	1		slickensided, smooth, wavy
																		55.80	J	35			10	6	10			1.5	1		slickensided, smooth, wavy
																		55.90	J	20			10	20	10			1.5	1		slightly rough, planar
																		56.40	J	25			10	6	10			1.5	1		slickensided, wavy, clay coating
56.7																		56.85	J	43			20	20	10			1.5	3		slightly rough, planar, silt infill < 5 mm
56.7																																
	12	100	83		SLMS	br gr	lam		**SILTY MUDSTONE** same as above	65	C1	R1	57.0-57.2	19	8			57.40	J	73	2	17	20	20	10	52.6	6	1.5	1	10.4	smooth, planar, silt infill < 5 mm
																		57.60	J	60			10	20	10			1.5	1		smooth, planar, silt infill < 5 mm
																		58.00	J	40			10	6	10			1.5	3		slickensided, wavy, clay coating
																		58.20	J	32			10	6	10			1.5	3		slickensided, wavy, clay coating
																		58.20	J	65			5	6	10			1.5	3		slickensided, wavy, clay coating
																		58.30	J	46			10	6	10			1.5	3		slickensided, wavy, clay coating
																		58.70	J	48			10	20	10			3	3		slightly rough, planar, silt infill < 5 mm
59.7																		59.50	J	36			10	20	10			3	3		slightly rough
59.7																																
	13	100	47		SLMS	gr, br	lam		**SILTY MUDSTONE** same as above	55	C1	R1			10			60.15	J	23		13	20	20	10		6	3	3	6.3	slightly rough, planar, silt infill < 5 mm
																		60.40	J	68			20	20	10			3	3		slightly rough, planar, silt infill < 5 mm
																		61.30	J	65			10	20	10			3	3		slightly rough, planar, silt infill < 5 mm
																		61.30	J	3			5	6	10			1.5	6		slickensided, wavy, clay coating
																		61.65	J	22			20	20	10			1.5	3		smooth, planar, coal infill < 5 mm
																		61.70	J	28			10	6	10			1.5	1		slickensided, wavy, silt coating
																		61.70	J	10			5	20	10			1.5	1		slightly rough, wavy
																		62.00	J	58			10	20	10			1	1		smooth planar
																		62.10	J	58			5	20	10			1	1		smooth planar
62.8																		62.50	J	22			10	6	10			1.5	1		slickensided, wavy
62.8																																
	14	100	78		SLMS SS	br gr,	mass		**SILTY MUDSTONE** same as above @ 63.6-63.9 m mudstone **SANDSTONE** @ 65.0 - 71.6 m very weak, fine -medium grained, massive, grey	65	C1	R1			6			62.90	J	55		13	20	20	10		3	1.5	3	27.3	smooth, planar, silt infill < 5 mm
																		63.65	J	43			10	6	10			1.5	1		slickensided, wavy, clay infill >5 mm
																		63.70	J	60			5	6	10			1.5	1		slickensided, planar
																		63.75	J	53			5	6	10			1.5	1		slickensided, planar
																		64.20	J	62			20	20	10			1.5	3		smooth, planar, silt infill < 5 mm
65.5																		65.00	C	30			20	20	10			3	1		close joint
65.5																																
	15	100	93		SS	gr	mass		**SANDSTONE** same as above	65	C1	R2			0							13									
68.6																																
68.6																																
	16	100	92		SS	gr	mass		**SANDSTONE** same as above	65	C1	R1	70.3-70.6	50	7			70.30	J	58	4	13	25	25	10	60.5	6	3	1	33.2	rough, planar
																		70.40	J	45			10	25	10			3	1		very rough, planar
																		70.55	J	23			10	25	10			3	1		very rough
																		70.55	J	40			5	6	10			1.5	3		slickensided, wavy, clay infill <5 mm
																		71.20	J	55			20	20	10			3	1		slightly rough, planar
																		71.30	J	65			10	20	10			3	1		slightly rough, planar
71.6																		71.50	J	40								3	1		slightly rough, planar

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-334C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m)** 1167.1 | **Northing (m):** 16772.70 | **Date Logged:** 14-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 19002.60 | **Start Date:** 14-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 14-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																					
																	DISCONTINUITY INFORMATION														
														UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
35.0									**COAL (Val D'or A)**																						
									@ 35.0 - 35.6 m fractured																						
									@ 35.6 m mudstone, carbonaceous, brown, 10 cm thick																						
									COAL (Val D'or B)																						
									@ 35.7 - 36.4 m fractured																						
									@ 36.4 m siltstone, massive, grey, some mudstone laminae																						
	1	100	67		coal	blk	mass blocky		**COAL (Val D'or C)**	60	C1	R1			1			37.20	C	60		13	25	20	10	68	1	3	1		close joint
									@ 36.6 - 37.0 m fractured																						
									@ 37.0 m mudstone, carbonaceous, brown, 20 cm thick																						
									COAL (Val D'or D)																						
									@ 37.2 - 37.8 m fractured																						
38.0									@ 37.8 m mudstone, carbonaceous, brown, 10 cm thick																						
38.0									**NO CORE** 38.0 - 38.4 m																						
									COAL (Val D'or E)																						
									@ 38.4 - 39.7 m fractured																						
									@ 39.1 - 39.3 m hard, massive, calcite streaks																						
	2	81	53		coal	blk			@ 39.7 m mudstone, carbonaceous, brown, 15 cm thick		C1				0						13										
									COAL (Val D'or F)																						
41.3									@ 39.85 - 41.0 m hard, massive																						
41.3									**COAL (Val D'or G&H)**									37.60	J	30			25	12	10			1	1		smooth, planar, silt coating
									@ 41.0 - 44.5 m highly fractured									40.15	J	27			20	12	10			1	1		smooth, planar
									@ below 43.2 m some mudstone beds, 1-2 cm thick at 57-60°									41.15	J	30			25	25	10			3	1		rough, planar
	3	97	22		coal	blk				60	C1				3							3				53	2			18.3	
44.5																															
44.5																															
	4				No Core				**NO CORE**																						
47.5																															
47.5									**SANDSTONE**				47.6-47.8	62.2																	
									@ 47.5 - 48.2 m fine grained, massive, weak, grey																						
									COAL (Arbour A)																						
									@ 48.2 - 49.5 m hard, fractured, some thin mudstone beds < 1 cm																						
	5	81	48		SS coal SltSt	gr blk	mass			65	C1	R2			1			48.20	C	63	7	8	25	12	10	62	1	3	1	144.0	slightly rough, planar silt coating
									SILTSTONE																						
50.2									@ 49.2 - 50.2 m very weak, massive, grey, highly fractured																						

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-339C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1167.1 | **Northing (m):** 16772.70 | **Date Logged:** 14-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 19002.60 | **Start Date:** 14-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 14-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																					
																	DISCONTINUITY INFORMATION														
																	Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
50.2				No Core					**NO CORE 50.2 - 50.4 m**																						
									COAL (Arbour B)																						
									@ 50.4 - 52.0 m fractured																						
									@ 51.65 m mudstone, carbonaceous, brown, 5 cm thick																						
	6	67	27		coal SltSt	blk	blocky mass		**SILTSTONE**	60	C1	R1			0							8									
									@ 52.0 - 52.4 m massive, bentonitic, grey																						
									NO CORE 52.4 - 53.6 m																						
									COAL (Arbour D1)																						
									@ 53.6 - 54.4 m fractured																						
53.3				No Core																											
53.3									**COAL (Arbour D1)**																						
									@ 53.6 - 54.4 m fractured																						
									@ 54.4 m mudstone, carbonaceous, black, 25 cm thick																						
									some coal, thin seams																						
	7	93	41		coal	blk	blocky		**COAL (Arbour D2)**		C1				0							8									
									@ 54.7 - 55.9 m hard, massive																						
									@ 54.7 m mudstone, carbonaceous, black, 2 cm thick at 65°																						
									@ 55.4 m mudstone, carbonaceous, black, 10 cm thick at 65°																						
									@ 55.7 m mudstone, carbonaceous, brown, 5 cm thick																						
									@ 55.9 m MS, slickensided, fractured dark grey, 10 cm thick																						
56																															
56									**SILTY MUDSTONE**									56.00	J	30			25	12	10			1	1		smooth, planar, clay coating
									@ 56.0 - 57.2 m massive, weak, bentonitic, grey																						
									@ 56.4 m coal, fractured, black,10 cm thick																						
									@ 56.9 m mudstone, carbonaceous, brown, 10 cm thick																						
									@ 57.1 m coal, fractured, black,5 cm thick																						
	8	100	47		MS	gr	mass		@ 57.2 m clay, high plactic, bentonitic, light brown, 10 cm thick	65	C1	R2			1							8					55	1			47.0	
									SANDSTONE																						
									@ 57.2 - 60.6 m massive, fine grained, very weak, grey																						
59.1									occasionally silty mudstone beds up to 15 cm thick																						
59.1									**SANDSTONE**									58.00	J	16			25	25	10			3	1		close joint
									same as above									59.40	J	35			20	20	10			3	1		slightly rough, planar, silt coating
									@ 59.5 m coal, highly fractured, black, 20 cm thick									60.00	J	18			20	12	10			3	1		slightly rough, planar, silt coating
									@ 57.1 m highly fractured zone, 15 cm thick									60.50	J	10			20	25	10			3	1		very rough, silt coating
	9	100	67		SS	gr	mass		@ 56.4 m coal, highly fractured, black, 10 cm thick													13					65	3			67.0	
									@ 60.0 m highly fractured zone, 10 cm thick																						
60.6																															

MDH ENGINEERED SOLUTIONS
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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-339C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1128.4 | **Northing (m):** 16776.10 | **Date Logged:** 7-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 16608.10 | **Start Date:** 7-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 7-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																DISCONTINUITY INFORMATION																
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				Notes
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
23.8									**COAL**									24.50	J	30			25	25	10			3	1		
									@ 23.8 - 24.7 m blocky, black									25.20	J	33			20	25	10			3	3		coal infill
									SILTSTONE									25.60	C	56			20	25	10			3	1		contact joint
									@ 24.7 - 25.6 m									25.70	J	26			20	25	10			3	1		
									fine grained, weak, massive, grey,									25.90	C	65			20	25	10			3	1		contact joint
									COAL									26.20	J	65			20	25	10			3	1		
	1	100	76		coal SltST	blk gr	blocky mass		@25.6 - 42.4 m black, blocky, @ 25.9 m mudstone 25 cm thick massive, very weak, carbonaceous, dark brown	65	C1	R2			6							17					4				42.8	
26.5																															
26.5									**COAL**									28.20	J	65			25	20	10			1	1		
									black, blocky @ 26.7 m mudstone bed, 20 cm thick massive, weak, carbonaceous, dark brown to black @ 28.5 m mudstone bed, 25 cm thick massive, very weak, carbonaceous, dark brown below 28.8 m occasional thin mudstone beds at 60- 65°																							
	2	100	37		coal	blk	blocky			65	C1	R1									8					1			37.0	
29.5																															
29.5									**COAL**																						
	3	85	63		coal	blk gr, br	blocky mass		black, blocky		C1	R1																			
32.6																															
32.6									**COAL**																						
	4	100	87		coal MS	blk gr, br	blocky mass		@ 32.6 m sandstone bed, 7.5 cm thick @ 33.2 - 33.4 m mudstone interbedded with coal @ 65° @ 33.4 -33.7 m mudstone, bentonitic, light brown to dr.grey @ 34.9 - 35.2 m bentonitic mudstone interbedded with coal @ 65°	65	C1	R1																				
35.6																															
35.6									**COAL**									37.80	C	30			20	6	10			1.5	1		slickensided
																		38.50	J	22			20	25	10			3	1		rough
									@ 37.2m mudstone, very weak, bentonitic, light brown, 10 cm thick @ 37.8 mudstone, very weak, bentonitic, light brown, 3 cm thick																						
	5	100	77		coal MS	blk gr, br	blocky mass			50-70	C1	R1									17					4			43.3	
38.7																															

MDH ENGINEERED SOLUTIONS
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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-420C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1128.4 | **Northing (m):** 16776.10 | **Date Logged:** 7-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 16608.10 | **Start Date:** 7-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 7-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																	DISCONTINUITY INFORMATION															
																Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				Notes
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
38.7									**COAL**																						
									black, blocky																						
									@ 37.2m mudstone, very weak, with coal streaks, carbonaceous, brown, 3 cm thick																						
									@ 37.2m mudstone, very weak, bentonitic, dark grey, 20 cm thick																						
	6	100	37		coal MS	blk gr	blocky mass			65	C1	R1						38.70	J	30		8	20	25	10		1	3	1	111.0	
41.7																															
41.7				No Core					**NO CORE 41.8 - 42.4 m**									42.40	J	30			20	25	10			3	1		
									SANDSTONE									44.00	J	20			20	20	10			1.5	1		
									@ 42.4 - 47.8 m									44.6-44.8	J				20	10	10			3	1		Fractured zone, multidirectional fractures
									strong, fine grained, massive, grey										J											
																			J											
																			J											
																			J											
	7	87	53		SS	gr	mass			65	C1	R2							J			13				1			132.5	
																			J											
																			J											
																			J											
44.8																															
44.8									**SANDSTONE**				45.7-46.0	77.4				46.30		80	7		20	6	7			1.5	1		slickensided
									massive									46.90		20			20	20	10			1.5	1		
																		47.05		20			20	10	10			1.5	1		
																		47.45		60			25	20	10			3	10		coal infill >5 cm thick
																		47.70		47			20	20	10			1.5	1		
	8	100	100		SS	gr, br	mass				C1	R3										20				73	6			10.7	
47.8																															

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-420C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1133.5 | **Northing (m):** 16660.90 | **Date Logged:** 8-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 16605.20 | **Start Date:** 8-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 8-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																	DISCONTINUITY INFORMATION															
																Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD % %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
32.9									**COAL**																						
									@ 32.9 - 33.5 m blocky, black									34.80	J	42			20	6	10			1.5	1		slickensided
									MUDSTONE									35.00	J	15			20	6	10			1.5	1		slickensided
									@ 33.5 - 38.5 m																						
									very weak, massive, dark grey, occasional small beds of siltstone, some coal streaks on top of unit																						
									@ 34.4 m fractured zone, 12 cm thick																						
	1	90	57		coal MS	blk gr	blocky mass		from 35.0 m greenish grey		C1	R1			2							13				3			28.5	
36.0																															
36.0									**MUDSTONE**									36.00	J	12	1		20	6	10			1.5	1		slickensided
									same as above									37.60	J	33			25	25	10			3	1		
									@ 36.1 m fractured zone, 12 cm thick									38.00	J	60			20	25	10			3	1		crossing bedding at 60°
									from 37.2 m mudstone laminated at 60- 65°									38.55	J	56			20	20	10			1	1		smooth, planar
									carbonaceous, dark brown									38.85	J	43			20	25	10			3	1		
																		38.95	C	63			20	25	10			3	1		Contact joint
	2	100	69		MS	br	blocky		@ 37.7 m siltstone bed, 8 cm thick	65	C1	R1			6							13				66	6			27.8	
39.0																															
39.0									**SILTSTONE**									40.50	J	35	2		25	25	10			3	1		very rough
									@ 38.9 - 42.9 m									41.45	J	35			25	20	10			1	1		smooth, planar
									fine grained, weak, laminated, grey, bedding @ 60- 65°																						
									occasional coal laminae																						
	3	100	93		SltSt	gr	lam			65	C1	R2			2							20				80	2			93.0	
42.0																															
42.0									**SILTSTONE**									42.00	J	25			20	20	10			1	1		smooth, planar
									@ 38.9 - 42.9 m									42.60	J	28			20	25	10			3	3		very rough, silt infill
									MUDSTONE									43.60	J	25			20	25	10			3	1		
									@ 42.9 - 43.3 m carbonaceous, dark brown to black interbedded with coal seams at 60- 65°									44.40	C	23			20	25	10			3	1		
									COAL									44.50	C	62			20	25	10			3	1		contact joint
									@ 43.3 - 44.5 m blocky, black									45.00	J	53			20	6	10			1.5	1		slickensided
									SANDSTONE																						
									@ 44.5 - 46.3 m very weak, fine grained, massive, dark grey																						
	4	100	71		coal MS SS	blk gr, br	blocky mass			65	C1	R1			6							13					4			32.2	
45.0																															
45.0									**SANDSTONE**									45.30	J	56			20	20	10			3	3		silt infill
									@ 44.5 - 46.3 m very weak, fine grained, massive, dark grey									45.70	J	37			20	25	10			3	1		rough,
									occasional coal and mudstone streaks									46.70	C	33			20	6	10			1.5	1		contact slickensided joint
									SILTSTONE									46.80	J	40			20	6	10			1.5	3		slickensided, silt infill
									@ 46.3 - 50.0 m									46.90	J	40			20	6	10			1.5	3		slickensided, silt infill
																		47.00	J	30			20	6	10			1.5	3		slickensided, silt infill
																		47.20	J	40			20	25	10			3	3		coal coating
																		47.70	J	23			20	25	10			3	3		silt infill
	5	100	85		SS SltSt	blk gr, br	mass			50-70	C1	R1			8				J			17					6			12.8	
48.1																															

ENGINEERED SOLUTIONS
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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-424C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1133.5 | **Northing (m):** 16660.90 | **Date Logged:** 7-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 16605.20 | **Start Date:** 7-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 7-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																DISCONTINUITY INFORMATION																
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)					
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD % %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
48.1									**SILTSTONE**									48.55	J	48			25	25	10			3	1		
									@ 46.3 - 50.0 m									48.60	J	63			20	6	10			3	3		slickensided, coal infill
									fine grained, weak, massive, dark grey, some coal seams and									49.30	J	12			20	20	10			3	1		
									mudstone beds at 60- 65°									50.15	J	23			20	25	10			3	1		
									COAL									50.40	J	70			20	25	10			3	1		
									@ 50.0 - 51.8 m									50.75	J	28			20	25	10			3	1		
	6	100	77		coal SltST	blk gr	blocky mass		black, blocky	65	C1	R2			6							17					6			28.9	
51.2																																
51.2									**COAL**									52.20	J	42			20	25	10			3	3		very rough, coal infill
									black, blocky									52.70	J	25			20	6	10			1.5	1		very rough, slickensided
									COAL									53.35	J	62			20	20	10			3	3		coal infill
									@ 51.8 - 52.7m									54.00	J	42			20	20	10			3	1		
									coal seams, up to 15 cm thick, interbedded with carbonaceous									54.10	J	0-17			10	20	10			3	1		
									thin mudstone beds at 45 - 65°										J												
									below 28.8 m occasional at 60- 65°										J												
	7	100	63		coal SLMS	blk	blocky		**SILTY MUDSTONE**	65	C1	R1			5				J			13					6			15.8	
									@ 52.7 - 56.3 m very weak, massive, dark grey,																						
									@ 55.3 m coal seam at 65°, 5 cm thick																						
54.2																																
54.2									**SILTY MUDSTONE**									54.70	J	32			20	25	10			3	1		
									@ 52.7 - 56.3 m very weak, massive, dark grey,									54.85	J	30			20	6	10			1.5	3		slickensided, silt infill
																		55.50	J	40			20	6	10			1.5	3		slickensided, silt infill
									COAL									56.90	J	38			20	6	10			1.5	1		slickensided
									@ 56.3 - 57.3 **m** black, blocky									57.00	J	30			10	25	10			3	1		
	8	100	65		SLMS coal	blk gr, br	blocky mass		below 57.4 m interbedded with mudstone and siltstone beds		C1	R1			5							13					3			25.3	
57.3																																
57.3									**SILTY MUDSTONE**									57.90	J	70			20	20	10			3	3		clay and coal infill
									@ 57.3 - 59.7 m very weak, massive, carbonaceous, dark									58.10	J	28			10	6	10			1.5	3		slickensided, silt and coal infill
									brown, occasionally siltstone small beds									58.65	J	75											
									@ 59.0 m coal seam, 22 cm thick									59.00	J	50			20	6	10			1.5	1		slickensided
									SILTSTONE																						
									@ 59.7 - 63.3 m weak interbedded with sandstone																						
	9	100	70		SLMS SltSt	blk gr, gr	mass			65	C1	R1			4							13					3			20.0	
60.3																																
60.3									**SILTSTONE**									60.35	J	45			20	20	10			3	1		
									@ 59.7 - 63.3 m weak, massive, dark grey, interbedded with									61.20	J	70			20	6	10			1.5	6		slickensided, clay infill
									sandstone, fine grained, weak, massive, grey									61.55	J	48			20	20	10			1	1		
									occasinally coal filled burrow, and coal streaks									61.70	J	68			20	25	10			3	3		silt and coal infill
									@ 62.0 - 62.3 m coal seam									61.80	J	35			20	6	10			1.5	3		slickensided, silt and coal infill
									@ 62.3 - 62.6 m fractured zone, multidirectional fractures									62.00	C	40			20	6	10			1.5	1		slickensided
																		62.25	C	65			20	25	10			3	1		
																		62.30	J	42			10	20	10			1	1		
																		62.85	J	45			20	25	10			3	3		silt infill
	10	100	69		SltSt	gr	mass			50-70	C1	R2						63.15	J	23		13	20	20	10		4	3	1	17.7	
63.3																																

MDH ENGINEERED SOLUTIONS
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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-420C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1136.1 | **Northing (m):** 16349.20 | **Date Logged:** 6-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 16597.40 | **Start Date:** 6-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 6-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																									
																DISCONTINUITY INFORMATION																				
													UCS Test			Spacing (m)						CSIR Rating						Q (Barton et al., 1974)					
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD % %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
43.5									**COAL** @ 43.5 - 44.2 m **MUDSTONE** @ 44.2 - 44.5 m very weak, massive, grey **COAL** @44.5 - 50.6 m black, blocky																									
	1	92	7		coal MS	blk gr	blocky mass			65	C1	R1										3											
44.8																																			
44.8									**COAL** @44.5 - 50.6 m black, blocky																									
	2	83	38		coal	blk	blocky			65	C1	R1										8											
47.8																																			
47.8									**COAL** black, blocky @ 49.1m carbonaceous, brown mudstone bed 2 cm thick																									
	3	83	37		coal	blk	blocky				C1	R1										8											
50.6																																			
50.6									**COAL** @ 50.6 - 52.1 m black, blocky, fractured @ 50-70°interbedded with brown to black carbonaceous mudstone beds, occasionally very weak, bentonitic, light brown mudstone beds up to 2 cm thick @ 52.1 - 52.5 m No Core @ 52.5 m mudstone, very weak, carbonaceous, brown, 15 cm thick **COAL** @ 52.7 - 53.7 m																									
	4	83	30		coal MS	blk gr, br	blocky mass			50-70	C1	R1			1			52.75	C	54		8	20	12	10		2	3	1		52.7 - 53.0 m Mudstone, bentonitic, grey 53.0 - 53.7 m Coal, massive, black
53.6																																			
53.6									**COAL** @ 52.7 - 53.7 m massive, black, @ 53.7 - 54.0 mudstone very weak, carbonaceous, brown @ 54.0 - 54.4 m coal, fractured, bedding @ 50-70° **MUDSTONE** @ 54.4- 57.6 m , massive, dark grey				54.8-55.1	14.2				54.60	J	57	2		20	6	10			1.5	1		slickensided
																		54.90	J	68			20	20	10			1.5	6		slightly rough, clay infill < 5 mm
																		55.20	J	50			20	20	10			1	1		
																0.05		55.40	J	25			10	6	10			1.5	1		rough, slickensided
																		55.45	J	31			10	20	10			1	1		slightly rough, planar
																		55.80	J	40			10	20	10			1	1		
	5	100	77		coal MS	blk gr, br	blocky mass			50-70	C1	R1			7		0.6	56.40	J	36		17	20	6	10	59	6	1.5	1	9.6	slickensided, wavy
56.7																																			
56.7									**MUDSTONE** @ 54.4- 57.7 m , massive, dark grey **SANDSTONE** @ 57.7 - 59.7 m strong, fine grained, massive, grey				57.8-58.1	15.8				56.90	J	20	2		20	20	10			1.5	1		slightly rough, planar
																		57.65	C	60			20	20	10			1.5	1		close contact joint
																		57.80	J	25			10	25	10			1	1		
																			J																
																			J																
	6	100	77		MS SS	gr	mass				C1	R3			3				J			17				67	4			25.7	
59.7																																			

