

14<sup>th</sup> May, 2017

File No.: USG396

# Geotechnical Investigation Irwin Ranches Ltd., Red Deer County



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**ATTACHMENTS**

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**DRAWINGS**

Drawing No. 1 - Site Location Plan

Drawing No. 2 - Test Pit Location Plan

**PHOTOGRAPHS**

Photograph No. 1 to 4, inclusive

**TEST PIT LOGS**

Test Pit TP101 to TP132, inclusive

**LABORATORY ANALYSES**

Laboratory Sieves, Samples MW3, MW4, MW13, MW15, MW17, MW20, MW31, MW37, MW47, and MW47

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## **EXECUTIVE SUMMARY**

Union Street Geotechnical Ltd. (Union Street) performed a gravel pit investigation on behalf of Irwin Ranches Ltd., on the 19<sup>th</sup> April, 2017, on a site located within the N.W. ¼ of 22-35-04 W5M in Red Deer County, Alberta. The site is located southeast of the intersection of Range Road 43 and Township Road 354.

Thirty-two test pits were excavated throughout an approximately 9.5 Ha parcel of the property for preliminary gravel quality and quantity determination. Subsurface soils generally consisted of topsoil overlying gravel. Sand, clay, and till strata were encountered in several test pits.

## **LIMITATIONS**

Union Street Geotechnical Ltd. prepared this report for the exclusive use of Irwin Ranches Ltd., and their agents, for preliminary gravel quality and quantity determination on an approximately 9.5 Ha parcel within the N.W. ¼ of 22-35-04 W5M in Red Deer County, Alberta. The content reflects Union Street's best judgement available to us at the time of preparation. Any use which a third party makes of this report, any reliance on, or decisions to be made based on it, are the responsibility of such third party and Union Street Geotechnical Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this report.

Our recommendations and conclusions are based upon the information obtained from the subsurface exploration. The test pits and associated laboratory testing indicate subsurface conditions only at the time and to the depth, of the specific test pit location investigated and only for the soil properties tested. The subsurface conditions may vary between the test pits and over time. The interpretation of subsurface conditions provided is a professional opinion of encountered conditions and is not a certification or guarantee of site conditions. If variations, or other latent conditions become evident, Union Street should be notified immediately so that our conclusions and recommendations can be re-evaluated. Although subsurface conditions have been explored, we have not conducted investigations, sampling, field or laboratory testing, evaluations, or modelling of the site or subsurface conditions

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with respect to the presence of contaminated soil or groundwater or slope stability conditions.

This report contains the results of our geotechnical investigation as well as certain recommendations arising from our investigation. The recommendations herein do not constitute a design, in whole or in part, of any of the structural elements of any proposed work. Incorporation of any or all of our recommendations into the design of any such element does not constitute us as designers or co-designers of such elements, nor does it mean that such design is appropriate in geotechnical terms. The designers of such elements must consider the appropriateness of our recommendations in light of all design criteria known to them, many of which are not known by us. Our mandate has been to perform a geotechnical investigation and recommend, which we have completed by means of this report. We have had no mandate to design, or review the design of any elements of the proposed work and accept no responsibility for such design or design review.

This report has been prepared in accordance with generally accepted geotechnical engineering practice common to the local area. No other warranty, expressed or implied, is made.

This document, and the information contained within, are the confidential property of Irwin Ranches Ltd. and any disclosure of same is governed by the provisions of each of the applicable provincial or territorial Freedom of Information legislation, the Privacy Act (Canada) 1980-81-82-83, c.111, Sch. II "2", and the Access to Information Act (Canada) 1980-81-82-83, c.111, Sch. I "1", as such legislation may be amended or replaced from time to time.

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## **1 INTRODUCTION**

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### **1.1 BACKGROUND**

Irwin Ranches Ltd. retained Union Street Geotechnical Ltd. (Union Street) to conduct a gravel pit investigation to determine preliminary gravel quality and quantity on an approximate 9.5 Ha section within the N.W. ¼ of 22-35-04 W5M. The “site” is located immediately southeast of the intersection of Range Road 43 and Township Road 354 in Red Deer County, Alberta.

### **1.2 OBJECTIVES**

The objectives of the geotechnical investigation are to:

- define the subsurface soil strata, their properties, and estimated overburden depths;
- perform laboratory testing on select samples to verify grain size distributions and soil textures;
- provide gravel quantity estimate; and,
- provide recommendations on pertinent geotechnical issues identified during the subsurface investigation.

## **2 DESCRIPTION OF THE PROJECT AND SITE**

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### **2.1 SITE DESCRIPTION**

The site is located immediately southeast of the intersection of Range Road 43 and Township Road 354 in Red Deer County, Alberta as shown on Drawing No. 1. The site is located within the N.W. ¼ of 22-35-04 W5M. The site is undeveloped and currently being utilized for agricultural purposes and is relatively level.

Township Road 354 borders the site to the north, agricultural purposed land, N.E. ¼ of 22-35-04 W5M and S.W. ¼ of 22-35-04 W5M border the site to the east and south respectively, and Range Road 43 borders the site to the west. Photographs showing the site are appended to this report.

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### **3 FIELD INVESTIGATION AND LABORATORY ANALYSIS**

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The field investigation program included excavating thirty-two test pits at the locations shown on Drawing No. 2. The test pit locations were established by Irwin Ranches Ltd. personnel and excavated by Irwin Ranches Ltd. personnel at an earlier date. No formal surveying was performed and all drawings, legal land descriptions, and locations are approximate and are for conceptual purposes only.

On 19<sup>th</sup> April, 2017, thirty-two test pits (designated as TP101 to TP132) were sampled by Union Street personnel. The test pits were excavated to depths between 3.81 m to 5.79 m below ground surface.

Supervision of the soil sampling and logging of the various soil strata were performed by Union Street personnel. All soil samples were visually examined and classified in the field in accordance with the Modified Unified Soil Classification System. The Test Pit Logs are appended.

The soil sampling and testing sequences which are shown on the test pit logs consisted of:

- Disturbed ('grab') samples were obtained at various depth intervals.

Standing water was observed in Test Pits TP101 to TP117, TP119, TP121 to TP123, TP126, and TP130 at an average approximate depth of 2.90 m below ground surface. Generally, sloughing to some extent was encountered in the test pits containing gravel.

Subsequent to excavating operations, laboratory tests were performed on select samples to determine visual soil classification and in-situ water contents of all collected samples. Mechanical Wash Sieve (MWS) analyses were also performed on select soil samples. Observations made during the field investigation, visual descriptions of the soils, and the results of laboratory tests are presented in the Test Pit Logs