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-430C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m)** 1167.6 | **Northing (m):** 16543.20 | **Date Logged:** 13-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 14397.00 | **Start Date:** 13-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 13-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																							
																	DISCONTINUITY INFORMATION																	
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				Notes	
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
33.6									**NO CORE 33.6 - 33.9 m**									34.30	J	40			20	6	10			1.5	1		slickensided, wavy, slightly rough coal infill
									SILTSTONE									35.35	J	30			20	20	10			3	1		rough, planar
									@ 33.9 - 34.1 m weak, massive, dark grey									35.90	J	40			20	20	10			3	1		rough, planar
									COAL (Val D'or A)									36.40	C	60			20	20	10			3	1		rough, planar
									@ 34.1 - 35.4 m blocky, black									36.60	J	26			20	25	10			3	1		very rough
	1	87	37		SltSt coal	blk gr	mass blocky		@ 35.4 m mudstone bed 10 cm thick at 60° slickensided fractures	65	C1	R2			5							8				56	6			13.4	
									COAL (Val D'or B)																					
									@ 35.4 - 36.2 m blocky, black, highly fractured																					
									SILTY MUDSTONE																					
36.6									@ 36.2 - 36.6 m very weak, laminated, high silt content, carbonaceous, dark brown																					
36.6									**SANDSTONE**				38-38.3	89.6				38.20	J	29	7		25	25	10			3	3		very rough, calcite infill 3 mm
									@ 36.6 - 40.3.8m weak, fine grained, massive									38.30	J	30			10	25	10			3	1		very rough
									below 38.2 m laminated with coal thin seams at 57°																					
	2	100	95		SS	gr	mass		@ 39.4 m coal seam 3 cm thick		C1	R2			2							20				80	1			142.5	
38.7																															
38.7									**COAL (Val D'or C)**									39.00	J	20			20	25	10			3	1		very rough
									@ 40.3 - 40.6 m blocky, black									39.40	J	42			20	6	10			1.5	1		slickensided, wavy
																		39.50	J	21			10	20	10			3	3		rough, silt and coal infill 4 mm
									CLAY									40.30	C	70			20	12	10			3	1		slightly rough
									@ 40.65 - 40.9 m stiff, high plastic, bentonitic, white																					
	3	100	73		coal	blk	blocky		**COAL (Val D'or D)**	55	C1	R1			4							13				56	3			42.6	
41.7									@ 40.95 - 41.5 m blocky, black,																					
41.7									**MUDSTONE**																					
									@ 41.5 - 42.5 m very weak, carbonaceous, dark brown occasional coal streaks																					
									COAL (Val D'or E)																					
									@ 42.55 - 43.05 m blocky, black																					
	4	100	72		MS coal	blk gr	lam blocky		@ 43.05 mudstone bed 15 cm thick at 63°	65	C1	R1			0							13									
									COAL (Val D'or F)																					
44.8									@ 43.2 - 45.5 m blocky, black																					
44.8									**COAL**																					
									@ 43.2 - 45.5 m blocky, black																					
									CLAY																					
									@ 45.55 - 45.8 m stiff, high plastic, carbonaceous, brown																					
	5	93	23		coal MS	blk	blocky mass		**COAL (Val D'or G)**	65	C1	R2			0							8									
									@ 45.8 - 46.4 m blocky, black																					
									MUDSTONE																					
									@ 46.4 - 46.6 m very weak, carbonaceous, dark brown																					
									COAL (Val D'or H)																					
47.5									@ 46.6 - 47.5 m blocky, black																					

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-495C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m)** 1167.6 | **Northing (m):** 16543.20 | **Date Logged:** 13-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 14397.00 | **Start Date:** 13-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 13-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																				
																DISCONTINUITY INFORMATION														
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
47.5									**SILTSTONE**									47.50	J	25			25	25	10			3	1		very rough
									@ 47.5 - 47.7 m weak, massive, dark grey									48.50	J	40			25	12	10			1	1		smooth, planar, cola coating
									COAL (Val D'or)									50.20	J	40			20	25	10			3	1		very rough
									@ 47.7 - 48.1 m blocky, black,																					
	6	100	35		SltSt coal	blk gr	mass blocky		**SILTSTONE**	65	C1	R2			3							8				62	3			30.3	
									@ 48.15 - 49.0 m weak, massive, dark grey																					
									COAL (Arbour A)																					
									@ 49.0 - 50.2 m hard, massive																					
									SILTSTONE																					
50.6									@ 50.2 - 50.6 m weak, massive, black, some clay beds																					
50.6									**COAL (Arbour B)**									51.50	J	28			20	25	10			3	1		very rough
									@ 50.6 - 52.7 m hard, massive									53.00	J	45			25	25	10			3	1		very rough
									occasionally thin beds of bentonitic clay									53.70	J	40			25	25	10			3	1		very rough, silt coating
									SILTSTONE																					
	7	100	63		coal	blk	blocky		@ 52.7 - 53.2 m weak, massive, dark grey	60	C1	R2			3							13				71	3			63.0	
									MS and coal beds up to 10 cm thick on top of unit																					
									COAL (Arbour D1)																					
53.6									@ 53.2 - 54.6 m hard, massive																					
53.6									**COAL (Arbour D1)**									54.60	J	25			25	25	10			3	1		very rough, stepped
									@ 53.2 - 54.6 m hard, massive									54.70	J	60			10	25	10			3	15		very rough, stepped, clay infill 7 mm
									SILTSTONE									55.95	J	30			10	25	10			3	1		very rough
	8	100	80		coal SltSt	blk gr, br	mass blocky		@ 54.6 - 55.0 m weak, massive, dark grey, some coal streaks		C1	R2			4			56.00	J	30		17	5	25	10	65	4	3	1	13.3	very rough
									COAL (Arbour D2)																					
56.7									@ 55.0 - 56.7 m hard, massive																					
56.7				No Core					**NO CORE 56.7 - 56.9 m**									58.00	J	35			25	12	10			1.5	1		slightly rough, planar, silt coating
									SILTSTONE									58.40	J	28			20	12	10			1.5	1		slightly rough, planar, silt coating
									@ 56.9 - 58.5 m very weak, massive, dark grey									58.85	J	18			20	25	10			3	1		very rough, stepped
									@ 57.3 m mudstone, carbonaceous, brown, 20 cm thick																					
	9	96	70		coal SS	blk gr	blocky lam		**SANDSTONE**	65	C1	R1			3							13				61	1			140.0	
									@ 58.5 - 61.1 m laminated at 65°, fine grained, weak, grey coal laminae																					
59.4																															
59.4									**SANDSTONE**									60.05	J	60			25	12	10			1.5	3		slightly rough, planar, coal coating
									@ 58.5 - 61.1 m laminated at 65°, fine grained, weak, grey coal laminae									60.30	J	20			10	20	10			3	1		rough, silt coating
									SILTSTONE									61.40	J	45			25	6	10			1.5	1		slickensided, wavy
	10	100	73		SS SltSt	blk	lam		@ 61.1 - 61.8 m weak, massive, dark grey	65	C1	R2			4			61.45	J	27		13	5	25	10	55	3	3	1	36.5	very rough, silt coating
									some clay beds up to 2 cm thick with slickensides																					
61.8																															

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-495C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m)** 1135.8 | **Northing (m):** 16233.80 | **Date Logged:** 12-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 14407.90 | **Start Date:** 12-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 12-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																							
																	DISCONTINUITY INFORMATION																	
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				Notes	
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
54.6									**COAL**																							
									@54.6 - 59.2 m blocky, black																							
									occasional thin carbonaceous mudstone beds, slickensided																							
	1	100	45		coal	blk gr	blocky				C1	R0			1			55.10	J	30		8	20	6	10	44	1	3	1	135.0	rough, wavy
56.7																																
56.7									**COAL**									59.30	J	36			20	25	10		3	1		very rough, wavy	
									same as above									59.65	J	27			20	25	10		3	1		very rough, stepped	
									SILTSTONE																							
	2	93	52		coal SS	blk	blocky mass		@ 59.2 - 60.9 m		C1	R2			2							13				68	1			156.0	
									weak, massive, black, carbonaceous, some coal seams and bentonitic clay thin slickensided beds																							
59.7																																
59.7									@ 60.5 m bentonitic high plastic, firm clay, 40 cm thick									60.35	J	40			20	25	10		3	1		very rough, stepped	
																		61.90	J	73			20	25	10		3	1		very rough, stepped	
									COAL									62.20	J	20			20	25	10		3	15		very rough, soft caly infill 7 mm	
									@ 60.9 - 61.8 m blocky, black																							
	3	90	33		coal SltSt	blk gr, br	mass blocky			55	C1	R2			3							8				63	3			5.8	
									SILTSTONE																							
									@ 61.8 - 65.8 m very weak, massive, dark grey sandstone laminae bottom of unit, some silt filled burrows																							
62.8									**SILTSTONE**									63.20	J	20			20	20	10		1.5	1		slightly rough, planar	
									@ 61.8 - 65.8 m very weak, massive, dark grey									63.40	J	30			10	25	10		3	8		very rough, soft caly infill 3 mm	
																		63.6-64.3												fractured zone	
	4	90	57		SltSt	blk gr	mass		@ 63.6-64.3 m fractured zone with multiple fratures	65	C1	R1			2							13				61	1			28.5	
65.8																																

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-499C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1146.2 | **Northing (m):** 16325.00 | **Date Logged:** 14-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 13210.00 | **Start Date:** 14-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 14-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																	DISCONTINUITY INFORMATION																
													UCS Test			Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
11.6									**COAL (Arbour)**									12.40	J	13			20	12	10			1	1		slightly rough silt infill
									@11.9 - 12.2 slough									12.50	J	43			10	12	10			1	1		slightly rough, planar silt coating
									SILTSTONE									12.65	J	44			10	12	10			1	1		slightly rough, planar silt coating
									@ 12.2 -13.6 m									12.85	J	45			10	12	10			1	1		slightly rough, planar silt coating
									weak, massive, dark grey, some coal laminae									13.25	J	52			20	12	10			1	1		slightly rough, planar silt coating
	1	90	50		Cola SltSt SLMS	blk gr	mass blocky		**SILTY MUDSTONE**	45	C1	R2			10			13.35	J	48		13	10	12	10	55	6	1	1	10.3	slightly rough, planar silt coating
									@ 13.6 - 18.6 m massive, carbonaceous, dark brown									13.75	J	46			20	20	10			1	1		smooth, planar, silt coating
																		14.15	J	55			20	20	10			1	1		smooth, planar, silt coating
									NO CORE									14.25	J	43			20	25	10			3	1		rough, planar, clay coating
14.6									@14.6-14.8 m									14.35	J	52			20	20	10			1	1		smooth, planar,
14.6				No core					**SILTY MUDSTONE**									15.30	J	45			20	12	7			1	1		smooth, planar, silt coating
									same as above									15.45	J	30			10	6	7			1.5	1		slickensided, rough, silt coating
									@ 14.8-15.3 m highly fractured zone multidirectional									16.15	J	30			20	6	7			1.5	1		slickensided, rough, silt coating
									fractures with slickensides									16.25	J	43			20	12	7			1	1		smooth, planar, coal coating
	2	93	33		SLMS	dr gr	mass				C1	R0			8			16.40	J	63		8	10	12	10	47	9	1	1	4.8	smooth, planar, silt coating
									@ 15.3 - 15.4 m siltstone bed									16.65	J	55			10	12	10			1	1		smooth, planar, silt coating
									@ 17.3 - 17.4 m siltstone bed									17.30	C	72			20	25	10			3	3		very rough, calcite infill < 5 mm
17.7																		17.45	C	75			20	25	10			3	1		very rough,
17.7									**SILTY MUDSTONE**				19.3-19.6	17.8				18.10	J	33	2		20	12	10			1	1		smooth, planar, silt coating
									same as above									19.10	J	19			20	12	10			1	1		smooth, planar,
																		19.90	J	30			20	25	10			3	1		rough, planar,
	3	90	70		SLMS SltSt	gr, br	lam		**SILTSTONE**	55	C1	R1			5			20.10	J	48		13	10	20	10	62	3	3	1	18.3	slightly rough, planar silt coating
									@ 18.6 - 21.2 m weak, laminated @ 60-65°, dark grey									20.45	J	28			20	25	10			3	10		rough, hard clay infill 7 mm
									thin coal seams and clay beds																						
20.7																																
20.7																		20.90	J	53			20	12	10			1	1		smooth, planar, silt coating
									SILTSTONE									21.00	J	22			10	20	10			1	1		close joint
									same as above									21.20	J	35			10	12	10			1	1		smooth, planar,
									COAL (McLeod)									22.20	J	33			25	20	10			3	1		
	4	93	37		SltSt coal MS	blk gr br	blocky mass		@ 21.2 - 22.9 m blocky, black	65	C1	R1			6			22.30	J	23		8	10	20	10	51	3	3	1	24.7	
									MUDSTONE									23.45	J	45			20	20	10			3	1		
									@ 22.9 - 25.1 m massive, very weak, dark brown to black																						
									highly fractured, multidirectional fractured, some thin coal																						
23.5									seams																						
23.5									**MUDSTONE**									24.00	J	30			20	25	10			3	1		rough, planar, silt coating
									same as above									24.15	J	62			10	25	10			3	1		rough, silt coating
									bottom of unit bentonitic mudstone, 10 cm thick									24.50	J	42			20	25	10			3	1		rough, silt coating
																		25.10	C	65			20	20	10			2	10		smooth, wavy, clay and coal infill 8 mm
									COAL (McPherson)									25.65	J	30			20	20	10			3	1		
	5	100	33		MS coal	br blk	mass blocky		@ 25.1 - 28.5 m blocky, black, fractured, some	65	C1	R1			10			26.00	J	35		8	20	20	10	55	6	3	1	8.4	
									carbonaceous mudstone beds at 55-60°									26.05	J	32			5	20	10			3	1		
																		26.10	J	30			5	20	10			3	1		
									@ 25.3 m carbonaceous clay, 15 cm thick									26.20	J	32			10	20	10			3	1		
									@ 25.6 m carbonaceous clay, 5 cm thick									26.50	J	32			20	20	10			3	1		
									@ 25.8 m carbonaceous clay, 10 cm thick																						
26.5																																

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-523C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m)** 1146.2 | **Northing (m):** 16325.00 | **Date Logged:** 14-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 13210.00 | **Start Date:** 14-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 14-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																				
													UCS Test			DISCONTINUITY INFORMATION														
																Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
26.5									**COAL (McPherson)**									28.60	J	0			20	6	7			1.5	1		slickensided,shine, wavy
									as above									29.40	J	26			20	20	7			3	1		slightly rough, silt coating
									@ 27.4 m carbonaceous clay, 15 cm thick																					
									@ 27.8 m carbonaceous clay, 20 cm thick																					
									@ 28.1 m carbonaceous clay, 5 cm thick																					
	6	100	60		coal SLMS	blk gr	mass blocky		@ 28.4 m carbonaceous clay, 5 cm thick	45	C1	R1			2							13				53	1			138.0	
									SILTY MUDSTONE																					
									@ 28.5 - 30.7 m massive, very weak, dark grey																					
									occasional clay beds, slickensided																					
29.5																														
29.5									**SILTY MUDSTONE**									30.00	J	30			20	20	7			1	1		slightly rough, silt coating
									same as above									30.05	J	30			5	25	7			3	1		rough, silt coating
																		30.70	J	50			20	25	10			3	1		rough, silt coating
									SANDSTONE									30.95	J	30			20	25	10			3	1		rough, silt infill
	7	88	62		SLMS SS	dr gr	mass		@ 30.7 - 31.8 m		C1	R2			6			31.60	J	50		13	10	6	10	55	9	1.5	1	14.4	slickensided, slightly rough, clay coating
									weak, fine grained, massive to laminated @ 60°, grey									31.80	C	65			10	12	10			1	1		close joint
									COAL (McPherson)																					
32.0									@ 31.8 - 33.7 m, blocky, black, fractured																					
32.0									**COAL (McPherson)**									33.95	J	33			20	12	10			3	1		slightly rough
									as above									34.90	J	7			20	6	10			1.5	1		slickensided, slightly rough, clay coating
									@ 32.8 m carbonaceous clay, 20 cm thick																					
									@ 34.9 m carbonaceous clay, 15 cm thick																					
	8	100	43		Coal SltSt	gr, br	blocky lam		**SILTSTONE**	55	C1	R1			2							8				47	1			96.8	
									@ 33.7 - 40.4 m weak, massive, interbedded with silty mudstone and sandstone @ 60-65°, dark grey																					
									some thin coal seams																					
35.0																														
35.0									**SILTSTONE**									35.30	J	30			20	6	10			1.5	1		slickensided, slightly rough, clay coating
									same as above									35.40	J	75			10	20	10			1	1		smooth, planar
																		35.40	J	28			5	12	10			1	1		smooth, planar, clay coating
									@ 37.5m coal seam, 20 cm thick									37.75	J	30			20	25	10			3	1		rough, silt and clay coating
	9	70	25		SltSt	dr gr	mass			65	C1	R1			4							8				47.5	3			13.5	
38.1																														
38.1									**SILTSTONE**									40.00	J	33			20	25	10			3	1		rough, planar, silt and clay coating
									same as above																					
	10	73	30		SltSt SS	gr	lam		**SANDSTONE**	65	C1	R2			1							8				63	1			90.0	
									@ 40.4 - 41.1m																					
									weak, fine grained, laminated @ 60 - 65°, grey																					
41.1																														

MDH ENGINEERED SOLUTIONS
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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-523C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1154.8 | **Northing (m):** 16430.80 | **Date Logged:** 17-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 12401.70 | **Start Date:** 17-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 17-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																	DISCONTINUITY INFORMATION															
															Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				Notes
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
57									**NO CORE** 57.0 - 57.5 m									57.90	C	23			25	20	10			3	1		close joint
									COAL (Val D'or A and B)									58.90	J	25			25	25	10			3	1		very rough, stepped
									@ 57.5 - 59.1 m hard, blocky, black									59.35	J	25			25	25	10			3	1		close joint
	1	93	85		coal SS	blk gr	blocky mass		@ 58.3 m mudstone, carbonaceous, brown, 5 cm thick	60	C1	R2			3							13				71	2			127.5	
									SANDSTONE																						
59.7									@ 59.1 - 61.7 m fine grained, massive, weak, grey																						
59.7									**SANDSTONE**				61.2-61.5	47.3				59.85	J	27	4		20	25	10			3	1		very rough, stepped
									@ below 60.7 m laminated with coal and siltstone, at 60-65°									61.65	J	15			25	25	10			3	1		very rough, stepped
																		61.85	J	15			20	25	10			3	1		very rough, stepped
									COAL (Val D'or C)																						
									@ 61.7-62.3 m hard, blocky, fractured at 15°. black																						
	2	100	90		SS coal	blk	blocky mass		@ 62.0 m mudstone, carbonaceous, brown, 7 cm thick	15	C1				3							13				74	3			90.0	
									@ 62.1 m mudstone, carbonaceous, brown, 2 cm thick																						
									@ 62.2 m mudstone, carbonaceous, brown, 1 cm thick																						
									@ 62.2 m mudstone, with coal striks, brown, 15 cm thick																						
									COAL (Val D'or D)																						
62.7									@ 62.5 - 62.9 m fractured																						
62.7									**COAL (Val D'or D)**									63.35	J	23			25	20	10			3	1		close joint
									@ 62.5 - 62.9 m fractured									63.45	J	24			10	20	10			3	1		close joint
									@ 62.9 m mudstone, carbonaceous, brown, 25 cm thick									64.00	J	25			20	20	10			3	1		close joint
									COAL (Val D'or E)									65.40	J	28			25	25	10			3	1		very rough, stepped
	3	100	83		coal	blk	blocky		@ 63.2 - 64.3 m fractured	60	C1				5			65.60	J	27		3	20	25	10	55	2	3	1	124.5	very rough, stepped
									@ 64.3 m mudstone, carbonaceous, brown, 20 cm thick																						
									COAL (Val D'or F, G)																						
65.8									@ 64.5 - 67.1 m hard, blocky																						
65.8									**COAL (Val D'or F, G)**									67.75	J	18			25	20	10			3	1		close joint
									@ 64.5 - 67.1 m hard, blocky																						
									@ 67.1 m mudstone, carbonaceous, brown, 10 cm thick																						
									COAL (Val D'or H)																						
	4	90	90		coal	blk	blocky		@ 67.2 - 68.4 m hard, blocky																	55	0.5			540.0	
									@ 67.8 m mudstone, carbonaceous, brown, 5 cm thick																						
									SILTSTONE																						
68.8									@ 68.4 - 68.9 m very weak, laminated at 60-65° with coal																						
68.8									**COAL**									69.60	J	18			25	25	10			3	1		close joint, rough
									@ 68.9 - 69.3 m fractured									69.90	J	28			20	25	10			3	1		very rough, stepped, silt coating
																		71.80	C	68			25	25	10			3	1		close joint
									SILTY MUDSTONE																						
									@ 69.3 - 69.9 m massive, very weak, dark grey to black																						
									some mudstone beds up to 10 cm thick																						
	5	100	95		SLMS SS coal	gr blk	mass blocky		**SANDSTONE**	65	C1	R1			3							8				66	3			95.0	
									@ 69.9 - 70.1 m fine graind, very weak, massive, grey																						
									COAL (Arbour A)																						
									@ 70.1 - 71.5 m hard, blocky																						
									@ 71.3 m mudstone, carbonaceous, dark brown, 10 cm thick																						
									@ 71.4-71.5 m calcite streaks																						
71.9									@ 71.5 m mudstone, carbonaceous, dark brown, 30 cm thick																						

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-544C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1154.8 | **Northing (m):** 16430.80 | **Date Logged:** 17-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 12401.70 | **Start Date:** 17-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 17-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
																	DISCONTINUITY INFORMATION															
																	Spacing (m)					CSiR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
71.9									**COAL (Arbour B)**																						
									@ 71.8 - 72.4 m																						
									@ 72.0 - 72.4 m calcite streaks																						
									SILTSTONE																						
									@ 72.4 - 73.3 m weak, grey																						
	6	100	96		coal SltSt	blk	blocky mass		interbedded with coal, mudstone and sandstone	60	C1	R2			0							20									
									COAL (Arbour C)																						
									@ 73.3 - 75.2 m fractured																						
									@ 74.6 m mudstone, carbonaceous, black,1 cm thick																						
									@ 74.7 m mudstone, carbonaceous, black, 2 cm thick																						
75.0																																
75.0									@ 75.2 m mudstone, carbonaceous, brown, 20 cm thick									75.60	J	50			25	25	10			3	1		close joint
																		76.00	J	25			20	25	10			3	1		very rough, silt coating
									SILTSTONE									76.70	J	45			25	25	10			3	1		very rough, silt coating
									@ 75.4 - 75.8 m weak, massive, grey									77.90	J	25			25	25	10			3	1		close joint, rough
	7	100	67		coal SltSt	blk	blocky mass		**COAL (Arbour D1)**	50	C1	R2			4							13				71.75	4			50.3	
									@ 75.8 - 77.0 m hard, massive																						
									@ 76.1 m mudstone, carbonaceous, black,10 cm thick																						
									@ 76.6 m mudstone, carbonaceous, black, 2 cm																						
									@ 77.0 m mudstone, carbonaceous, brown, 10 cm thick																						
									COAL (Arbour D2)																						
78.0									@ 77.1 - 78.3 m hard, massive																						
78.0																		78.10	J	20			25	25	10			1	1		close joint, rough
									SILTSTONE																						
									@ 78.3 - 79.8 m very weak, grey highly fractured																						
									interbedded with coal, mudstone and sandstone, at 60 - 65°																						
									beds up to 10 cm thick																						
	8	96	60		SltSt SS	gr	mass		@ 79.4 m mudstone, carbonaceous, black,2 cm thick	65	C1	R2			1							13				73	1			60.0	
									@ 79.5 m mudstone, carbonaceous, black,5 cm thick at 65°																						
									SANDSTONE																						
									@ 79.8 - 83.8 m massive, fine grained, weak, grey																						
81.0																																
81.0									**SANDSTONE**									82.30	J	28			25	25	10			3	1		very rough, silt coating
									same as above									83.40	J	20			25	25	10			3	1		very rough, silt coating
	9	100	97		SS	gr	mass			65	C1	R2										20				80	1			291.0	
83.8																																

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-544C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m)** 1155.8 | **Northing (m):** 16004.40 | **Date Logged:** 11-Mar-12

Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 12397.50 | **Start Date:** 11-Mar-12

Drill Hole Diameter: 4.75 mm | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** 11-Mar-12

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
														UCS Test			DISCONTINUITY INFORMATION															
																	Spacing (m)					CSIR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (MPa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
41.8									**SILTSTONE**																						
									@ 41.8-44.4 m									42.20	J	40	7		20	6	10			1.5	3		slickensided, planar, slightly rough coal infill
									weak, massive, dark grey, some coal seams and									42.50	C	60			20	6	10			0.5	1		slickensided, planar, smooth
									mudstone beds up to 20 cm thick at 60- 65°									42.90	C	50			20	20	10			3	1		close joint
									from 43.3 to 44.4 m highly fractured zone with multidirectional									43.00	C	72			10	20	10			3	1		close joint
									slickensided fractures									44.00	J	22			20	20	10			1.5	1		slickensided, wavy, stepped, very rough
	1	100	35		SltSt coal	blk gr	mass blocky		**COAL**	65	C1	R2			5							8				57	3			15.8	
44.8									@ 44.4 - 50.5 m blocky, black, highly fractured																						
44.8									**COAL**																						
									same as above																						
									@ 47.0-47.2 mudstone carbonaceous, very weak with coal streaks																						
	2	90	20		coal	blk	blocky				C1	R0			0							3									
47.8																															
47.8									**COAL**																						
									same as above																						
									SILTSTONE																						
	3	100	27		coal SltSt	blk gr, br	mass blocky		@ 50.5-50.9 m weak, massive, dark grey	55	C1	R1			0							3									
50.9																															
50.9									**COAL**																						
									@ 50.9- 51.9 m interbedded with bentonitic mudstone at 55 -60°, beds up to 20 cm thick																						
									CLAY																						
	4	93	70		coal clay	blk gr	blocky		@ 51.9-52.3 m stiff, high plastic, bentonitic, grey	65	C1	R1			0							13									
52.3																															
52.3									**COAL**																						
									@ 52.3-54.3 m blocky, black, fractured, some carbonaceous mudstone beds at 55-60°																						
									@ 52.8-53.1 m bentonitic clay with coal streaks, highly disturbed																						
	5	100	80		coal	blk	blocky			65	C1	R2			0							17									
53.9																															
53.9									**COAL**									54.30	C	58			30	20	10			3	1		slightly rough, planar,
									@ 52.3-54.3 m blocky, black, fractured									54.70	J	60			20	6	10			1.5	1		slickensided, planar, clay infill <5 mm
																		54.75	J	60			5	6	10			1.5	1		slickensided, planar, clay infill <5 mm
									SILTSTONE									55.60	J	70			10	20	10			3	3		smooth, planar
									@ 54.3-59.7 m									55.80	J	18			10	25	10			3	1		rough, stepped
									weak, massive, dark grey, occasional sandstone beds up to 10 cm thick at 60- 65°																						
									@ 54.7 m mudstone bed, 5 cm thick																						
									below 58.5 m laminated with thin sandstone beds and coal seams																						
	6	100	75		coal SltSt	blk gr	blocky mass lam			65	C1	R1			5							17				57	3			42.9	
56.7																															
56.7									**SILTSTONE**				58.6-58.9	54.9				56.85	J	18	7		25	25	10			3	1		rough, stepped
									same as above									57.00	J	32			10	6	10			1.5	1		slickensided, wavy, smooth
																		57.05	J	65			5	6	10			1.5	1		very rough, slickensided
																		57.90	J	70			20	6	10			1.5	3		slickensided, wavy, rough
	7	100	87		SltSt	gr	lam			65	C1	R1			7			58.10	J	65		17	20	6	10	63	6	0.5	1	22.6	slickensided, wavy, smooth
																		58.30	J	24			10	20	10			3	1		slightly rough, planar
																		59.60	J	15			20	25	10			3	1		very rough, stepped
59.7																															

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-549C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Andrew Smorschok

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m** 1206.1 | **Northing (m):** 15988.20 | **Date Logged:** March 23, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 10398.30 | **Start Date:** March 23, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 23, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																			
																DISCONTINUITY INFORMATION													
													UCS Test			Spacing (m)					RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD % %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Ration	Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
28.9									**COAL**		C1	R3				0.02	0.28	29.08	J	59		20	10	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 28.9 - 29.5 m									29.10	J	59								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Shiny black, clean coal, blocky, jointed, medium									29.12	J	59								3	1		Tight, rough, unaltered/unweathered, persistent joint
									strong rock		C1	R2						29.16	J	75								3	1		Tight, rough, unaltered/unweathered, persistent joint
									MUDSTONE PARTING									29.44	J	72								1	1		Open, smooth, planar, unaltered/unweathered, persistent
	1	100	93		coal MS	blk/br	blocky		@ 29.5 -29.6 m	-	C1	R3			7			29.48	J	72							3	3	1	84.1	Tight, rough, unaltered/unweathered, persistent joint
									Brown, fine-grained, massive, weak rock									29.62	J	65								3	1		Tight, rough, unaltered/unweathered, persistent joint
									COAL																					
30.4									@ 29.6-30.4 m SAA																					
30.4									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 30.4-30.9 m																					
									Dull black, dirty coal, massive, medium strong rock,																					
									rock partly shiny black clean coal, contact @ 30.9m 60 tca																					
									MUDSTONE PARTING		C1	R2																		
									@ 30.5-31.1 m SAA																					
	2	100	95		coal MS	blk/br	blocky		**COAL**	-	C1	R3			0											-	-		-	
									@ 31.0 -31.6 m SAA, contact @ 31.6 m 50 tca																					
									MUDSTONE PARTING		C1	R2																		
									@ 31.6 -31.7 m SAA, contact @ 31.7 m 52 tca																					
									COAL		C1	R3																		
									@ 31.7 - 32.0 m																					
32.0									Shiny black, clean coal, blocky, jointed, medium strong rock																					
32.0									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 32 -33.4 m SAA																					
									SILTSTONE PARTING		C1	R5																		
	3	100	97		coal SltSt	blk/br	blocky coarse-grained		@ 33.4 -33.5m	-					0											-	-		-	
									Brown, fine-grained, sandy, carbonaceous, massive																					
									very strong rock, contact @ 33.5m 60 tca																					
33.5									**MUDSTONE PARTING**		C1	R2				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 33.5 - 33.7 m SAA																					
									COAL		C1	R3																		
	4	100	95		MS coal	blk/br	Fine-grained/ blocky		@ 33.7 - 34.1 m	-					0											-	-		-	
									Dull black, dirty coal, massive, medium strong rock																					
									COAL		C1	R3																		
35.2									@ 34.1 - 35.2 m																					
35.2									Shiny black, clean coal, massive, medium strong rock																					
									COAL		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 35.2 - 36.1 m SAA																					
									COAL		C1	R3																		
									@ 36.1 - 36.15 m																					
									Dull black, dirty coal, massive, medium strong rock																					
	5	100	100		coal MS	blk/br	blocky		contact @ 36.15 m 65 tca	-	C1	R2			0											-	-		-	
									MUDSTONE PARTING		C1	R3																		
									36.1-36.2 m SAA, contact @ 36.2m 70 tca																					
									COAL																					
36.7									@ 36.2 - 36.7 m																					
36.7									SAA, @ 36.4 m mudstone parting 10mm 60 tca																					
									COAL		C1	R3				0.4	0.4	37.10	J	58	-	-	-	-	-			1	1		Very tight, smooth, planar, unaltered/ unweathered
									@ 36.7 - 36.9 m																					
									Shiny black, clean coal, massive, medium strong rock																					low persistent joint
									COAL		C1	R4						37.50	J	66							3	3		Tight, rough, sand-filled, persistent joint
									@ 36.9 - 37.1 m																					
									Dull black, dirty coal, massive, strong rock																					
									CALCITE STRINGER																					
									@ 37.2 - 37.3 m																					
									White, persistent, 65 tca																					
									COAL		C1	R3																		
	6	100	87		coal MS	blk/br	blocky		@ 37.1 - 37.8 m	-					2											0.8			108.8	
									Shiny black, clean coal, massive, medium strong rock																					
									CALCITE STRINGER																					
									@ 37.7 - 37.7 m SAA																					
									MUDSTONE PARTING		C1	R2																		
									@ 37.8 - 37.8 m SAA, 75 tca																					
									COAL		C1	R4																		
									@ 37.8 - 38.1 m																					
									Dull black, dirty coal, massive, strong rock		C1	R3																		
									COAL																					
38.4									@ 38.1 - 38.4 m																					
38.4									Shiny black, clean coal, massive, medium strong rock																					
									COAL		C1	R3				-	-	38.4-38.9	-	-	-	-	-	-	-			-	-		Core losses
									@ 38.9 - 39.0 m																					
									Dull black, dirty coal, massive, medium strong rock																					
									contact @ 38.5 m 75 tca																					
									SILTSTONE PARTING		C1	R5																		
	7	67	47		coal SltSt MS	B gr	blocky/ fine-grained		@ 39.0 - 39.4 m	.					0											.	-		-	
									Grey, fine-grained, massive, very strong rock																					
									COAL		C1	R3																		
									@ 39.4 - 39.6 m SAA																					
39.9									**MUDSTONE PARTING**		C1	R4																		
									@ 39.6 - 39.9 m																					
									Grey, fine-grained, massive, strong rock																					

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NOTES:

- Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-612C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

ROCK CORE LOG

Drilling Contractor Rocky Mountain Drilling | **Elevation (m):** 1206.1 | **Northing (m):** 15988.20 | **Date Logged:** March 23, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 10398.30 | **Start Date:** March 23, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 23, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																						
														UCS Test			DISCONTINUITY INFORMATION															
																	Spacing (m)					RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD % %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
39.9									**SILTSTONE PARTING**		C1	R4				0.08	0.48	40.02	J	60		20	15	20	10			3	1		Open, rough, irregular, unaltered/unweathered, persistent
									@ 39.9 - 40.0 m																						
									SAA, strong rock, contact @ 40.0 m 60° tca									40.10	J	60								3	1		Tight, rough, unaltered/unweathered, persistent
									CALCITE STRINGER									40.58	J	68								3	1		Tight, rough, unaltered/unweathered, persistent
									@ 40.4 - 40.4 m SAA									41.00	J	30								3	1		Tight, rough, unaltered/unweathered, persistent
									CALCITE STRINGER									41.08	J	90								3	1		Tight, rough, unaltered/unweathered, persistent
									@ 40.9 -40.9 m SAA									41.16	J	60								3	1		Very tight, rough, unaltered/unweathered, low persistent
	8	100	82		SltSt coal MS	blk/br	fine-grained/ blocky		**COAL**	-	C1	R3			7			41.28	J	64						4		3	1	61.5	Very tight, rough, unaltered/unweathered, low persistent
									@ 40.0 - 41.0 m																						
									Shiny black, clean coal, jointed, medium strong rock																							
									COAL		C1	R3																			
									@ 41.0 - 41.2 m																						
									Dull black, dirty coal, jointed, medium strong rock																						
									MUDSTONE PARTING		C1	R2																			
									@ 41.2 - 41.4 m																						
41.4									SAA, weak rock, contact @ 41.21 m 72° tca																						
41.4									**COAL**		C1	R3				0.24	0.72	41.80	J	82		20	15	20	10			3	1		Open, rough, irregular, unaltered/unweathered, persistent
									@ 41.4 - 42.2 m																						
									Shiny black, clean coal, massive, medium strong rock									42.52	J	45								3	1		Open, rough, irregular, unaltered/unweathered, persistent
									partly dull black, dirty coal, contact @ 42.2m 58° tca									42.76	J	80								3	1		Tight, rough, unaltered/unweathered, persistent
									MUDSTONE PARTING		C1	R2																			
									@ 42.2 - 42.2 m																						
									Grey, fine-grained, massive, weak rock, contact @ 42.2 m 66° tca																						
	9	100	67		coal MS	blk/br gr	blocky		**COAL**	-	C1	R3			3												2				100.5	
									@ 42.2 - 42.6 m																						
									SAA, blocky, contact @ 42.6m 70° tca																						
									MUDSTONE PARTING		C1	R2																			
									@ 42.6 - 42. 7m																						
									SAA, contact @ 42.7 m 80° tca																						
									COAL		C1	R3																			
42.9									@ 42.7 - 42. 9m SAA, blocky																						
42.9									**MUDSTONE PARTING**		C1	R2				-	-	43.49-43.58	-	-	-	-	-	-	-			-	-		Broken core samples
									@ 42.9 - 43.1 m									43.8-44.2													Core losses
									Brown, fissile, weak rock, contact @ 43.1 m 60° tca																						
									COAL		C1	R3																			
									@ 43.1 - 43.3 m																						
	10	69	26		MS coal	br gr B	blocky		Dull black, dirty coal, massive, medium strong rock	-					0										-		-		-		-	
									MUDSTONE PARTING		C1	R3																			
									@ 43.3 - 43.8m																						
									Grey, silty, carbonaceous, medium strong rock																						
44.2									@43.5 - 43.5m sulphides minerals noted																						
44.2									**COAL**		C1	R2				0.01	0.27	44.51	J	40		13	8	20	10			2	1		Slightly open, smooth, unaltered/unweathered, persistent
									@ 44.2 - 44.6 m									44.52	J	40								2	1		Slightly open, smooth, unaltered/unweathered, persistent
									Shiny black, blocky, jointed, weak rock		C1	R3						45.25	J	55								2	1		Slightly open, smooth, unaltered/unweathered, persistent
									SANDSTONE PARTING									45.28	J	55								2	1		Slightly open, smooth, unaltered/unweathered, persistent
									@ 44.6 - 45.2 m																				2	1		Slightly open, smooth, unaltered/unweathered, persistent
									Grey, very coarse-grained, massive, medium strong rock																				2	1		Slightly open, smooth, unaltered/unweathered, persistent
	11	100	73		coal SS	B gr	fine grained blocky		**COAL**	-	C1	R3			10			45.32	J	50						2		2	1	73.0	Slightly open, smooth, unaltered/unweathered, persistent
									@ 45.2 - 45.7 m									45.35	J	60								2	1		Slightly open, smooth, unaltered/unweathered, persistent
									Dull black, dirty coal, massive, medium strong rock									45.37	J	60								2	1		Slightly open, smooth, unaltered/unweathered, persistent
									partly shiny, blocky clean coal									45.40	J	60								2	1		Slightly open, smooth, unaltered/unweathered, persistent
45.7																		45.48	J	60											
45.7																		45.57	J	78											
									COAL		C1	R3				-	-	46.9-47.2	-	-	-	-	-	-	-			-	-		Core losses
									@ 45.7 - 46.1 m																						
									Dull black, dirty coal, massive, medium strong rock		C1	R1																			
									BENTONITE CLAY																						
									@ 46.1 - 46.1 m																						
									Grey, massive, very weak rock, contact @ 46.1m																						
	12	100	53		coal bent clay	B gr br	blocky		sulphide minerals noted	-	C1	R3			0												-				-	
									COAL																						
									@ 46.1 - 46.3 m SAA		C1	R1																			
									BENTONITE CLAY																						
									@ 46.3 - 46.3 m																						
									Brown, silty, very weak rock, sulphide minerals noted		C1	R3																			
47.2									**COAL**																						
									@ 46.3 - 46.9 m SAA																						
47.2									**COAL**		C1	R3				0.06	0.27	47.42	J	50		20	10	20	10			2	1		Broken joint, smooth, unaltered/unweathered, persistent
									@ 47.2 - 47.9 m SAA									47.69	J	26								3	1		Moderately open, rough, unaltered/ unweathered, persistent
									COAL		C1	R3						47.75	J	26								3	1		Moderately open, rough, unaltered/ unweathered, persistent
									@ 47.9 - 48.1 m																						
									Shiny black, clean coal, blocky, jointed, medium strong rock																						
	13	100	34		coal	B	blocky		**COAL**	-	C1	R3			3												2				43.7	
									@ 48.1 - 48.7 m																						
									Dull black, dirty coal, massive, medium strong rock																						
48.7									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 48.7 - 48.8 m SAA																						
	14	100	66		coal MS	B gr	blocky		**MUDSTONE**	-	C1	R3			0												-				-	
									@ 48.8 - 50.3 m																						
50.3									Grey, fine-grained, massive, brittle hard, carbonaceous slightly oxidized/ weathered, medium strong rock																						

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NOTES:

- Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-612C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

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ROCK CORE LOG

Drilling Contracto Rocky Mountain Drilling | **Elevation (m):** 1206.1 | **Northing (m):** 15988.20 | **Date Logged:** March 23, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 10398.30 | **Start Date:** March 23, 2012
Drill Hole Diamete 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 23, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																				
																DISCONTINUITY INFORMATION														
														Spacing (m)					RMR Rating							Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD % %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
50.3									**MUDSTONE**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-	
									@ 50.3 -50.5m SAA																					
									SANDSTONE		C1	R5																		
									@ 50.5 -51.4m																					
									Grey, very coarse-grained, massive, very strong rock																					
									contact @ 50.4 m 40º tca																					
									CALCITE STRINGER																					
									@ 50.6 m 72 tca																					
									CALCITE VEINLET																					
	15	100	71		MS SS	gr	fine-grained/ very coarse-grained		@ 50.6 m	-					0										-	-			-	
									White, 30mm thick, 90º tca																					
									CALCITE STRINGER		C1	R3																		
									@ 50.8 m																					
									White, 5mm thick, 40º tca																					
									MUDSTONE																					
									@ 51.4 -51.8 m																					
									Grey, fine-grained, carobonaceous, massive, medium strong rock, contact @ 51.4 m 58º tca																					
51.8									*AA-09, 50.5 - 50.8m*																					
51.8									**MUDSTONE**		C1	R5	52.7-52.8	37.9		-	-	51.95	B	60	4	20	30	25	10				-	-	Bedding plane
									Grey, fine-grained, silty, cross-bedded, jointed, very strong rock, very strong rock									52.47	J	42									-	-	Bedding plane
	16	100	95		MS	gr			*AA-10, 52.7 -52.9 m*	50-60					1			52.60	B	60							3	-	-	Bedding plane
																		53.25	B	50								3	1	Moderately open, rough, irregular, unaltered/unweathered
53.3																										89				persistent joint
53.3									**SILTSTONE**		C1	R4				-	-	53.75	B	60	-	-	-	-	-			-	-	Bedding plane
									Grey, fine-grained, cross-bedded, jointed, strong rock									54.20	B	70									-	-	Bedding plane
	17	100	95		SltSt	gr	fine-grained		*AA-11, 53.8 -54.0 m*	60-70					0										-	-			-	
54.8																														
54.8									**SANDSTONE**		C1	R5				-	-	55.10	B	70	-	-	-	-	-			-	-	Bedding plane
									@ 54.8 - 55.4 m									55.30	B	65									-	-	Bedding plane
									Grey, very coarse-grained, cross-bedded, jointed, very strong rock									55.70	B	62									-	-	Bedding plane
	18	100	98		SS SltSt	gr	fine-grained/ very coarse-grained		**SILTSTONE**	62-70					0										-	-			-	
									@ 55.4 -56.4 m		C1	R5						56.20	B	70									-	-	Bedding plane
56.4									SAA, very strong rock																					

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NOTES:

Q' = RQD %/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Numbe A3688
Client: CVRI
Borehole Num RT-12-612C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

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ROCK CORE LOG

Drilling Contracto Rocky Mountain Drilling | **Elevation (m):** 10394.9 | **Northing (m):** 15723.40 | **Date Logged:** March 26, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 1164.30 | **Start Date:** March 26, 2012
Drill Hole Diamete 2.5 " | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 26, 2012

DRILL INFORMATION				GEOLOGY										GEOTECHNICAL AND HYDROTECHNICAL																		
														DISCONTINUITY INFORMATION																		
														Spacing (m)						RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (Max)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
44.8																															
	1	100	46		coal MS	blk br	blocky lam		**COAL** @ 44.8 - 44.9 m Shiny black, clean coal, blocky, medium strong rock	-	C1	R3			2	0.28	0.28	45.92	J	70		20	10	20	10		0.8	3	1	172.5	Tight, rough, unaltered/unweathered, persistent
									MUDSTONE PARTING @ 44.9 - 45.2 m Grey, fine-grained, carbonaceous, slicken-sided, massive, medium strong rock, contact @ 45.2 m 60° tca		C1	R3						46.20	J	30								3	1		Open, rough, unaltered/ unweathered, persistent
									COAL @ 45.2 - 45.4 m SAA, contact @ 45.4 m 60° tca		C1	R3																		
									MUDSTONE PARTING @ 45.4 - 46.1 m SAA, contact @ 46.1 m 75° tca		C1	R3																		
46.3									**COAL** @ 46.1 - 46.3 m SAA		C1	R3																		
46.3									**COAL** @ 46.3 - 46.4 m SAA		C1	R3				-	-	-	-	-	-	-	-	-	-		-	-	-	
	2	77	27		coal MS	blk gr	blocky		**MUDSTONE PARTING** @ 46.4 - 46.6 m Grey, fine-grained, massive, medium strong rock	-	C1	R3			0												-	-	-	
47.5									**COAL** @ 46.6 - 47.5 m SAA, contact @ 46.6 m 70° tca		C1	R3																		
47.5									**COAL** @ 47.5 - 47.8 m SAA		C1	R3				0.03	0.35	48.25	J	40		20	5	20	10			3	1		Tight, rough, unaltered/unweathered, persistent
																		48.30	J	80								3	1		Tight, rough, unaltered/unweathered, persistent
									COAL @ 47.8 - 47.9 m Dull black, dirty coal, massive, medium strong rock		C1	R3						48.39	J	95								3	1		Tight, rough, unaltered/unweathered, persistent
									COAL @ 47.9 - 48.7 m Shiny black, clean coal, blocky, medium strong rock		C1	R3						48.48	J	95								3	1		Tight, rough, unaltered/unweathered, persistent
																		48.51	J	85											
	3	100	36		coal SltSt	blk br	blocky		**SILTSTONE PARTING** @ 48.7 - 48.8 m Brown, fine-grained, massive, medium strong rock, contact @ 48.8 m fault contact, 3 mm thick gouge, 78° tca	-	C1	R3			8			48.56	J	85							2	3	1	54.0	Tight, rough, unaltered/unweathered, persistent
																		48.61	J	80								3	1		Tight, rough, unaltered/unweathered, persistent
49									**COAL** @ 48.8 - 49 m Dull black, dirty coal, massive, medium strong rock		C1	R3						48.96	J	80								3	1		Tight, rough, unaltered/unweathered, persistent
49									**COAL** Shiny black, clean coal, blocky, medium strong rock patches of impurities noted @ 49.4 m and 50.0 m	-	C1	R3			0	-	-	-	-	-	-	-	-	-	-		-	-	-	
50.6	4	98	66		coal	blk	blocky																								
50.6									**COAL** @ 50.6 - 51.5 m Dull black, dirty coal, massive, medium strong rock		C1	R3				-	-	51.60	F	15		20	30	6	10			1	8		5mm thick, gouge, brecciated
	5	100	95		coal MS	blk gr	blocky		**MUDSTONE PARTING** @ 51.5 - 52.1 m Grey, fine-grained, silty, massive, medium strong rock	-	C1	R3			1												0.8			14.8	
52.1									**SILTSTONE PARTING** @ 52.1 - 52.1 m Brown, fine-grained, massive, medium strong rock		C1	R3				-	-	52.75	J	30		20	30	25	10			1	1		Open, rough, unaltered/ unweathered, persistent
									MUDSTONE PARTING @ 52.1 - 52.2 m SAA		C1	R3																		
									SILTSTONE PARTING @52.2 - 52.4 m SAA, contact @ 52.2 m 70° tca		C1	R3																		
									MUDSTONE PARTING @ 52.4 - 52.5m Brown, fine-grained, massive, weak rock, contact @ 52.4 m 60° tca		C1	R2																		
									SILTSTONE PARTING @ 52.5 - 52.6 m SAA, contact @ 52.6 m 55° tca		C1	R3																		
	6	98	71		SltSt MS	gr, br	fine-grained mass		**MUDSTONE PARTING** @ 52.55 - 52.7 m Grey, fine-grained, massive, medium strong rock	-	C1	R3			1												0.8			88.8	
									SILTSTONE PARTING @ 52.7 - 52.9 m SAA, contact @ 52.9m 60° tca		C1	R3																		
									MUDSTONE PARTING @ 52.9 - 52.9 m Grey, fine-grained, massive, weak rock		C1	R2																		
									SILTSTONE PARTING @ 52.9 - 53.0 m SAA, contact @ 53.0m 55° tca		C1	R3																		
									MUDSTONE PARTING @ 53.0 - 53.4 m SAA		C1	R2																		
53.6									**SILTSTONE PARTING** @ 53.4 - 53.6 m SAA		C1	R3																		
53.6									**SILTSTONE PARTING** @ 53.6 - 53.8 m Brown, fine-grained, massive, strong rock		C1	R4				0.02	0.02	54.44	J	52		13	5	12	10			1	1		Open, smooth, planar, unaltered/ unweathered, persistent
									COAL @ 53.8 - 54.0 m SAA, contact @ 53.8 m 52° tca		C1	R3						54.46	J	52								1	1		Open, smooth, planar, unaltered/ unweathered, persistent
									MUDSTONE PARTING @ 54.0 - 54.3m Grey, fine-grained, carbonaceous, massive, very weak rock, contact @ 54.3 m 74° tca		C1	R1																		
	7	100	60		SltSt coal MS	br, blk gr	blocky mass		**COAL** @ 54.3 - 55.0 m Shiny black, clean coal, blocky, medium strong rock	-	C1	R3			2												0.8			75.0	
55.1									**SILTSTONE** @ 55.0 - 55.1 mSAA		C1	R3																		

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NOTES:

Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-616C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 10394.9 | **Northing (m):** 15723.40 | **Date Logged:** March 26, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 1164.30 | **Start Date:** March 26, 2012
Drill Hole Diamete 2.5 " | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 26, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL DISCONTINUITY INFORMATION																										
														UCS Test				Spacing (m)						RMR Rating						Q (Barton et al., 1974)					
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
55.1											C1	R3	55.5-55.7	37.8		-	-	-	-	-	4	-	-	-	-			-	-		
	8	100	100		SltSt	gr	fine-grained		**SILTSTONE** Grey, fine-grained, carbonaceous, massive, medium strong rock *AA-14, 55.5 - 55.8m*	-					0												-	-		-	
56.7																																				
56.7											C1	R3	57.1-57.3	35.5		-	-	57.60	B	65	4	-	-	-	-			-	-		Bedding plane
																		57.75	B	60											Bedding plane
											C1	R5						58.10	B	45											Bedding plane
	9	100	86		SltSt SS	gr	fine-grained/ coarse-grained		**SILTSTONE** @ 56.7 - 57.2m Grey, fine-grained, carbonaceous, massive, cross-bedded, medium strong rock **SANDSTONE** @ 57.2 - 57.5m Grey, very coarse-grained, massive, very strong rock **SILTSTONE** @ 57.5 - 58.2m Grey, fine-grained, carbonaceous, massive, medium strong rock *AA-15, 57.1 - 57.3m*	25-45	C1	R3			0												-	-		-	
58.2																																				
58.2											C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
	10	100	80		SltSt SS	gr	fine-grained/ coarse-grained		**SILTSTONE** @ 58.2 - 58.3m SAA **SANDSTONE** @ 58.3 - 59.7m SAA	-	C1	R5			0												-	-		-	
59.7																																				

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NOTES:

Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-616C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

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ROCK CORE LOG

Drilling Contractor Rocky Mountain Drilling | **Elevation (m):** 1176.5 | **Northing (m):** 15673.50 | **Date Logged:** March 21, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 8399.60 | **Start Date:** March 21, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 21, 2012

Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Intact Strength Classification	UCS Test DEPTH	UCS Test Result (Mpa)	Joint Count	Spacing (m) min	Spacing (m) max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	RMR Rating: Strength of Rock	RMR Rating: RQD	RMR Rating: Spacing	RMR Rating: Roughness	RMR Rating: Ground Water	RMR Rating: Total Rating	Q (Barton et al., 1974): Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
18.3									**SILTSTONE**		C2	-				-	-	-	-	-	-	-	-	-			-	-		
	1	100	0		SltSt	br	coarse-grained		Brown, fine-grained, slightly oxidized, unweathered, broken core samples	-					0										-	-				Broken core samples
18.6																															
18.6									**COAL**		C1	R3				-	-	19.67	J	55		20	30	25	10			3	1		Very tight, rough, unaltered/unweathered, persistent joint
									@ 18.6 - 19.6m																					
									Black, clean coal, massive, blocky, medium strong rock																						
									MUDSTONE PARTING		C1	R3																		
									@ 19.6 - 19.7m																					
	2	100	80		coal MS	blk	fine		Brown, fine-grained, medium strong rock, contact @ 19.7m 50° tca	-					1												0.6				400.0
									COAL		C1	R3																		
20.1									@ 19.7 - 20.1m SAA																					
20.1									**COAL**		C1	R3				0.01	0.57	20.65	J	52		20	12.5	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 20.1 - 20.6m																					
									SAA, contact @ 20.62m 50° tca																					
									SANDSTONE PARTING		C1	R5						20.75	J	52							3	1		Tight, rough, unaltered/unweathered, persistent joint
	3	100	100		coal SS	blk gr	fine/ mediu - grained		@ 20.6 - 21.6m	-					4			20.76	J	52						2	3	1	150.0	Tight, rough, unaltered/unweathered, persistent joint
									Grey, mediu - grained, jointed, very strong rock																					
21.6																		21.23	J	-							3	1		Broken joint, rough, planar, unaltered/unweathered, persistent
21.6									**SANDSTONE PARTING**		C1	R5				0.12	0.52	22.27	J	50		20	12.5	20	10			2	1		Very tight, smooth, irregular, unaltered/unweathered joint
									@ 21.6 - 21.9m									22.39	J	50								2	1		Very tight, smooth, irregular, unaltered/unweathered joint
									SAA, contact @ 21.9m 90° tca																					
									COAL		C1	R3						22.91	J	40							2	1		Very tight, smooth, irregular, unaltered/unweathered joint
									@ 21.9 - 22.1m																					
									Dull black, dirty coal, jointed, medium strong rock, shiny black, blocky clean coal in part, contact @ 22.5m 70° tca																					
									MUDSTONE PARTING		C1	R3																		
									@ 22.1 - 22.2m																					
	4	100	80		SS coal MS	gr blk br	coarse-grained/fine/fine-grained		SAA, 90° tca	-					3												2			80.0
									COAL		C1	R3																		
									@ 22.2 - 22.7m SAA																					
									MUDSTONE PARTING		C1	R3																		
									@ 22.7 - 22.7m																					
									SAA, contact @ 22.7m 70° tca																					
									COAL		C1	R3																		
23.2									@ 22.7 - 23.1m SAA																					
23.2									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 23.2 - 23.4m																					
									SAA, contact @ 23.4m 55° tca																					
									MUDSTONE PARTING		C1	R3																		
									@ 23.4 - 23.5m																					
									SAA, contact @ 23.5m 60° tca																					
									MUDSTONE PARTING		C1	R3																		
	5	100	80		coal MS	blk br, gr	fine/ fine-grained		@ 23.5 - 23.6m	-					0												-	-		
									Grey, silty, medium strong rock, contact @23.6m 48° tca																					
									COAL		C1	R3																		
									@ 23.6 - 24.7m																					
									Shiny black, clean coal, blocky, massive, medium strong rock																					
24.7																														
24.7									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 24.7 - 25.2m																					
									SAA, contact @ 25.24m 60° tca																					
									MUDSTONE PARTING		C1	R3																		
									@ 25.2 - 25.5m																					
	6	100	95		coal MS	blk gr	fine/ fine-grained		SAA, contact @ 25.5m 60° tca	-					0												-	-		
									COAL		C1	R3																		
									@ 25.5 - 26.2m																					
26.2									Dull black, dirty coal, massive, medium strong rock																					
26.2									**COAL**		C1	R3				-	-	26.56	J	60		20	30	25	10			1	1		Open, smooth, planar, unaltered/unweathered, persistent
									@ 26.2 - 27.4m																					
									Shiny black, clean coal, blocky, massive, medium strong rock																					
									CALCITE STRINGERS																					
									@ 26.3 - 26.3m																					
									White, sub-parallel 72° tca																					
									CALCITE STRINGERS																					
									@ 26.6 - 26.8m																					
	7	100	100		coal MS	blk br	fine/ fine-grained		White, criss-crossing, 72° tca	-					1												0.6				166.7
									CALCITE STRINGERS																					
									@ 27.0 - 27.1m																					
									SAA, 74° tca																					
									MUDSTONE PARTING		C1	R3																		
									@ 27.4 - 27.4m																					
									Brown, fine-grained, medium strong rock, contact 54° tca																					
									COAL		C1	R3																		
27.7									@ 27.4 - 27.7m, SAA																					
27.7									**COAL**	57-59	C1	R3			0	-	-	28.65	B	57	-	-	-	-	-	-	-	-		'	Bedding plane
									@ 27.7 - 27.9m																					
									SAA, interlayered with thin mudstone partings																					
									COAL		C1	R3						27.80	B	59										Bedding plane
									@ 27.9 - 28.3m																					
									SAA, partly shiny black, clean coal																					
									CALCITE STRINGERS																					
									@ 27.9 - 27.9m																					
	8	100	97		coal MS	blk br	fine/ fine-grained		White, criss-crossing																					
									MUDSTONE PARTING		C1	R3																		
									@ 28.3 - 28.4m																					
									SAA, 65° tca																					
									CALCITE STRINGERS																					
									@ 29.0 - 29.0m																					
									SAA, 65° tca																					
29.3									**COAL**		C1	R3																		
									@ 28.4 - 29.3m SAA																					

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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-672C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

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ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1176.5 | **Northing (m):** 15673.50 | **Date Logged:** March 21, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 8399.60 | **Start Date:** March 21, 2012
Drill Hole Diameter: 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 21, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																					
																DISCONTINUITY INFORMATION															
													UCS Test			Spacing (m)					RMR Rating							Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Description	Intact Rock Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
29.3									**COAL**		C1	R3				0.13	0.13	29.88	B	65		20	10	20	10			-	-		Bedding plane
									@ 29.3 - 29.9m SAA									30.57	J	52								2	1		Moderately open, smooth, planar, unaltered/unweathered
									CALCITE STRINGERS									30.70	J	58								1	1		Tight, smooth, planar, unaltered/unweathered, persistent
									@ 29.8 - 30m																					
									White, sub-parallel, 10-30mm spacing, 66° tca																						
									SILTSTONE		C1	R5																			
	9	86	40		coal SltSt	blk gr	fine/ fine-grained		@ 29.9 - 30.1m	65					2											0.7			95.2	
									Grey, fine-grained, carbonaceous, massive, very strong rock																						
									COAL		C1	R3																			
									@ 30.1 - 30.7m SAA																						
									SILTSTONE		C1	R5																			
30.8									@ 30.7 - 30.8m																					
									Grey, fine-grained, massive, very strong rock																						
30.8									**SILTSTONE**		C1	R5				0.35	0.35	31.20	J	69		20	20	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 30.8 - 31.2m																					
									SAA, contact @ 31.2m 70° tca																						
									COAL		C1	R3						31.55	J	38							3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 31.2 - 31.4m SAA																					
									SILTSTONE		C1	R5																			
	10	100	66		SltSt coal	gr blk	fine-grained/ fine		@ 31.35 - 31.6m	-					2											0.7			282.9	
									SAA, contact @ 31.6m 85° tca																						
									COAL		C1	R3																			
									@ 31.6 - 32m SAA																						
32.0																															
32.0									**COAL**		C1	R3				0.01	0.66	32.40	J	45		20	12.5	20	10			3	1		Open, rough, planar, unaltered/unweathered, persistent
									@ 32 - 32.7m SAA									32.48	J	45								3	1		Open, rough, planar, unaltered/unweathered, persistent
									MUDSTONE PARTING		C1	R4						32.65	J	48								3	1		Open, rough, planar, unaltered/unweathered, persistent
									@ 32.7 - 32.8m									32.68	J	60								3	1		Open, rough, planar, unaltered/unweathered, persistent
									Grey, massive, slickensided, massive, strong rock,									32.69	J	60								3	1		Open, rough, planar, unaltered/unweathered, persistent
									contact @ 32.8m 65° tca																					Open, rough, planar, unaltered/unweathered, persistent
									COAL		C1	R4						32.76	J	60							3	1		Open, rough, planar, unaltered/unweathered, persistent
									@ 32.8 - 32.9m									32.79	J	60							3	1		Bedding plane
									SAA, contact @ 32.9m 65° tca																						
									MUDSTONE PARTING		C1	R3						33.45	B	58							-	-		
									@ 32.9 - 33.1m																						
	11	87	66		coal MS	blk gr	fine/ fine-grained		SAA, contact @ 33.1m 69° tca	58					7											4			49.5	
									COAL		C1	R3																			
									@ 33.1 - 33.5m																						
									SAA, interlayered with very thin mudstone partings																						
									CALCITE STRINGERS																						
									@ 32.4m, 32.5m, 32.6m and 32.7m																						
									White, sub-parallel @ 58° tca																						
33.5																															
33.5									**COAL**		C1	R3				-	-	33.95	B	64	-	-	-	-	-		-	-		Bedding plane
									@ 33.5 - 34.5m SAA																					
									CALCITE STRINGERS																					
									@ 33.7 - 33.7m, 75° tca																					
									CALCITE STRINGERS																					
									@ 34.15 - 34.153m, 75° tca																					
									CALCITE STRINGERS																					
									@ 34.27 - 34.275m, 55° tca																					
									CALCITE STRINGERS																					
	12	100	73		coal MS	blk gr	fine/ fine-grained		@ 34.52 - 34.53m, 55° tca	26					0										-	-		-	
									CALCITE STRINGERS																					
									@ 34.6 - 34.6m, 5° tca																					
									MUDSTONE PARTING		C1	R3																			
									@ 34.5 - 34.5m																					
									SAA, 60° tca																					
									MUDSTONE PARTING		C1	R3																			
									@ 34.6 - 34.6m																					
35.0									SAA, 60 tca																					
35.0									**COAL**		C1	R3				0.01	0.4	35.67	J	68		20	12.5	20	10			1	1		Open, smooth, planar, unaltered/unweathered, persistent
									@ 35.0 - 35.8m									35.71	J	68								1	1		Open, smooth, planar, unaltered/unweathered, persistent
									SAA, contact @ 35.8m 65° tca																					
									MUDSTONE PARTING		C1	R3						35.73	J	68							1	1		Open, smooth, planar, unaltered/unweathered, persistent
									@ 35.8 - 35.9m									35.85	J	65							3	1		Tight, rough, unaltered/unweathered, persistent joint
									SAA, contact @ 35.9m 67° tca																					
									COAL		C1	R3						35.86	J	65							3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 35.9 - 36.1m									35.87	J	65							3	1		Tight, rough, unaltered/unweathered, persistent joint
	13	100	48		coal MS	blk gr	fine/ fine-grained		SAA, contact @ 36.14m 65° tca	-					9											4			27.1	
									MUDSTONE PARTING		C1	R3						36.03	J	43							3	1		Open, rough, irregular, unaltered/unweathered, persistent
									@ 36.1 - 36.4m									36.43	J	65							3	1		Tight, rough, unaltered/unweathered, persistent joint
									SAA, contact @ 36.4m 60° tca																					
									COAL		C1	R3						36.45	J	65							3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 36.4 - 36.5m																					
									SAA, contact @ 36.5m 67° tca																					
									MUDSTONE PARTING		C1	R3																			
36.5									@ 36.5 - 36.5m SAA																					

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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-672C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

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ROCK CORE LOG

Drilling Contractor Rocky Mountain Drilling | **Elevation (m):** 1166.00 | **Northing (m):** 15380.40 | **Date Logged:** March 20, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 8398.70 | **Start Date:** March 20, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 20, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																			
																DISCONTINUITY INFORMATION													
														Spacing (m)					RMR Rating							Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
48.5									**SILTSTONE**		C1	R4				0.09	0.09	49.06	J	50		17	10	20	10			3	1		Broken joint, slightly rough, planar, unaltered/unweathered
									Carbonaceous, massive with few joints, strong rock																					persistent
																		49.15	J	130							2	3	1	115.5	Broken joint, slightly rough, planar, unaltered/unweathered
	1	82	77		SltSt	gr	fine-grained								3																persistent
49.4																		49.24	J	36								3	1		Broken joint, slightly rough, planar, unaltered/unweathered
49.4									**SILSTONE**		C1	R4				0.06	0.2	49.80	B	55		20	10	20	10						persistent Bedding plane
									@ 49.4 - 49.8m SAA									49.95	J	58								3	1		Broken joint, slightly rough, planar, unaltered/unweathered
									COAL		C1	R3																		persistent
									@ 49.8 - 50.6m									50.15	J	72								3	1		Broken joint, slightly rough, planar, unaltered/unweathered
									Generally dirty coal, dull black in color associated partly																					persistent
									with shiny black, blocky, clean coal, massive with few									50.22	J	70								3	1		Broken joint, slightly rough, planar, unaltered/unweathered
	2	100	93		SltSt/ coal	gr blk	fine-grained		joints, medium strong rock	55					4												2			139.5	persistent
																		50.28	J	70								3	1		Very tight, rough, unaltered/unweathered, persistent joint
50.6																															
50.6									**COAL**		C1	R3				0.02	0.4	51.00	J	50		20	15	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									SAA									51.25	J	55								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		51.40	J	57								3	1		Tight, rough, unaltered/unweathered, persistent joint
															6			51.58	J	57							2.5	3	1	117.6	Tight, rough, unaltered/unweathered, persistent joint
	3	100	98		coal	blk	fine											51.98	J	55								3	1		Tight, rough, unaltered/unweathered, persistent joint
52.1																		52.00	J	145								3	1		Moderately open, rough, unaltered/unweathered, persistent
52.1									**COAL**		C1	R3				0.05	1	52.50	J	65		20	15	20	10			3	1		Moderately open, rough, unaltered/unweathered, persistent
									@ 52.1 - 52.8m SAA									53.50	J	38								3	1		Moderately open, rough, unaltered/unweathered, persistent
									CALCITE STRINGERS									53.55	B	50											Bedding plane
									@ 52.8 - 52.8m																					
									White, criss-crossing																					
									COAL		C1	R3																		
									@ 52.8 - 53.0m SAA																					
									MUDSTONE PARTING		C1	R1																		
									@ 53.0 - 53.1m																					
									Brown, fine-grained, very weak rock, 70° tca																					
	4	100	100		coal MS	blk	Fine		**COAL**	50	C1	R3			2												0.7			428.6	
									@ 53.1 - 53.1m SAA																					
									MUDSTONE PARTING		C1	R1																		
									@ 53.1 - 53.1m																					
									SAA, 70° tca																					
									COAL		C1	R3																		
									@ 53.1 - 53.6m SAA																					
53.6																															
53.6									**COAL**		C1	R3				0.02	0.21	53.75	J	60		20	8	20	10			3	1		Broken joint, rough, unaltered/unweathered, persistent
									Generally dirty coal, dull black in color associated partly									53.80	J	55								3	1		Broken joint, rough, unaltered/unweathered, persistent
									with shiny black, blocky, clean coal, jointed, medium									53.95	J	70								3	1		Very tight, rough, unaltered/unweathered, persistent joint
									strong rock									53.97	J	70								3	1		Very tight, rough, unaltered/unweathered, persistent joint
																		54.18	J	60								3	1		Very tight, rough, unaltered/unweathered, persistent joint
															9			54.20	J	60							2	3	1	120.0	Very tight, rough, unaltered/unweathered, persistent joint
	5	100	80		coal	blk	Fine											54.41	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		54.52	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
55.1																		54.60	J	42								3	1		Very tight, rough, unaltered/unweathered, persistent joint
55.1									**COAL**		C1	R3				0.01	0.23	55.15	J	40		20	8	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 55.1 - 56.4m SAA									55.31	J	75								3	1		Tight, rough, unaltered/unweathered, persistent joint
									MUDSTONE PARTING		C1	R1						55.47	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 56.4 - 56.5m									55.70	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Grey, fine-grained, very weak rock																					
									COAL		C1	R3						55.75	J	65								3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 56.5 - 56.5m SAA									55.78	J	50								3	1		Very tight, rough, unaltered/unweathered, persistent joint
									MUDSTONE PARTING		C1	R1						55.84	J	50								3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 56.5 - 56.6m SAA									55.89	J	50								3	1		Tight, rough, unaltered, slightly weathered, persistent
									COAI		C1	R3						56.10	J	50								3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 56.6 - 56.7m SAA									56.17	J	53								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		56.26	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
56.7	6	100	100		coal MS	blk gr	fine/lam								12			56.27	J	60							2	3	1	150.0	Tight, rough, unaltered/unweathered, persistent joint

MDH ENGINEERED SOLUTIONS
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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-680C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

ROCK CORE LOG

Drilling Contractor Rocky Mountain Drilling | **Elevation (m):** 1166.00 | **Northing (m):** 15380.40 | **Date Logged:** March 20, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 8398.70 | **Start Date:** March 20, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 20, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																			
																DISCONTINUITY INFORMATION													
														Spacing (m)				RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
56.7									**COAL**		C1	R3				0.05	0.6	56.88	J	70		20	15	20	10			3	3		Open, rough, sand-filled, persistent joint
									@ 56.7 - 57.0m									56.93	B	65											Bedding plane
									Generally dirty coal, dull black in color associated partly with shiny black, blocky, clean coal, massive with few joints, medium strong rock									56.98	J	65							3	1		Open, rough, slightly weathered, persistent joint
																		57.05	J	65							3	1		Open, rough, slightly weathered, persistent joint
									MUDSTONE PARTING		C1	R1						57.10	B	65										Bedding plane
					coal SS MS	blk gr	fine/ foarse-grained/ fine-grained		@ 57.0 - 57.0m SAA	42-75					3			57.33	B	75							2			15.0	Bedding plane
									COAL		C1	R3						57.93	B	35										Bedding plane
									@ 57.0 - 57.0m SAA									58.04	B	42										Bedding plane
									SANDSTONE PARTING		C1	R3																	
									@ 57.0 - 57.1m																					
									Grey, coarse-grained, clayey, carbonaceous, jointed, medium strong rock																					
									MUDSTONE PARTING		C1	R3																	
									@ 57.1 - 57.2m																					
									Grey, fine-grained, carbonaceous, interbedded with 1mm thick coal seamlets, medium strong rock																					
	7	100	20						**COAL**		C1	R3																	
									@ 57.2 - 57.3m																					
									Dirty coal, dull black, massive, medium strong rock																					
									MUDSTONE PARTING		C1	R3																	
									@ 57.3 - 57.4m																					
									Brown, fine-grained, massive, medium strong rock																					
					coal MS	blk br	mass		**COAL**		C1	R3																	
									@ 57.4 - 57.5m SAA																					
									MUDSTONE PARTING		C1	R3																	
									@ 57.5 - 57.6mSAA																					
									COAL		C1	R3																	
									@ 57.6 - 57.7mSAA																					
									MUDSTONE PARTING		C1	R3																	
									@ 57.7 - 58.2m																					
									Grey, fine-grained, massive, medium strong rock																					
									COAL		C1	R3																	
58.2									@ 58.2 - 58.2m SAA																					
58.2									**COAL**		C1	R3				-	-	58.50	B	62	-	-	-	-	-		-	-		Bedding plane
									@ 58.2 - 58.5mSAA									58.58	B	58										Bedding plane
									MUDSTONE PARTING		C1	R3																	
									@ 58.5 - 58.6m SAA																					
									COAL		C1	R3																	
									@ 58.6 - 58.8m SAA																					
	8	100	72		coal MS	b br	fine/ fine-grained		**MUDSTONE PARTING**	58-62	C1	R2			0										-	-			-	
									@ 58.8 - 59.2m																					
									Brown, very fine-grained, carbonaceous, weak rock																					
									COAL		C1	R3																	
59.7									@ 59.2 - 59.7m SAA, cross-bedded, partly blocky																					
59.7									**SILTSTONE**		C1	R5				-	-	-	-	-	-	-	-	-	-		-	-		
	9	100	80		SltSt	gr	fine-grained		Grey, fine-grained, massive, very strong rock						0										-	-			-	
61.2									*AA-04 @ 59.9 - 60.2m*																					
61.2									**SILTSTONE**		C1	R4				-	-	61.30	B	45	-	-	-	-	-		-	-		Bedding planes
									@ 61.2 - 61.5m									61.45	B	48										Bedding planes
									Grey, fine-grained, cross-laminated, strong rock																					
									SANDSTONE		C1	R4						61.55	B	58										Bedding planes
									@ 61.5 - 61.5m									61.94	B	48										Bedding planes
									Grey, coarse-grained, massive, strong rock, 45 tca																					
									SILTSTONE		C1	R4						62.15	B	55										Bedding planes
	10	100	87		SltSt SS	gr	fine-grained/ coarse-grained		@ 61.5 - 61.6m SAA	45-70					0			62.25	B	63							-	-		-	Bedding planes
									SANDSTONE		C1	R4						62.60	B	70										Bedding planes
									@ 61.6 - 61.6m SAA, 65º tca																					
									SILTSTONE		C1	R4																	
62.8									@ 61.6 - 62.8m SAA *AA-05 @ 61.8 - 62.4m*																					
62.8									**SILTSTONE**		C1	R4				-	-	-	-	-	-	-	-	-	-		-	-		
									@ 62.8 - 63.1m																					
									Grey, fine-grained, massive, strong rock																					
									SANDSTONE		C1	R5																	
									@ 63.1 - 64.3m																					
									Grey, very coarse-grained, massive, very strong rock																					
	11	87	60		SltSt SS	gr	fine-grained/ very coarse-grained		**CALCITE STRINGERS**						0										-	-			-	
									@ 63.6 - 63.6m SAA, 55º tca																					
									CALCITE STRINGERS																					
									@ 63.9 - 63.9m SAA, 45º tca																					
64.3									*AA-06 @ 63.7 - 64.0m*																					
64.3									**SILTSTONE**		C1	R4				-	-	64.75	B	55	-	-	-	-	-		-	-		Bedding plane
									Grey, fine-grained, massive, medium strong rock									65.14	B	65										Bedding plane
	12	100	87		SltSt	gr	fine-grained			55-65					0										-	-			-	
65.5																														

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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-680C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

Back Main Menu Search

ROCK CORE LOG

Drilling Contractor Rocky Mountain Drilling | **Elevation (m):** 1172.2 | **Northing (m):** 6798.70 | **Date Logged:** March 24, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 15378.90 | **Start Date:** March 24, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 24, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																				
																DISCONTINUITY INFORMATION														
														UCS Test		Spacing (m)				RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Intact Strength Classification		Joint Count	DEPTH	Result (Mpa)	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
34.1									**COAL**		C1	R3				0.01	0.3	34.32	J	33		20	8	20	10			1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									@ 34.1 - 34.9m									34.62	J	37								1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									Shiny black, clean coal, blocky, jointed, medium strong rock, contact @ 34.9m 65° tca									34.65	J	37								1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									MUDSTONE PARTING		C1	R2						34.67	J	37								1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									@ 34.9 - 34.9m									34.72	J	37								1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									Brown, fine-grained, massive, weak rock																						
	1	100	93		coal MS	blk br	blocky/ fine-grained		**COAL**	-	C1	R3	9					34.75	J	37						2	1	1	46.5	Very tight, smooth, planar, unaltered/unweathered, persistent
									@ 34.9 - 35.2m									34.77	J	37								1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									SAA, contact @ 35.15m 58° tca																						
									MUDSTONE PARTING		C1	R2						35.04	J	42								1	1		Tight, smooth, planar, unaltered/unweathered, persistent
									@ 35.2 - 35.3m SAA									35.05	J	42								1	1		Very tight, smooth, planar, unaltered/unweathered, persistent
									COAL		C1	R3																		
35.6									@ 35.3 - 35.6m SAA																						
35.6									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-		-	-			
									@ 35.6 - 36.2m SAA																						
									SANDSTONE PARTING		C1	R5																		
	2	100	100		coal SS	blk gr	blocky/ medium - grained		@ 36.2 - 37.2m	-			0													-	-			-	
									Grey, mediu - grained, silty, massive, very strong rock																						
									AA-12, 36.3 - 36.5m																						
37.2																														
37.2									**SANDSTONE PARTING**		C1	R5				-	-	37.50	B	64	-	-	-	-	-		-	-		Bedding plane
									@ 37.2 - 38.2m																						
									SAA, cross-bedded									38.20	B	50										Bedding plane
									COAL SEAMLET		C1	R3																		
									@ 37.75m																						
									Shiny black, clean coal, blocky, 10 mm thick, 60° tca																						
	3	100	75		SS coal	gr blk	medium - grained/ blocky		**COAL SEAMLET**	50-64	C1	R3	0													-	-			-	
									@ 37.9m SAA																						
									COAL		C1	R3																		
38.4									@ 38.2 - 38.4m SAA																						
38.4									**COAL**		C1	R3				0.75	0.75	38.65	J	60		13	20	25	10			3	1		Tight, rough, unaltered/unweathered, low persistent
									@ 38.4 - 38.6m									39.40	J	38								3	1		Tight, rough, unaltered/unweathered, persistent
									SAA, contact @ 38.6m 75° tca																						
									MUDSTONE PARTING		C1	R2																		
									@ 38.6 - 38.8m																						
									SAA, contact @ 38.8m 85° tca																						
									COAL		C1	R3																		
	4	100	60		coal MS	blk br	fine/ fine-grained		@ 38.8 - 39.3m				2													0.8			225.0		
									SAA, 35° tca																						
									MUDSTONE PARTING		C1	R2																		
									@ 39.3 - 39.4m SAA																						
									COAL		C1	R3																		
39.9									@ 39.4 - 39.9m SAA																						
39.9									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-		-	-			
									@ 39.9 - 41.2m																						
									SAA, contact @ 41.2m 70° tca																						
	5	100	98		coal MS	blk br	fine/ fine-grained		**MUDSTONE PARTING**		C1	R3	0													-	-			-	
									@ 41.2 - 41.4m																						
41.4									Brown, fine-grained, silty, massive, medium strong rock																						
41.4									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-		-	-			
	6	100	98		coal	blk	fine		SAA				0													-	-			-	
42.9																														
42.9									**COAL**		C1	R3				0.03	0.61	43.10	J	38		20	15	20	10			3	1		Broken joint, rough, unaltered/unweathered, persistent
									@ 42.9 - 43.6m SAA									43.20	J	30								3	1		Broken joint, rough, unaltered/unweathered, persistent
									MUDSTONE PARTING		C1	R3						43.23	J	30								3	1		Tight, rough, unaltered/unweathered, low persistent
									@ 43.6 - 43.7m SAA									43.35	J	38								3	1		Open, rough, unaltered/unweathered, persistent
									COAL		C1	R3						43.38	J	55								3	1		Open, rough, unaltered/unweathered, persistent
	7	100	95		coal MS	blk br	fine/ f]ine-grained		@ 43.7 - 44.5m SAA				9					43.46	J	42						3		3	1	95.0	Tight, rough, unaltered/unweathered, low persistent
																		43.55	J	35								3	1		Very tight, rough, unaltered/unweathered, low persistent
																		44.16	J	36								3	1		Open, rough, unaltered/unweathered, persistent
44.5																		44.25	J	36								3	1		Open, rough, unaltered/unweathered, persistent
44.5									**COAL**		C1	R3				0.04	0.26	44.68	J	70		20	8	20	10			3	1		Open, rough, unaltered/ unweathered, persistent
									@ 44.5 - 45.4m SAA									44.86	J	70								3	1		Open, rough, unaltered/ unweathered, persistent
									MUDSTONE PARTING		C1	R3						45.06	J	45								3	1		Open, rough, unaltered/ unweathered, persistent
									@ 45.4 - 45.4m									45.10	J	65								3	1		Open, rough, unaltered/ unweathered, persistent
									SAA, contact @ 45.4m 75° tca																						
									COAL		C1	R3						45.36	J	65								3	1		Open, rough, unaltered/ unweathered, persistent
	8	100	93		coal MS SltSt	blk br gr	fine/ fine-grained		@ 45.4 - 45.5m				5													2			139.5		
									SAA, contact @ 45.5m 75° tca																						
									SILTSTONE PARTING		C1	R5																		
									@ 45.5 - 45.6m																						
									Grey, fine-grained, massive, very strong rock																						
									contact @ 45.6m 75° tca																						
									COAL		C1	R3																		
46									@ 45.6 - 46m SAA																						

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NOTES:

Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation).

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-719C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation:** 1172.2 | **Northing (m):** 6798.70 | **Date Logged:** March 24, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 15378.90 | **Start Date:** March 24, 2012
Drill Hole Diameter: 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 24, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																							
																DISCONTINUITY INFORMATION																	
																Spacing (m)					RMR Rating						Q (Barton et al., 1974)				Notes
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	UCS Test DEPTH	UCS Test Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	(i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
46.0									**SILTSTONE PARTING**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 46.0 - 46.8m																							
									Grey, fine-grained, massive, medium strong rock																							
									MUDSTONE PARTING		C1	R2																			
									@ 46.8 - 47.1m																							
	9	100	93		SltSt MS coal	gr, blk	fine-grained/ blocky		Grey, fine-grained, massive, carbonaceous, weak rock						0											-	-		-	-	
									contact @ 46.8m 75º tca		C1	R4																			
									COAL																							
									@ 47.1 - 47.5m																							
									Dull black, dirty coal, massive, strong rock																							
47.5																																
47.5									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 47.5 - 48.4m																							
									Dull black, dirty coal, massive, medium strong rock																							
									partly shiny black clean coal																							
									MUDSTONE PARTING		C1	R3																			
									@ 48.4 - 48.5m																							
	10	100	88		coal/ MS/ SltSt	gr, br, blk	blocky, mass/ fine-grained/		Brown, fine-grained, massive, medium strong rock						0											-	-		-	-	
									SILTSTONE PARTING		C1	R3																			
									@ 48.5 - 48.6m SAA																							
									MUDSTONE PARTING		C1	R2																			
									@ 48.6 - 48.8m																							
									Grey, fine-grained, massive, weak rock, sulphide minerals noted																							
									COAL		C1	R3																			
48.9									@ 48.8 - 48.9m SAA																							
48.9									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 48.9 - 50.1m																							
									SAA, medium strong rock																							
									MUDSTONE PARTING		C1	R2																			
	11	100	87		coal/ MS	blk br	fine/ fine-grained		@ 50.1 - 50.1m						0											-	-		-	-	
									Brown, fine-grained, massive, weak rock																							
									COAL		C1	R3																			
50.3									@50.1 - 50.3m																							
									Dull black, dirty coal, massive, medium strong rock																							
50.3									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 50.3 - 50.7m SAA																							
									MUDSTONE PARTING		C1	R2																			
									@ 50.7 - 50.8m																							
									SAA, contact @ 50.67m 70º tca																							
									COAL		C1	R3																			
									@ 50.8 - 51.0m SAA																							
									MUDSTONE PARTING		C1	R4																			
	12	100	33		coal MS	blk br	blocky, fine-grained		@ 51.0 - 51.3m						0											-	-		-	-	
									Brown, fine-grained, silty, massive, slicken-sided, strong rock																							
									COAL		C1	R3																			
									@ 51.3 - 51.4m SAA																							
									MUDSTONE PARTING		C1	R4																			
									@ 51.4 - 51.7m SAA																							
									COAL		C1	R3																			
51.8									@ 51.7 - 51.8m SAA																							
51.8									**COAL**		C1	R3				0.11	0.11	52.02	J	60		20	10	20	10			1	1		Tight, smooth, unaltered/unweathered, persistent joint
									@ 51.8 - 52.3m SAA									52.13	J	70								1	1		Tight, smooth, unaltered/unweathered, persistent joint
									SANDSTONE PARTING		C1	R5																			
	13	100	60		coal SS	blk gr	blocky, coarse-grained		@ 52.3 - 53.3m						0												0.8				75.0	
									Grey, very coarse-grained, massive, very strong rock, contact @ 52.3m 50º tca																							
53.3									**SANDSTONE PARTING**		C1	R5				-	-	53.3-53.6	-	-	-	-	-	-	-			-	-		Core losses
									@ 53.6 - 53.9m SAA																							
									COAL		C1	R3																			
									@ 53.9 - 54.5m																							
									Shiny black, clean coal, blocky, massive,medium strong rock, contact @ 53.9m 72º tca																							
	14	90	80		SS coal MS	gr blk br	fine/ very coarse-grained/ fine-grained		**MUDSTONE PARTING**		C1	R2			0												-			-	
									@ 54.5 - 54.5m																							
									Brown, fine-grained, massive, weak rock, contact																							
									@ 54.5m 85º tca																							
									COAL		C1	R4																			
54.8									@ 54.5 - 54.8m																							
54.8									Dull black, dirty coal, massive, strong rock																							
									MUDSTONE PARTING		C1	R3				-	-	-	-	-	-	-	-	-	-			-	-		
									@ 54.8 - 55.2m																							
									Brown, fine-grained, silty, slicken-sided, massive, medium strong rock																							
									COAL		C1	R3																			
									@ 55.2 - 55.5m																							
									Dull black, dirty coal, massive, medium strong rock																							
									partly shiny black clean coal																							
	15	100	37		MS coal	br blk	fine-grained/ fine		**MUDSTONE PARTING**		C1	R2			0												-			-	
									@ 55.5 - 55.5m																							
									Brown, fine-grained, massive, weak rock, contact																							
									@ 55.5m 90º tca																							
									COAL		C1	R3																			
56.4									@ 55.5 - 56.4m SAA																							

MDH ENGINEERED SOLUTIONS
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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-719C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

ROCK CORE LOG

Drilling Contractor Rocky Mountain Drilling | **Elevation (m)** 1172.2 | **Northing (m):** 6798.70 | **Date Logged:** March 24, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 15378.90 | **Start Date:** March 24, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 24, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																			
															DISCONTINUITY INFORMATION														
													UCS Test		Spacing (m)					RMR Rating						Q (Barton et al., 1974)					
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD %	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
56.4									**COAL**		C1	R3				-	-	-	-	-	-	-	-	-	-		-	-		
									@ 56.4 - 57.0m SAA																						
									BENTONITE CLAY		C1	R2																		
									@ 57.0 - 57.1m																						
									Grey, fine-grained, weak rock, contact @ 57.05m																						
									62° tca																						
									COAL		C1	R3																		
									@ 57.05 - 57.2m SAA																						
									MUDSTONE PARTING		C1	R2																		
	16	98	26		coal bent MS SS	blk gr br	fine/ fine-grained/ fine-grained/ very coarse-grained		@ 57.2 - 57.3m						0										-	-			-	
									Brown, fine-grained, massive, weak rock, contact																						
									@ 57.3m 70° tca																						
									COAL		C1	R3																		
									@ 57.3 - 57.6m																						
									SAA, contact @ 57.6m 62° tca																						
									SANDSTONE		C1	R5																		
57.9									@ 57.6 - 57.9m SAA																						
57.9									**SANDSTONE**		C1	R5				-	-	-	-	-		20	30	25	-		-	-		
									@ 57.9 - 58.4m SAA																						
									COAL SEAMLET		C1	R3																		
									@ 58.4 - 58.5m																						
									Shiny black, clean coal, blocky, massive,medium strong																						
									rock, contact @ 58.5m 78° tca																						
									SILTSTONE		C1	R4																		
	17	100	70		SS coal SltSt	gr blk	very coarse-grained fine fine-grained		@ 58.5 - 59.3m						0										-	-			-	
									Grey, fine-grained, massive, strong rock																						
									COAL SEAMLET		C1	R3																		
									@ 59.3 - 59.4m SAA																						
									SILTSTONE		C1	R4																		
59.4									@ 59.4 - 59.4m SAA																						
									AA-13, 58.3 - 58.5m																						
59.4									**SILTSTONE**		C1	R4				-	-	60.57	B	68	-	-	-	-	-		-	-		Bedding plane
									@ 59.4 - 59.7m SAA																						
									SANDSTONE		C1	R5																		
									@ 59.7 - 60.1m SAA																						
									SILTSTONE		C1	R4																		
	18	86	60		SltSt SS	gr	very coarse-grained fine-grained		@ 60.1 - 60.4m SAA	68					0										-	-			-	
									SANDSTONE		C1	R5																		
									@ 60.4 - 60.7m																						
									SAA, graded bedded		C1	R4																		
									SILTSTONE																						
60.9									@ 60.7 - 60.9m SAA																						
60.9									**SANDSTONE**		C1	R5				-	-	61.15	B	70	-	-	-	-	-		-	-		Bedding plane
									@ 60.9 - 61.8m									61.90	B	65										Bedding plane
									SAA, graded bedded																						
									SILTSTONE		C1	R4																		
									@ 61.8 - 62.1m SAA																						
	19	100	73		SS SltSt	gr	very coarse-grained/ fine-grained		**SANDSTONE**	61-70	C1	R5			0										-	-			-	
									@ 62.1 - 62.2mSAA																						
									SILTSTONE		C1	R4																		
									@ 62.2 - 62.5m																						
62.5									SAA, cross-bedded																						

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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-719C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

Back Main Menu Search

ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1144.6 | **Northing (m):** 15018.10 | **Date Logged:** March 20, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 6398.40 | **Start Date:** March 20, 2012
Drill Hole Diameter: 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 20, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																					
																DISCONTINUITY INFORMATION															
													UCS Test			Spacing (m)					RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
62.8									**COAL**		C1	R3				0.01	0.62	62.8-63.05				17	15	20	10						Broken core samples
									@ 62.8 - 63.2m									62.80	J	50								3	1		Tight, rough, no infilling, unaltered/unweathered, persistent joint
									Clean coal, shiny black, glassy, jointed, medium strong rock									63.42	J	45								3	1		Tight, rough, no infilling, unaltered/unweathered, persistent joint
											C1	R1						63.43	J	45								3	1		Tight, rough, no infilling, unaltered/unweathered, persistent joint
									BENTONITE CLAY									63.64-63.72	J	68								3	1		Joint set at 1mm spacing, tight, rough, no infilling, unaltered
									@ 63.2 - 63.2m									63.88	J	70								3	1		unweathered, persistent joints
	1	100	79		coal bent	blk br	fine/ fine-grained		Dark brown, very weak rock, contact @ 63.2m 45° tca						15			64.00	J	45						2		3	1	117.5	Very tight, rough, no infilling, unaltered/unweathered, persistent joint
									COAL									64.10	J	73								3	1		Very tight, rough, no infilling, unaltered/unweathered, persistent joint
									@ 63.2 - 64.3m SAA									64.25	J	35								1.5	1		Very tight, rough, no infilling, unaltered/unweathered, persistent joint
																															Slightly rough, slickensided, no infilling, unaltered/unweathered,
64.3																															persistent joint, sample breaks along joint
64.3									**COAL**		C1	R3				0.01	0.29	64.52	J	45		17	8	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 64.3 - 64.5m SAA									64.72	J	78								3	1		Tight, rough, unaltered/unweathered, persistent joint
									COAL		C1	R4						64.85	J	52								3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 64.5 - 65.8m									64.88	J	52								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Dirty coal, dull black, jointed, strong rock									64.94	J	85								3	1		Tight, rough, unaltered/unweathered, persistent joint
									CALCITE STRINGERS									64.97	J	40								3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 65.2 - 65.2m		C1	R1						65.26	J	65								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Closely-spaced, sub-parallel 60° tca,									65.40	J	20								3	1		Tight, rough, unaltered/unweathered, persistent joint
	2	100	89		coal bent	blk br	fine/ fine-grained		**BENTONITE CLAY**						12			65.45	J	54						2		3	1	133.5	Tight, rough, unaltered/unweathered, persistent joint
									@ 65.1 - 65.1m									65.46	J	64								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Grey, very weak rock									65.49	J	64								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		65.52	J	64								3	1		Tight, rough, unaltered/unweathered, persistent joint
65.8																		65.64-65.8													Broken core samples.
65.8									**MUDSTONE PARTING**		C1	R3				0.08	0.38	66.20	J	60		17	15	20	10			3	1		Broken joint, rough, planar surface, unaltered/unweathered
									Grey, silty, carbonaceous, massive, medium strong rock									66.29	B	45											Bedding plane
																		66.57	B	50											Bedding plane
																		66.58	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
	3	100	76		MS	Gr	fine-grained			45-58					3			66.66	J	58						1		3	1	228.0	Tight, rough, unaltered/unweathered, persistent joint
																		67.02	B	56											Bedding plane
																		67.20	B	56											Bedding plane
67.3																															
67.3									**MUDSTONE PARTING**		C1	R3				0.02	0.41	68.00	J	65		20	15	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									@ 67.3 - 67.8m									68.22	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Grey, silty, medium strong rock									68.26	J	60								3	1		Tight, rough, unaltered/unweathered, persistent joint
	4	100	94		MS coal	g blk	fine-grained/ fine		**COAL**		C1	R3			6			68.28	J	60						3		3	1	94.0	Tight, rough, unaltered/unweathered, persistent joint
									@ 67.8 - 68.9m SAA									68.32	J	34								3	1		Tight, rough, unaltered/unweathered, persistent joint
									CALCITE STRINGERS									68.73	J	70								3	1		Tight, rough, unaltered/unweathered, persistent joint
68.9									@ 68.7 - 68.7m, 55° tca																						
68.9									**COAL**		C1	R4				0.08	0.23	68.9-69.1				13	10	20	10			3	1		Broken core samples
									Clean coal, shiny black, glassy, blocky, jointed, strong rock									69.44-69.52										3	1		Broken core samples
																		69.64	J	50								3	1		Very tight, rough, unaltered/unweathered, persistent joint
																		69.72	J	50								3	1		Very tight, rough, unaltered/unweathered, persistent joint
	5	100	73		coal	blk	fine								5			69.95	J	55						2		3	1	109.5	Very tight, rough, unaltered/unweathered, persistent joint
																		70.15	J	70								3	1		Very tight, rough, unaltered/unweathered, persistent joint
																		70.25	J	60								3	1		Very tight, rough, unaltered/unweathered, persistent joint
70.4																															
70.4									**COAL**		C1	R3				0.01	0.5	70.53	J	35		20	15	20	10			3	1		Tight, rough, unaltered/unweathered, persistent joint
									Dirty coal, dull black, blocky, jointed, medium strong rock									70.56	J	58								3	1		Tight, rough, unaltered/unweathered, persistent joint
									BENTONITE CLAY @ 71.7 - 71.7m									70.58	J	58								3	1		Tight, rough, unaltered/unweathered, persistent joint
									Grey, with light brown FeO stainings, 50° tca		C1	R1						70.62	J	58								3	1		Tight, rough, unaltered/unweathered, persistent joint
									BENTONITE CLAY									71.12	J	42								3	1		Tight, rough, unaltered/unweathered, persistent joint
	6	100	73		coal bent	blk g	fine/ fine-grained		**@ 71.9 - 71.9m SAA**	48	C1	R1			10			71.20	J	54						3		3	1	73.0	Tight, rough, unaltered/unweathered, persistent joint
																		71.21	J	54								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		71.22	J	54								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		71.48	J	25								3	1		Tight, rough, unaltered/unweathered, persistent joint
																		71.53	J	55								3	1		Tight, rough, unaltered/unweathered, persistent joint
71.9																		71.56	B	48											Bedding plane
71.9									**COAL**		C1	R3				0.12	0.12	72.83	J	45		20	10	20	10			3	1		Broken joint, rough, unaltered/unweathered, persistent
									@ 71.9 - 72.1m SAA									72.95	J	40								3	1		Broken joint, rough, unaltered/unweathered, persistent
									SANDSTONE		C1	R4						72.10	B	45											Bedding plane
	7	100	90		coal SS	blk g	fine/ mediu - grained		@ 72.1 - 73.4m	45					2											1				270.0	
									Grey, mediu - grained, massive with few joints, strong rock																					
73.4									*AA-01 @ 72.5 - 72.9m*																					

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NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-737C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

Back Main Menu Search

ROCK CORE LOG

Drilling Contractor: Rocky Mountain Drilling | **Elevation (m):** 1144.6 | **Northing (m):** 15018.10 | **Date Logged:** March 20, 2012
Drill Rig: Diamond Drill Rig | **Azimuth:** | **Easting (m):** 6398.40 | **Start Date:** March 20, 2012
Drill Hole Diameter 2.5" | **Angle:** Vertical hole | **Source:** CVRI | **Completion Date:** March 20, 2012

DRILL INFORMATION				GEOLOGY						GEOTECHNICAL AND HYDROTECHNICAL																				
																DISCONTINUITY INFORMATION														
													UCS Test			Spacing (m)					RMR Rating						Q (Barton et al., 1974)				
Depth Range (ft) or (m)	Core Run	Core Recovery %	RQD %	Symbol	Rock Type	Color	Texture	Alteration	Other Descriptors	Bedding Dip Angle	Rock Mass Condition Rating	Strength Classification	DEPTH	Result (Mpa)	Joint Count	min	max	Discontinuity Depth (m)	Type	Dip Angle (to core axis)	Strength of Rock	RQD	Spacing	Roughness	Ground Water	Total Rating	Jn	Jr	Ja	Min Q'	Notes (i.e., alteration, mineralization, staining, lithology, etc. on geotechnical discontinuities)
73.4									**SANDSTONE**		C1	R5				-	-	73.50	B	65	-	-	-	-	-			-	-	Bedding plane
									Grey, medium to coarse-grained, massive, very strong rock									74.40	B	65										Bedding plane
	8	100	100		SS	g	mediu - grained		*AA-02 @ 73.6 - 73.8m*	65					0										-	-			-	
75.0																														
75.0									**SANDSTONE**		C1	R5				-	-	75.20	J	45	-	-	-	-	-			3	3	Broken joint, rough, with minor sandy infillings, unaltered,
									@ 75.0 - 75.5m SAA																				unweathered, persistent
									SILTSTONE		C1	R4																	
	9	100	100		SS SltSt	g g	mediu - grained/ fine-grained		@ 75.5 - 76.5m Grey, fine-grained, carbonaceous, massive with few joint, strong rock, 60° tca @ 75.45m *AA-03 @76.1 - 76.4m*						1												1			100.0
76.5																														
76.5									**SILTSTONE**		C1	R4				0.07	0.1	77.45	J	55		20	30	25	10			3	1	Tight, rough, unaltered/unweathered, persistent joint
									SAA									77.52	J	55								3	1	Tight, rough, unaltered/unweathered, persistent joint
	10	100	98		SltSt	g	fine-grained								3			77.62	J	55							2	1	1	Tight, slightly smooth, planar surface, unaltered, unweathered, persistent joint
78.0																														133.0

MDH ENGINEERED SOLUTIONS
Member of the SNC-LAVALIN Group

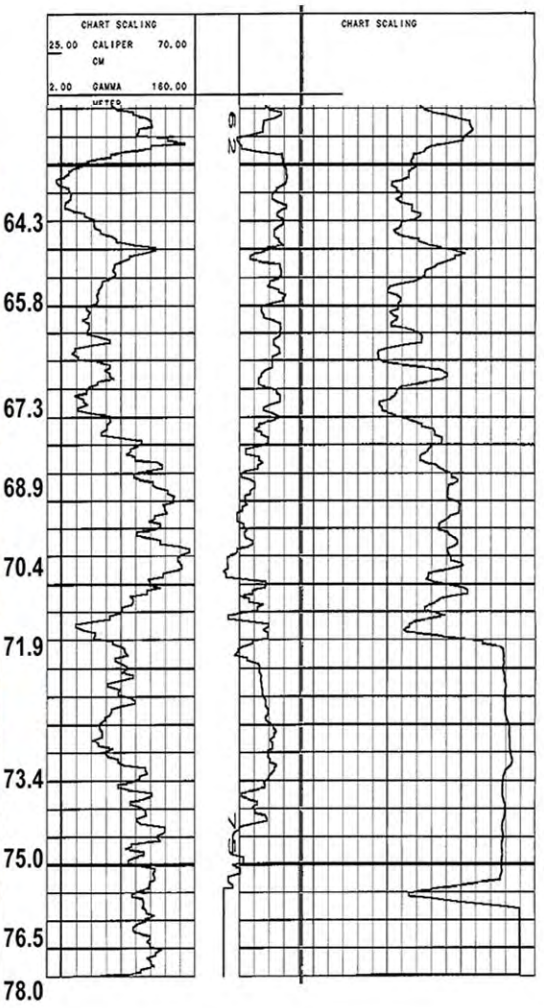
NOTES:

- Q' = RQD/Jn * Jr/Ja (Jw/SRF term ignored for calculation),

Project Number: A3688
Client: CVRI
Borehole Number: RT-12-737C
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Logged by: Alex Aco, P. Geol.

Appendix C
Geophysical Logs and Core Photos

RT-12- 737C



SCALE		DATE
DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geol	3-May-12

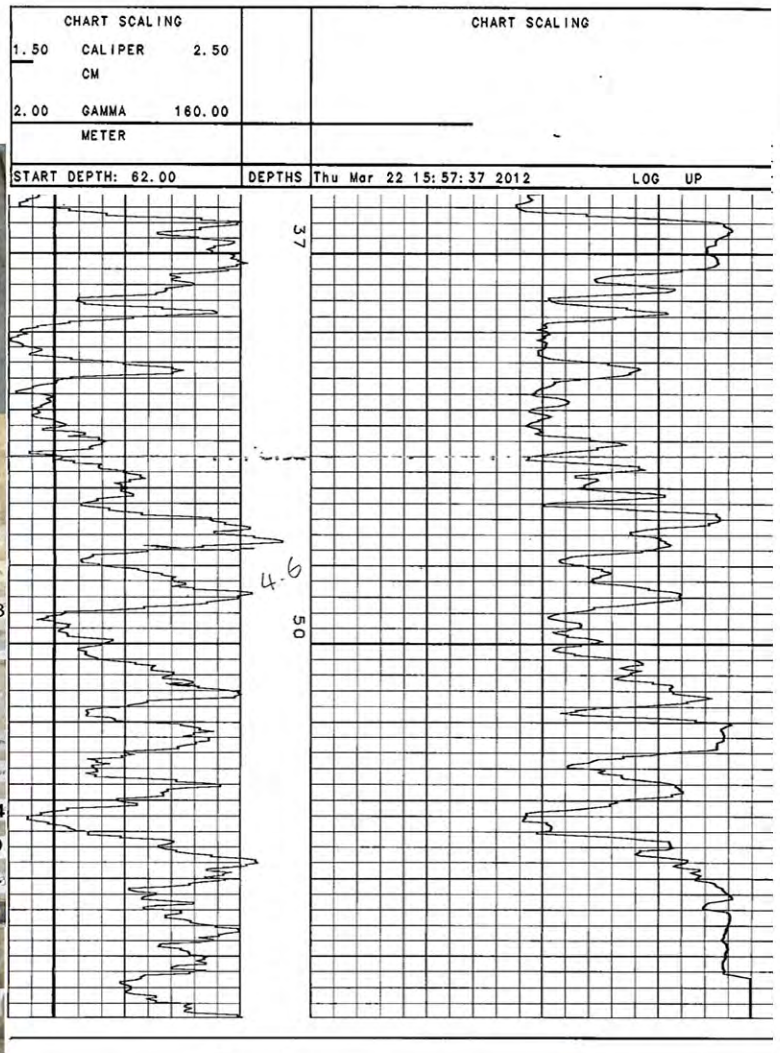
PRODUCED BY MDH ENGINEERED SOLUTIONS Member of the SNC-LAVALIN Group

CLIENT cvri

TITLE Rob Trend
Geological and Geotechnical
Core logging Project

PROJECT No. A3368-1750012 FIG. No. A-17

DRAWING No. A3368-RT-12- 737C



CLIENT cvri

TITLE Rob Trend
Geological and Geotechnical
Core logging Project

SCALE		DATE
DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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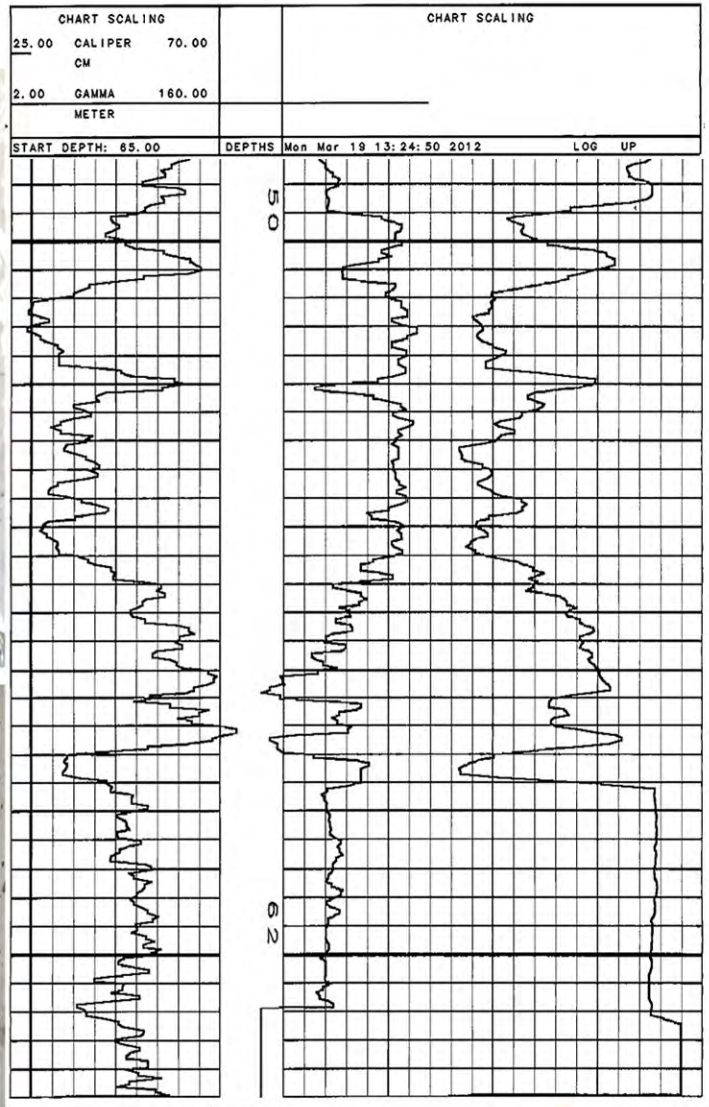
PROJECT No. A3368-1750012 FIG. No. A-16

DRAWING No. A3368-RT-12- 719C



CLIENT cvri

TITLE Rob Trend
Geological and Geotechnical
Core logging Project

SCALE		DATE
DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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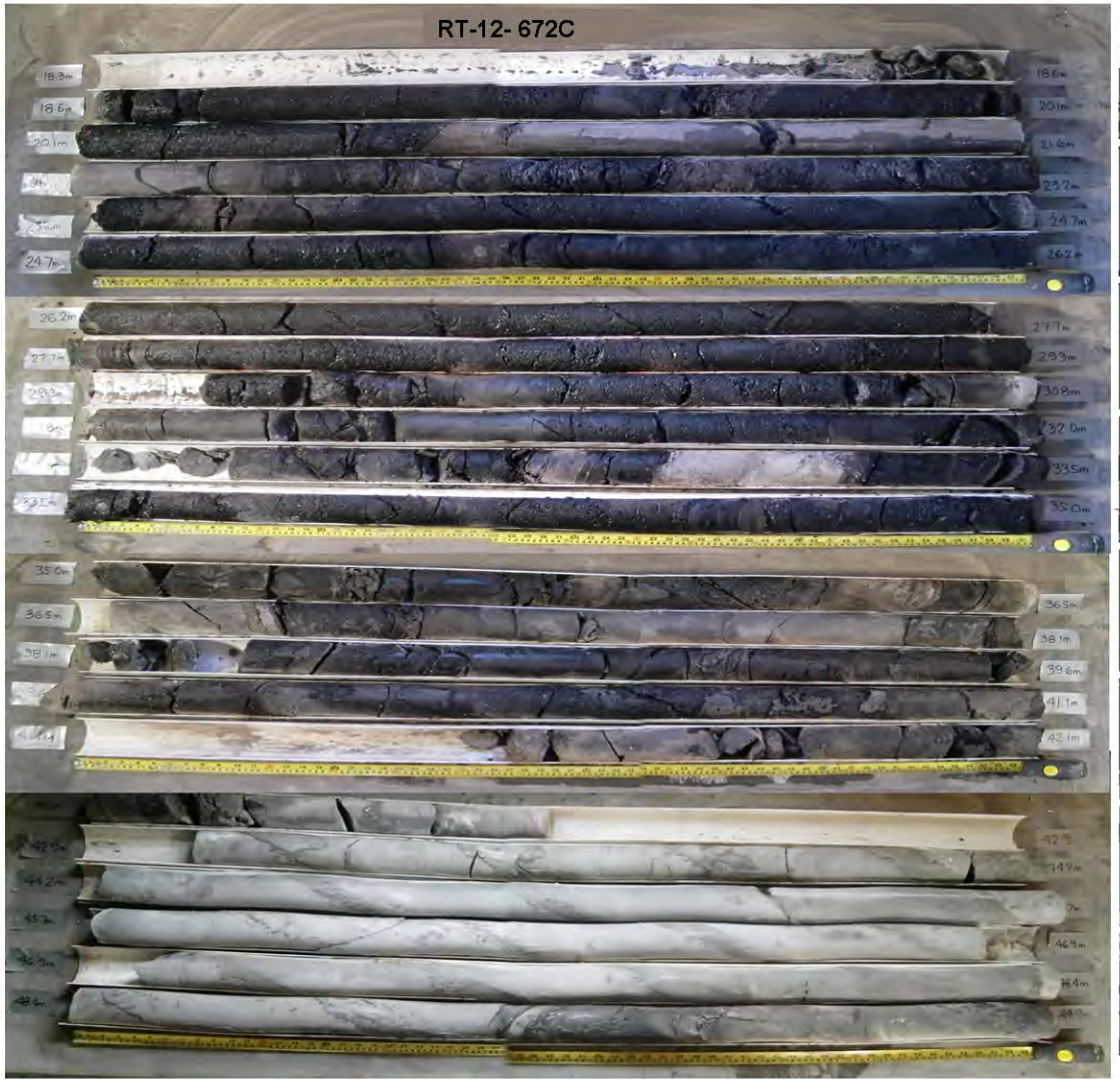
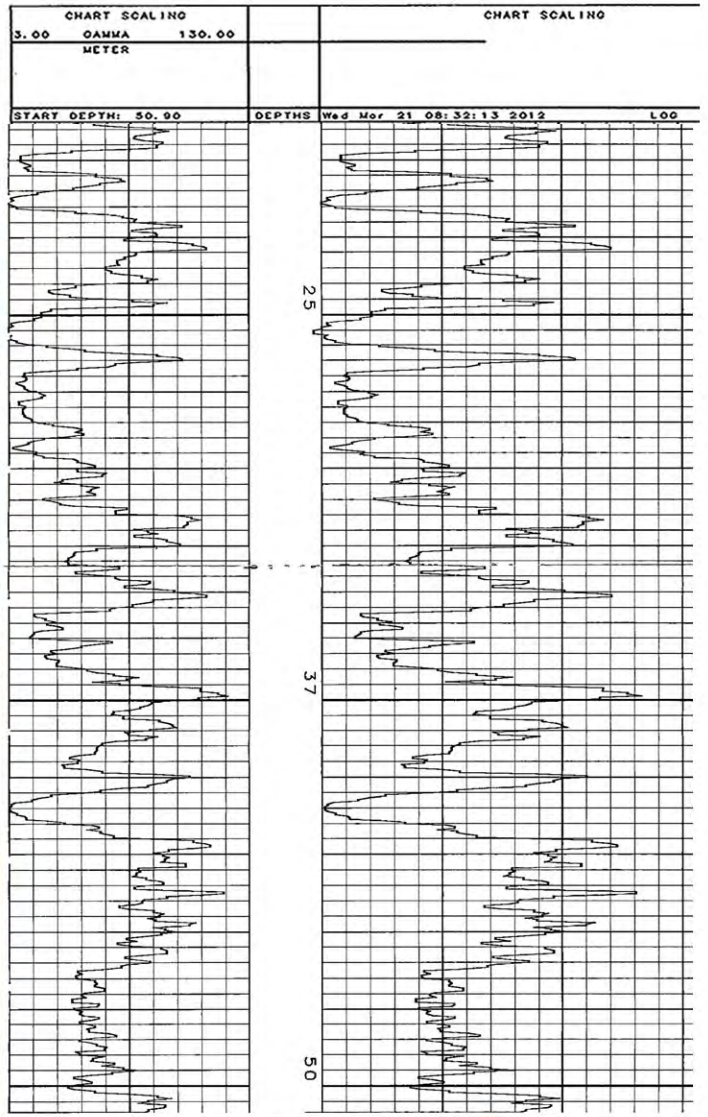
PROJECT No. A3368-1750012 FIG. No. A-15

DRAWING No. A3368-RT-12- 680C





CLIENT cvri

TITLE Rob Trend
Geological and Geotechnical
Core logging Project

SCALE		DATE
DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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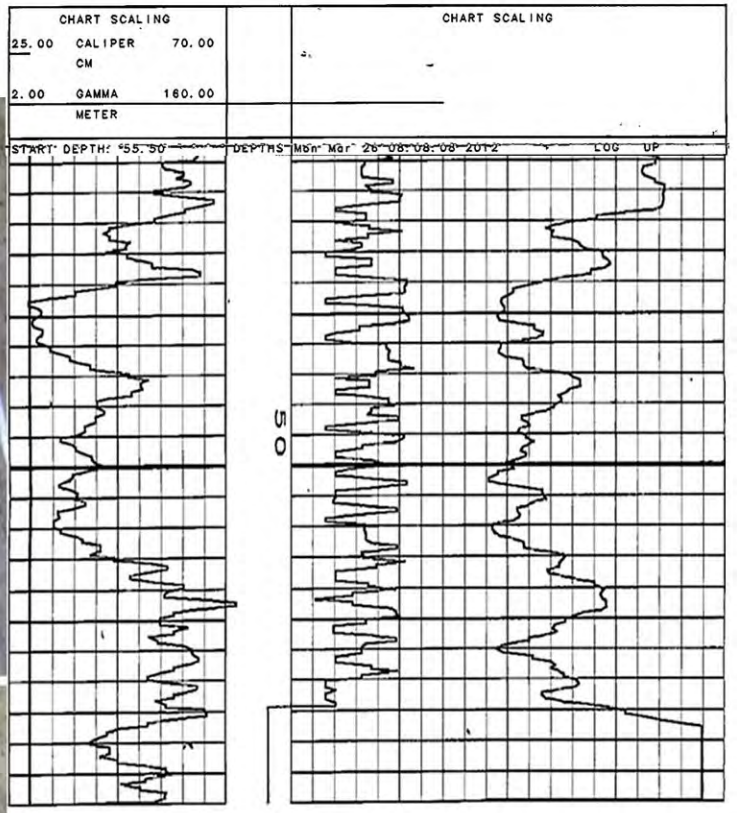
PROJECT No. A3368-1750012 FIG. No. A-14

DRAWING No. A3368-RT-12- 672C



SCALE		DATE
DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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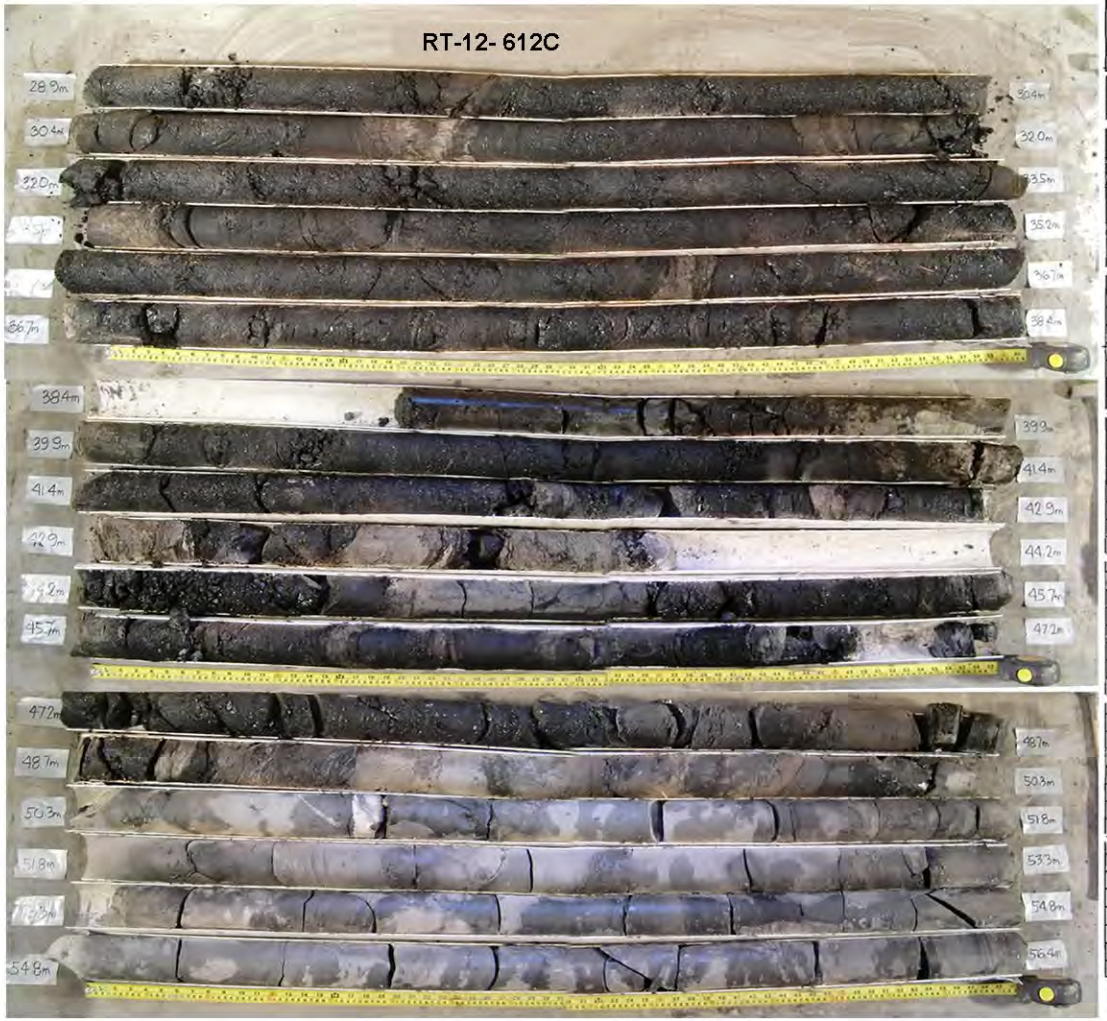
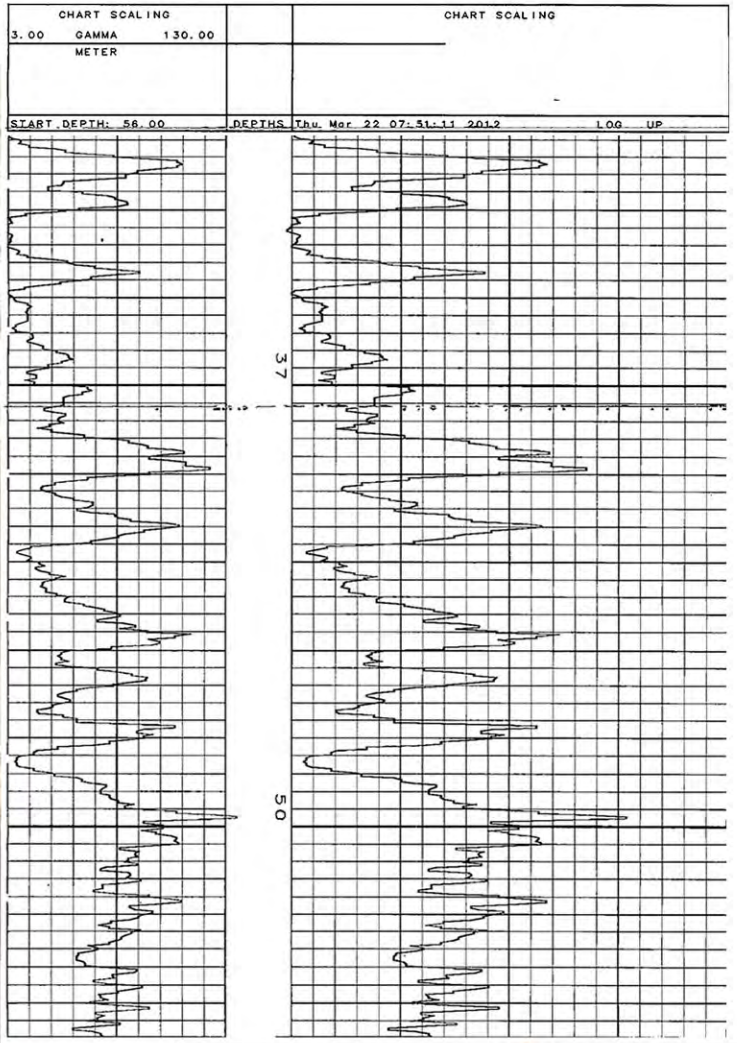
PROJECT No. A3368-1750012 FIG. No. A-13

DRAWING No. A3368-RT-12- 616C





SCALE		DATE
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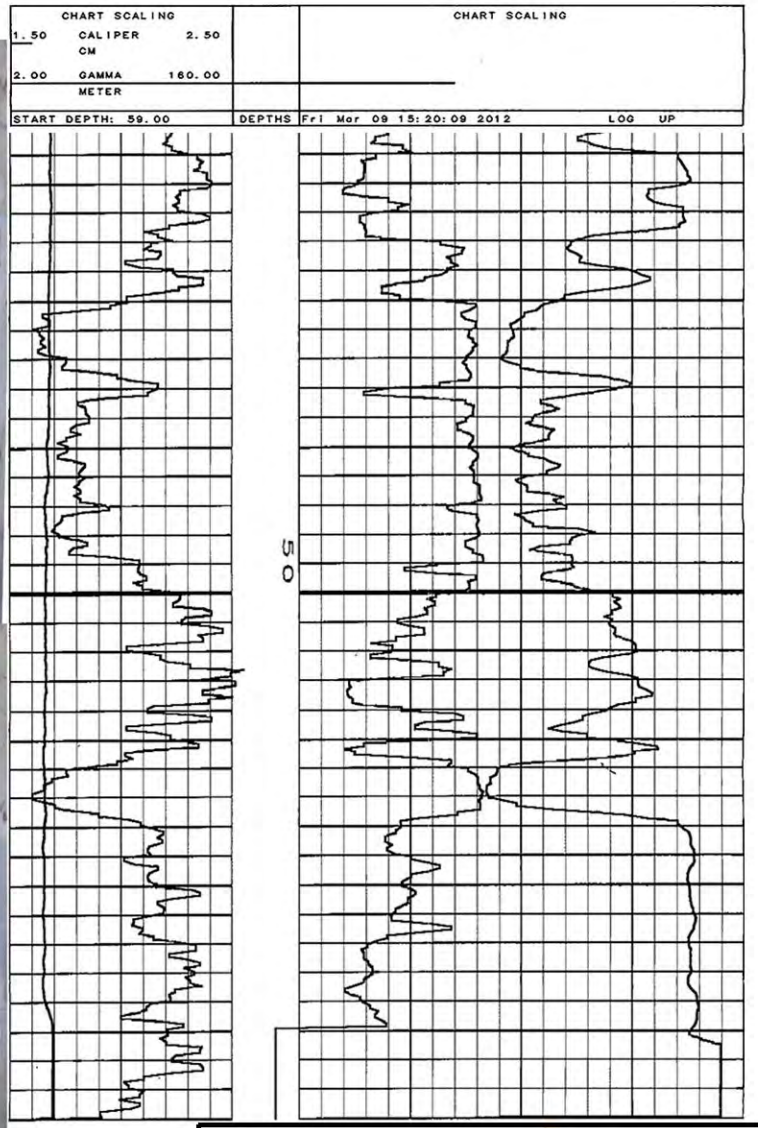
PROJECT No. A3368-1750012 FIG. No. A-12

DRAWING No. A3368-RT-12- 612C

RT-12- 549C



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DESIGN BY	A.Smorschok, P.Geol	2-May-12
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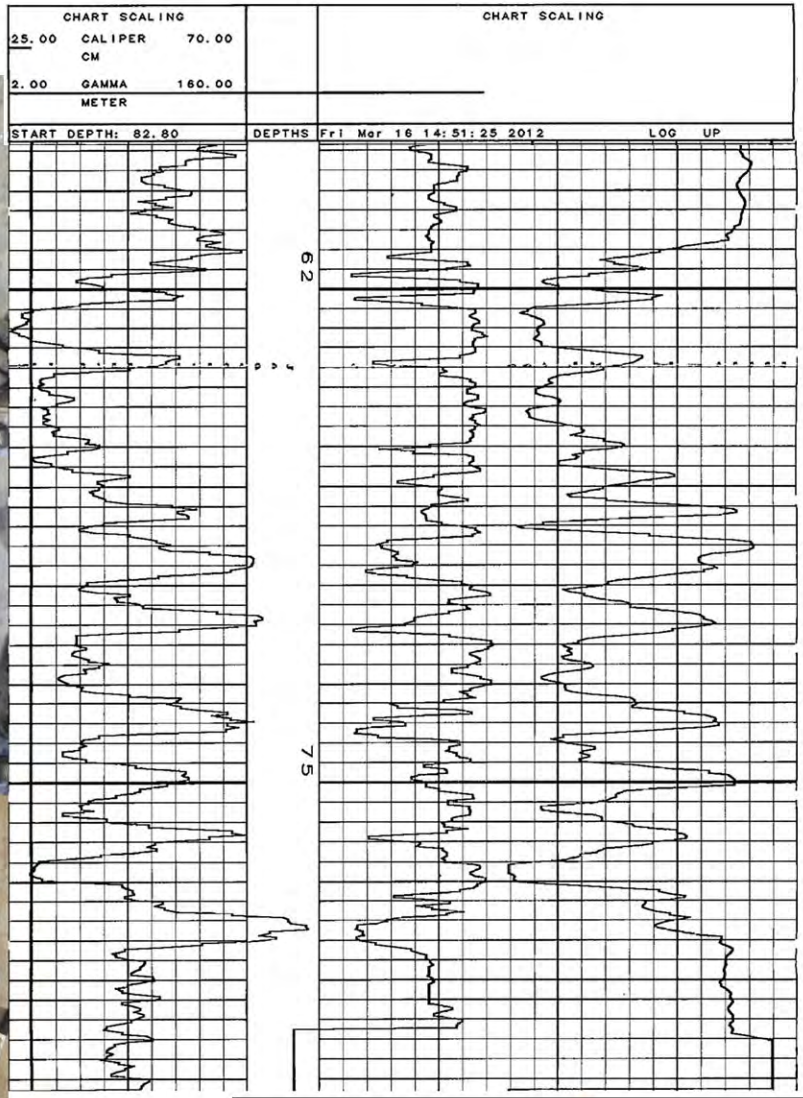
PROJECT No. A3368-1750012 FIG. No. A-11

DRAWING No. A3368-RT-12- 549C



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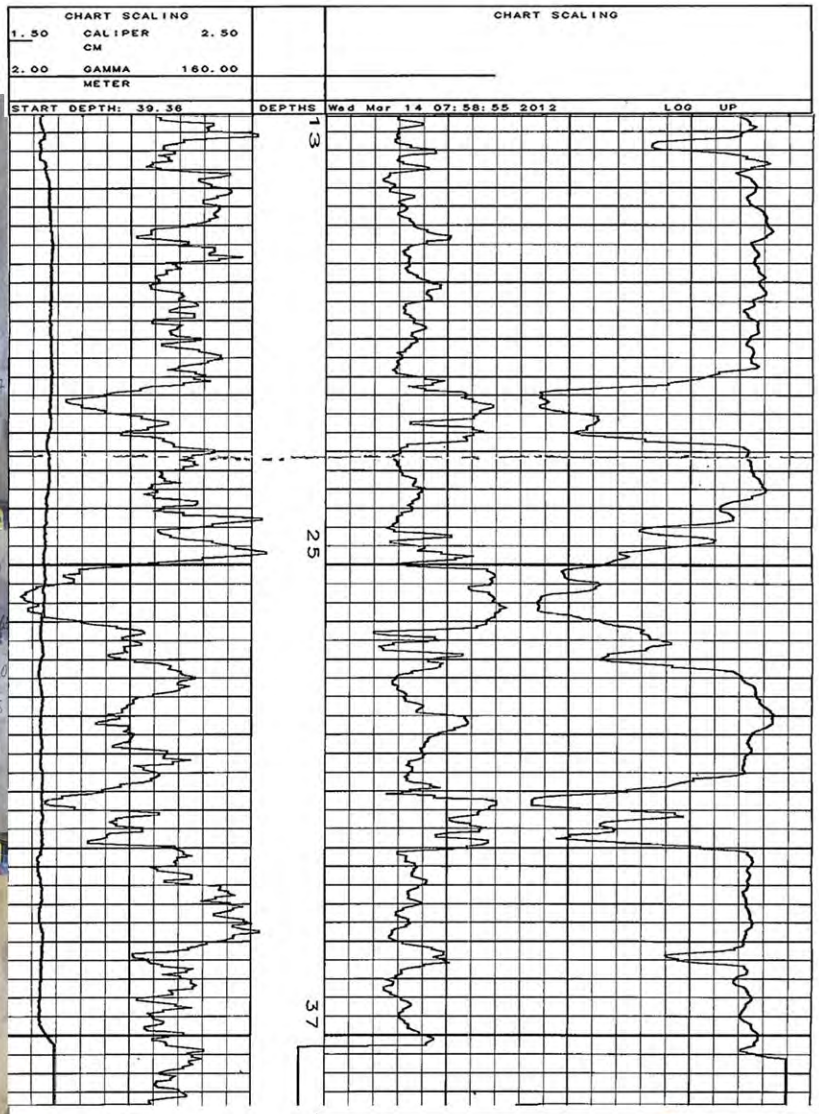
PROJECT No. A3368-1750012 FIG. No. A-10

DRAWING No. A3368-RT-12- 544C



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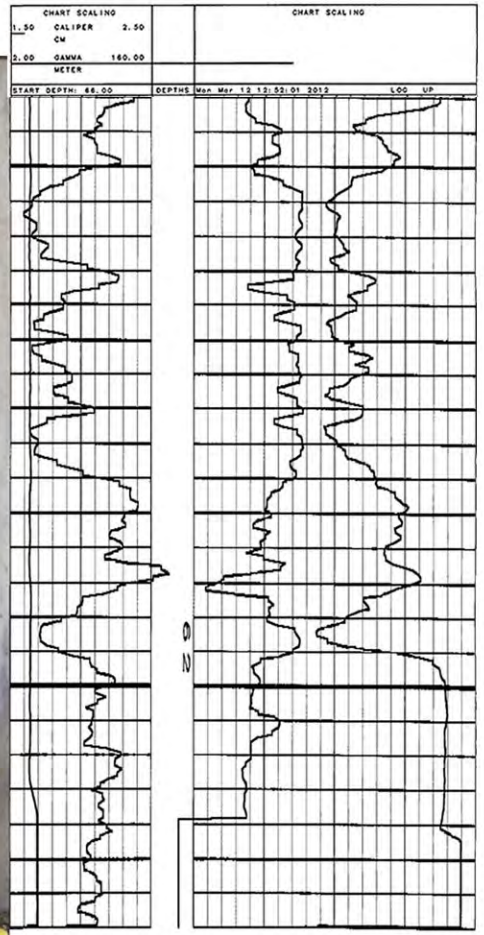
PROJECT No. A3368-1750012 FIG. No. A-9

DRAWING No. A3368-RT-12- 523C

RT-12- 499C



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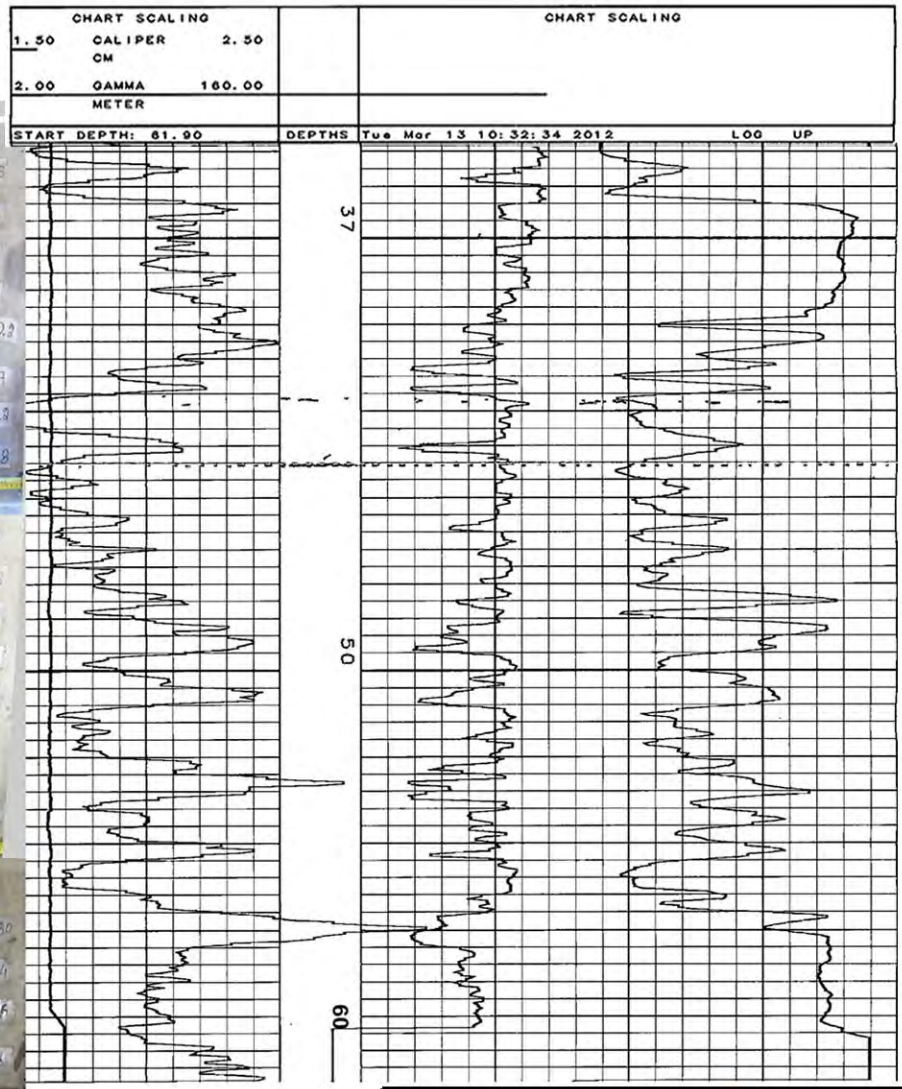
PROJECT No. A3368-1750012 FIG. No. A-8

DRAWING No. A3368-RT-12- 499C



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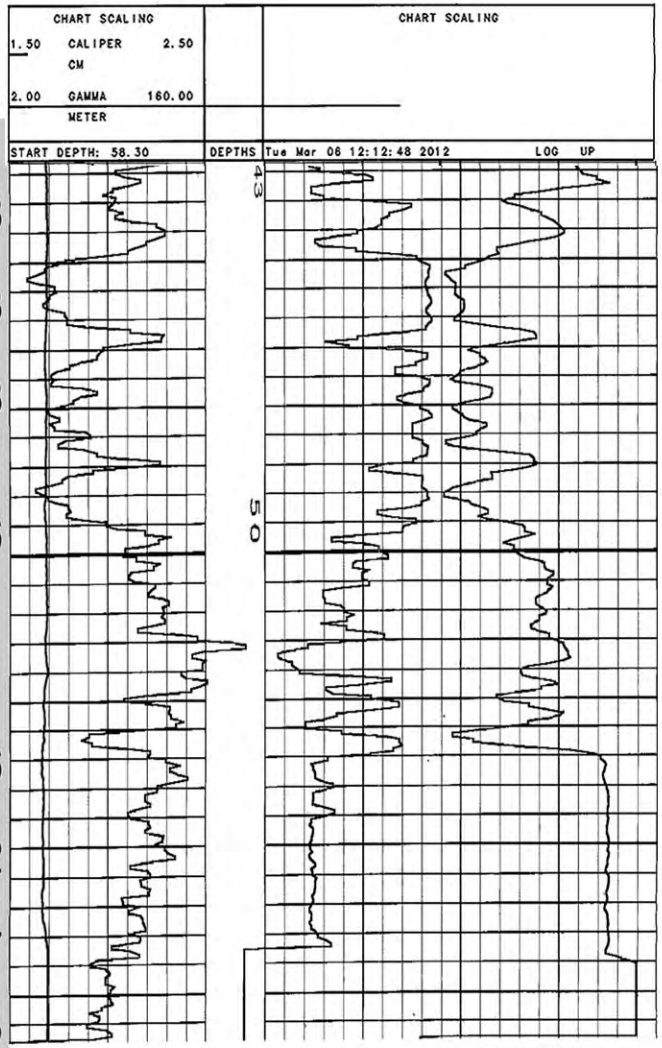
PROJECT No. A3368-1750012 FIG. No. A-7

DRAWING No. A3368-RT-12- 495C



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DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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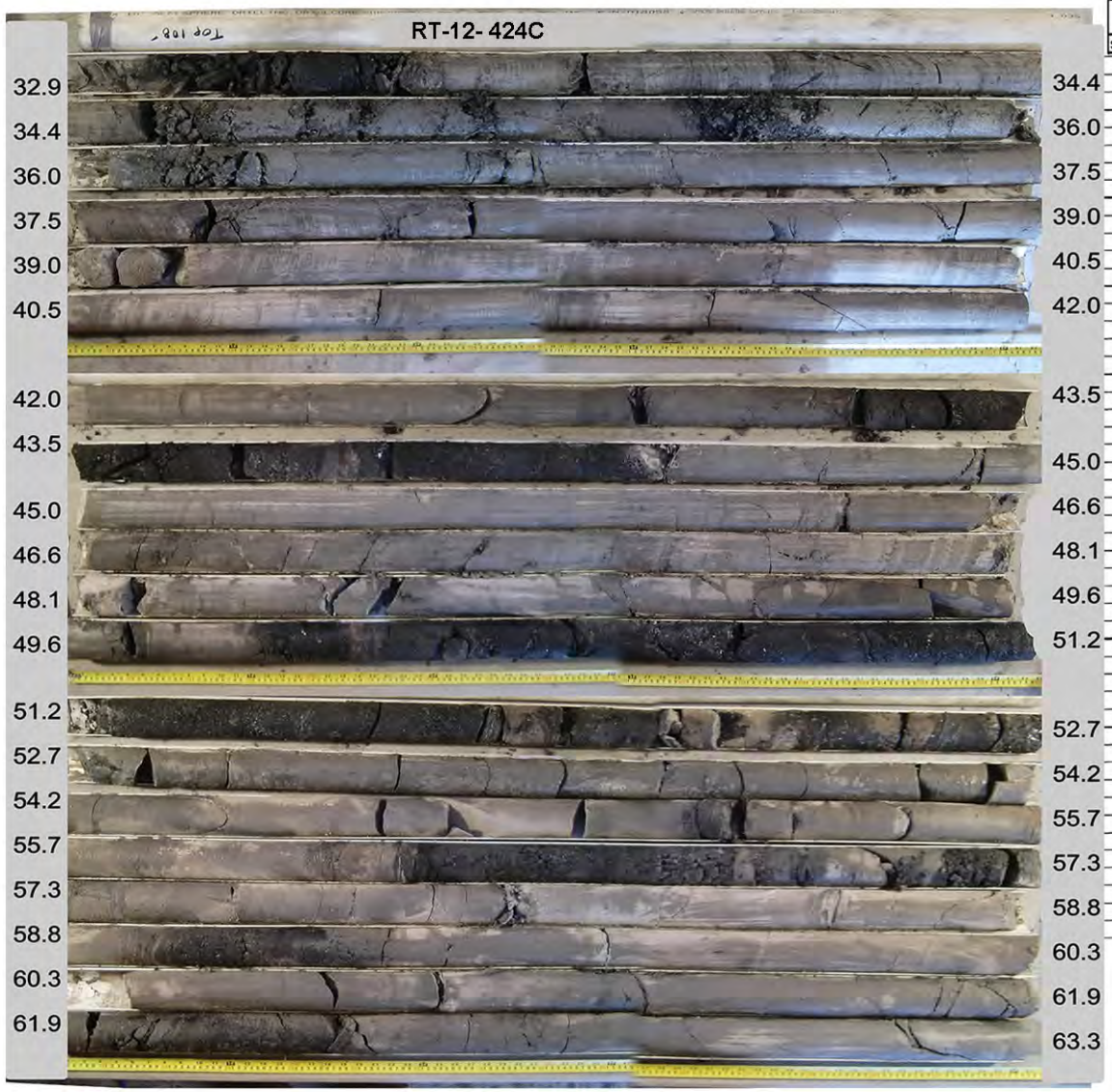
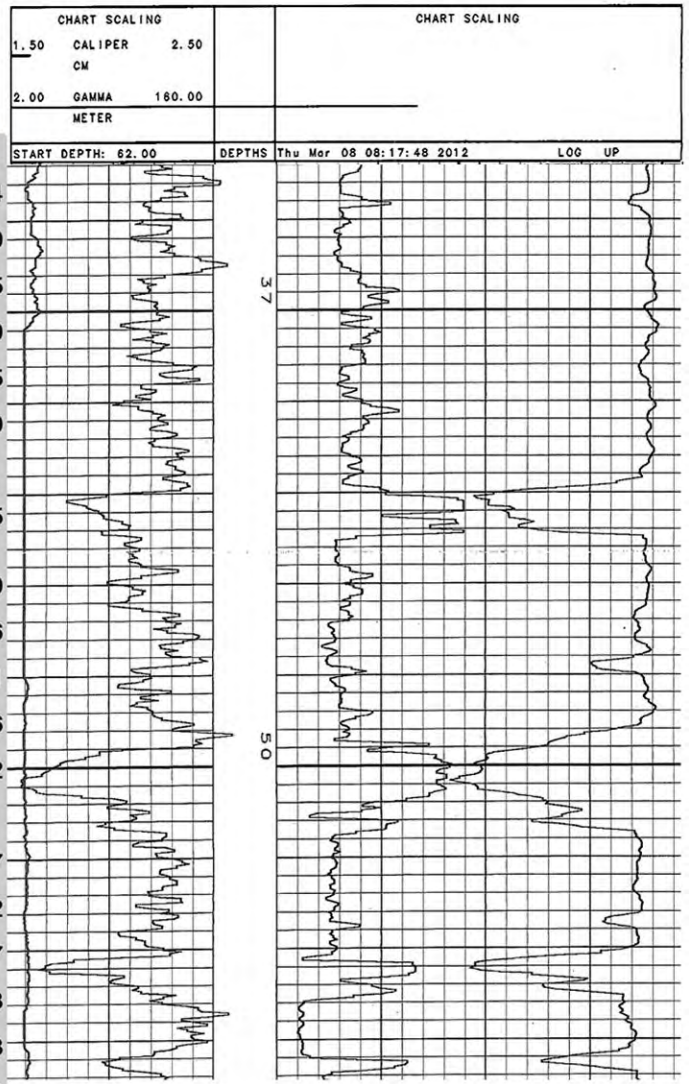
PROJECT No. A3368-1750012 FIG. No. A-6

DRAWING No. A3368-RT-12-430C





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DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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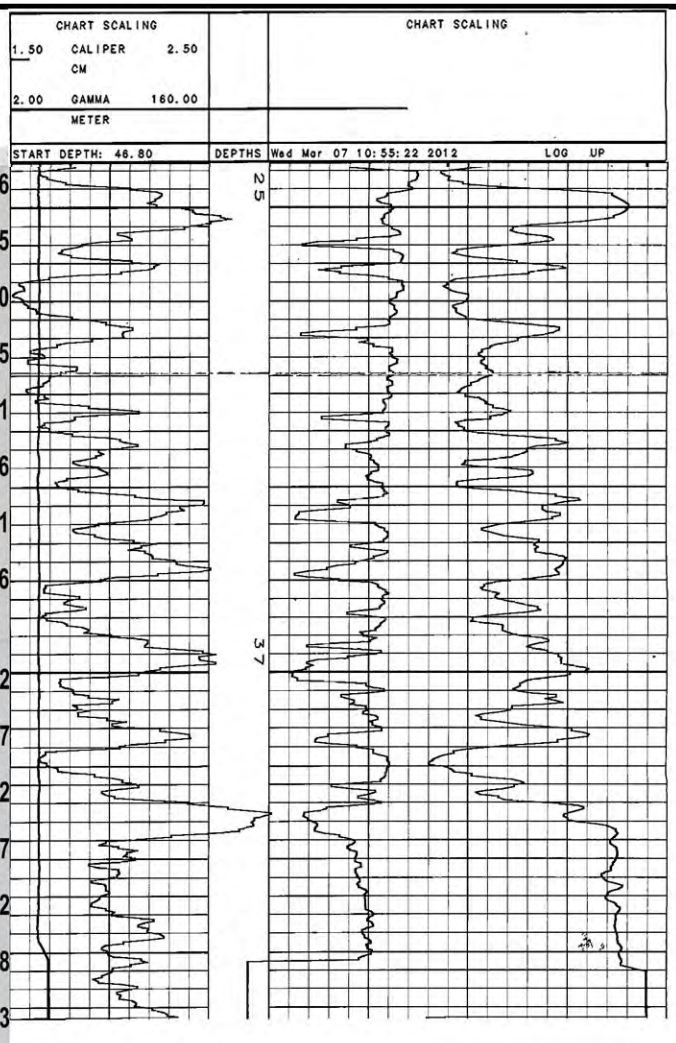
PROJECT No. A3368-1750012 FIG. No. A-5

DRAWING No. A3368-RT-12-424C

RT-12- 420C



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APPROVED BY	G.Potter, P.Geo.	3-May-12

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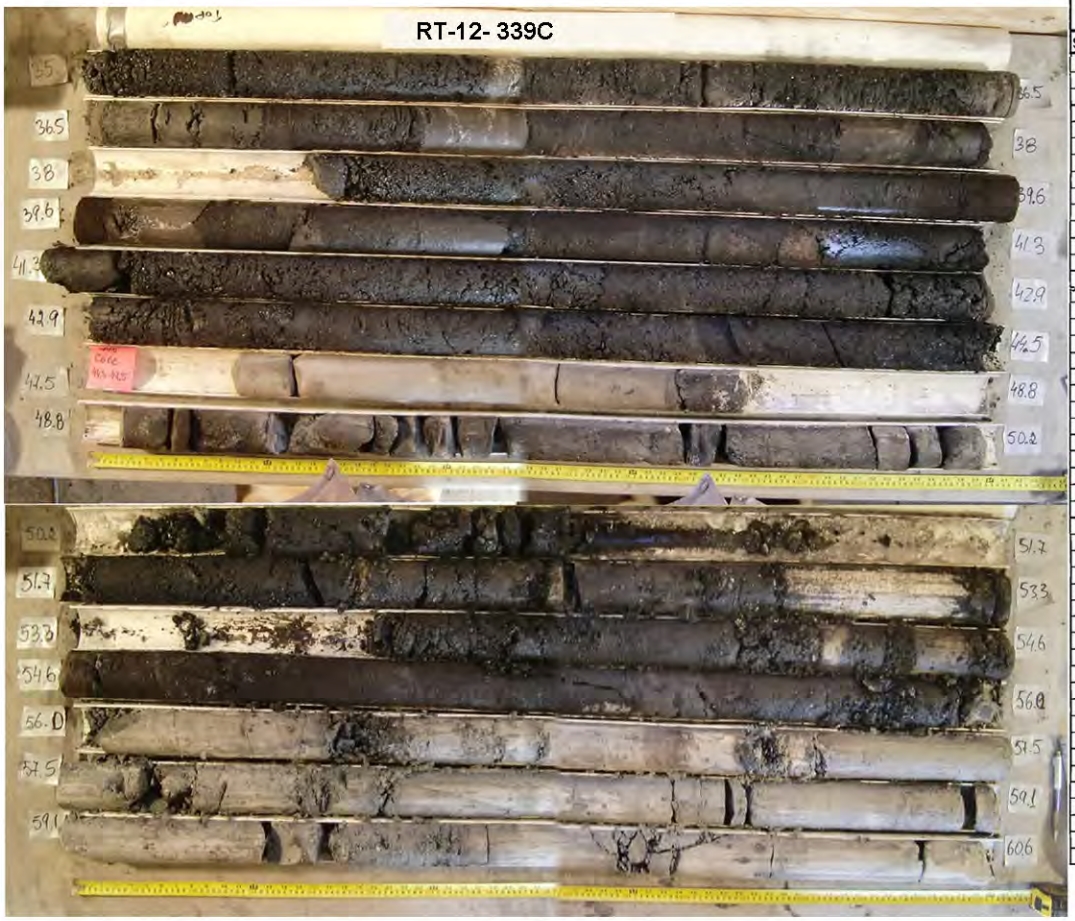
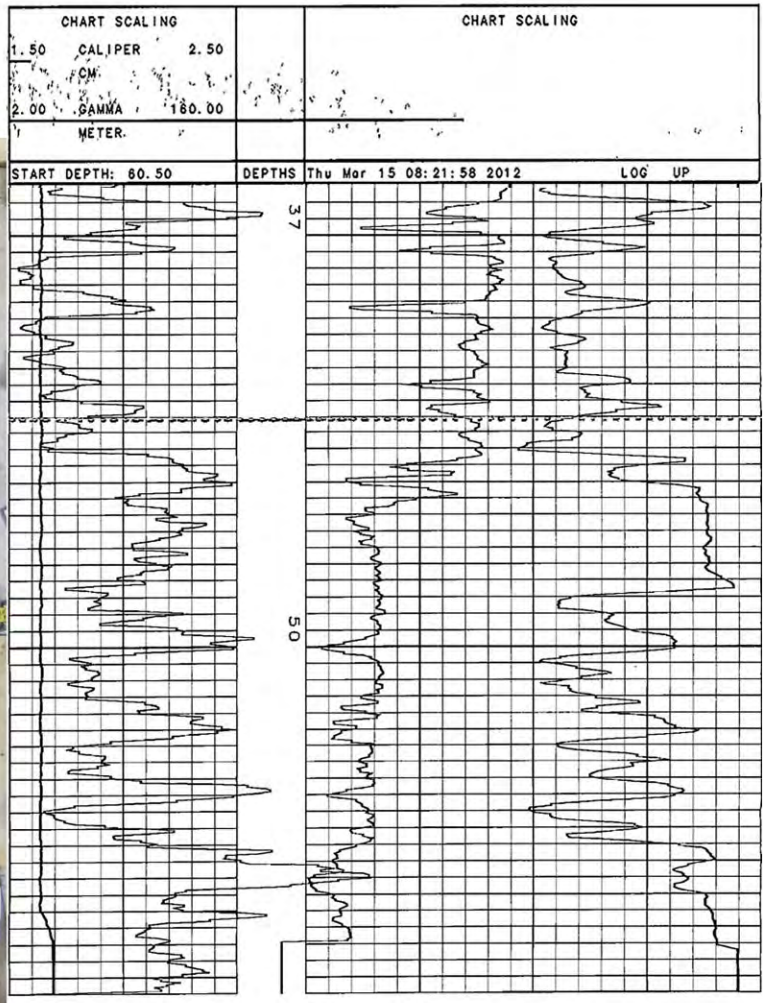
PROJECT No. A3368-1750012 FIG. No. A-4

DRAWING No. A3368-RT-12- 420C





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DESIGN BY	A.Smorschok, P.Geol	2-May-12
DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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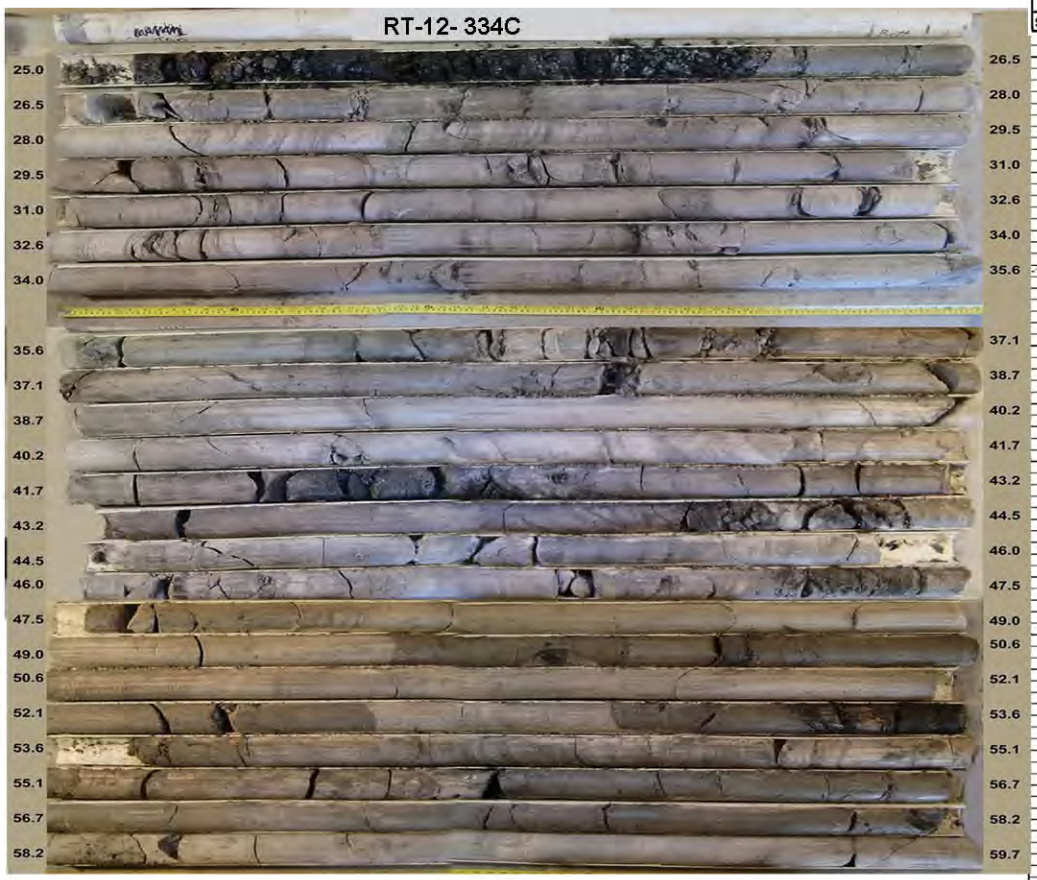
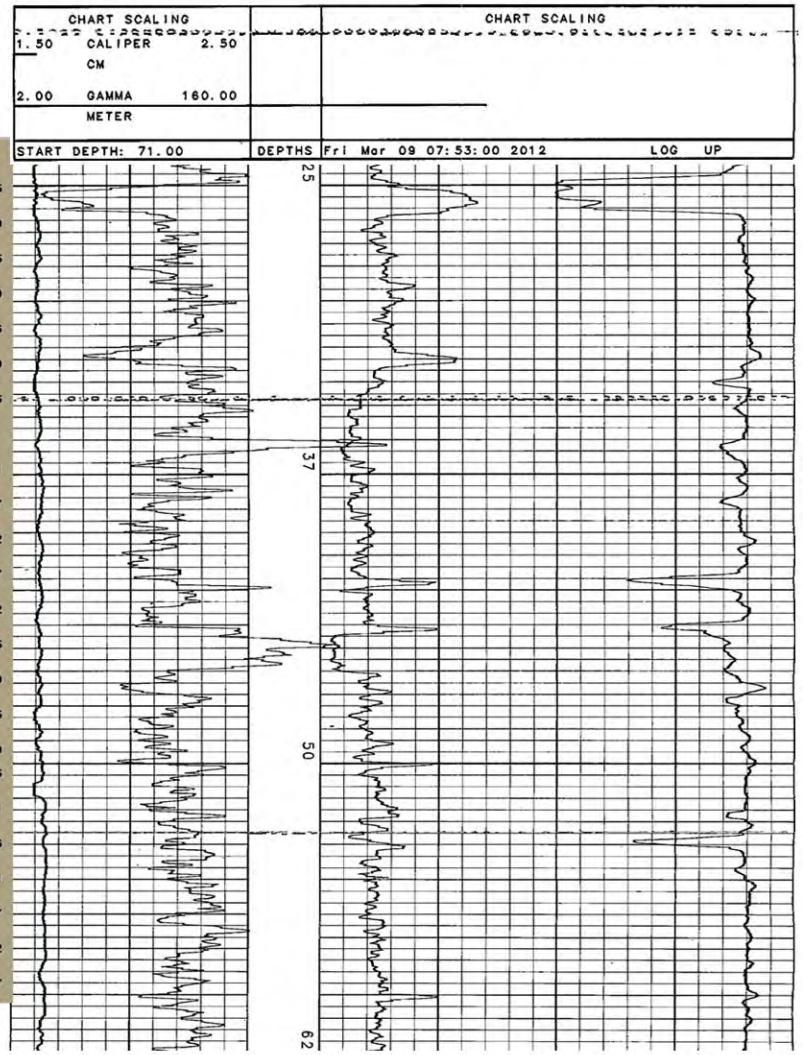
PROJECT No. A3368-1750012 FIG. No. A-3

DRAWING No. A3368-RT-12-339C





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DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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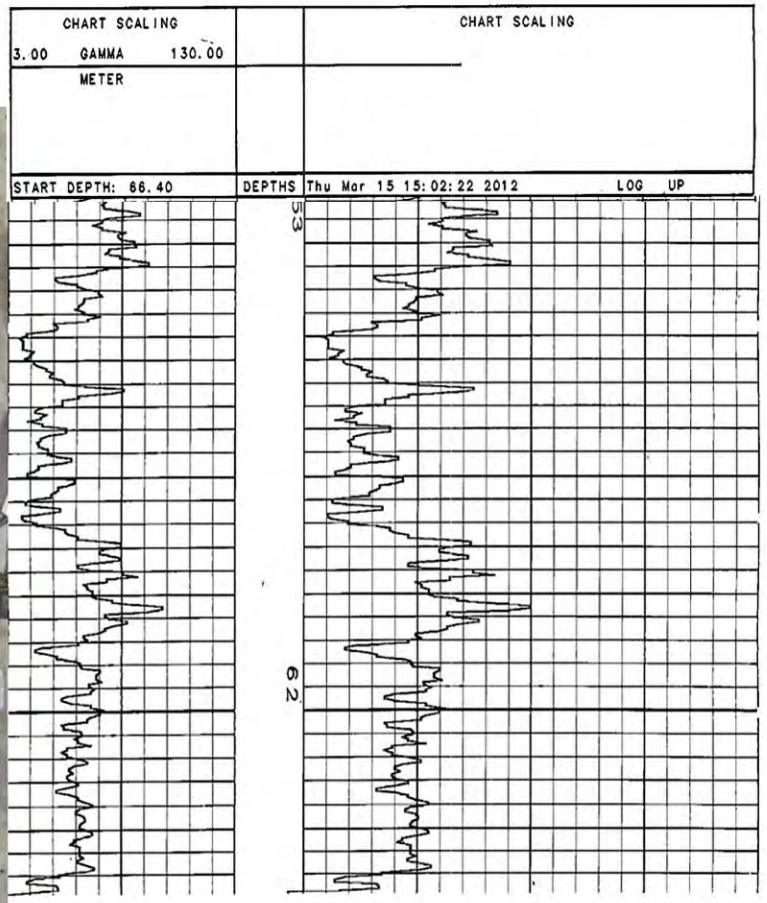
PROJECT No. A3368-1750012 FIG. No. A-2

DRAWING No. A3368-RT-12-334C



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DRAWN BY	A.Smorschok, P.Geol	2-May-12
APPROVED BY	G.Potter, P.Geo.	3-May-12

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PROJECT No. A3368-1750012 FIG. No. A-1

DRAWING No. A3368-RT-12- 334B

Appendix D
Core Sampling Data and UTS Test Results

Uniaxial Compressive Strength (UCS) Test results

MDH ENGINEERED SOLUTIONS

Project: CVRI Robb Trend Core Logging and Sampling
Location: Robb Trend Coal Valley Mine, Edson, Alberta
Date: 22-May-12
Project #: A3368
Project Engineer: Andrew Smorschok

Sample Info

Sample Type/Rock Type	Borehole Number	Sample Number	Depth (m)	Test Result (Mpa)	Sample Type	Borehole Number	Sample Number	Depth (m)	Test Result (Mpa)
MS	RT-12-612C	AA-10	52.7-52.8	**37.5**	MS	RT-12-424C	AS-1	36.9-37.2	**7.9**
MS	RT-12-430C	AS-1	54.8-55.1	**14.2**	MS	RT-12-334C	AS-1	34-34.25m	**test failed**
SltSt	RT-12-737C	AA-03	76.05-76.34	**test failed**	SLMS	RT-12-334C	AS-3	57.0-57.2m	**19.0**
SltSt	RT-12-680C	AA-04	59.85-60.1	**15.4**	SltSt	RT-12-424C	AS-2	40.8-41.1	**24.1**
SltSt	RT-12-680C	AA-05	61.84-62.34	**47.4**	SltSt	RT-12-549C	AS-1	41.9-42.2m	**53.1**
SltSt	RT-12-672C	AA-07	42.9-43.0	**test failed**	SltSt	RT-12-549C	AS-2	58.6-58.9m	**54.9**
SltSt	RT-12-612C	AA-11	53.8-53	**test failed**	SltSt	RT-12-523C	AS-1	19.3-19.6m	**17.8**
SltSt	RT-12-616C	AA-14	55.5-55.74	**37.8**	SS	RT-12-430C	AS2	57.8-58.1	**15.8**
SS	RT-12-737C	AA-01	72.5-72.84	**38.8**	SS	RT-12-420C	AS-1	45.7-46.0	**77.4**
SS	RT-12-737C	AA-02	73.55-73.7	**test failed**	SS	RT-12-334C	AS-2	39.3-39.6m	**5.3**
SS	RT-12-680C	AA-06	63.74-64.01	**37.0**	SS	RT-12-334C	AS-4	70.3-70.6m	**50.0**
SS	RT-12-672C	AA-08	45.7-46.1	**71.7**	SS	RT-12-523C	AS-2	32.3-32.6m	**test failed**
SS	RT-12-612C	AA-09	50.45-50.74	**test failed**	SS	RT-12-339C	AS-1	47.6-47.85m	**62.2**
SS	RT-12-719C	AA-12	36.25-36.4	**38.1**	SS	RT-12-334B	AS-1	64.7-65.0m	**40.2**
SS	RT-12-719C	AA-13	58.25-58.44	**broken**	SS	RT-12-544C	AS-1	61.2-61.5m	**47.3**
SS	RT-12-616C	AA-15	57.13-57.27	**35.5**	SS	RT-12-495C	AS-1	38.0-38.3m	**89.6**

NOTES: MS - mudstone; SS - sandstone; SltSt – siltstone; SLMS – silty mudstone;

Summary of UCS (MPa) results for each rock type

Project:	CVRI Robb Trend Core Logging and Sampling
Location:	Robb Trend Coal Valley Mine, Edson, Alberta
Date:	22-May-12
Project #:	A3368
Project Engineer:	Andrew Smorschok

Sample Info

Rock Type	Number of Samples	Lowest Value	Highest Value	Average(Mpa)
Mudstone	3	14.2	37.9	**19.9**
Sandstone	13	5.2	89.6	**46.8**
Siltstone	7	15.4	54.8	**35.8**
Silty Mudstone	1			**19.0**

Q-Values, Rock Mass Rating and UCS results for each rock type

Project:	CVRI Robb Trend Core Logging and Sampling
Location:	Robb Trend Coal Valley Mine, Edson, Alberta
Date:	22-May-12
Project #:	A3368
Project Engineer:	Andrew Smorschok

Sample Info

Rock Type	Number of Samples	Q' - Value	RMR	UCS (Mpa)
Mudstone	3	3.6-124	69	19.9
Sandstone	13	10.9-144.0	68	46.8
Siltstone	7	12.0-43.0	65.5	35.8
Silty Mudstone	1	4.8-25.3	52	19.0

Appendix E
Terms, Symbols and Abbreviations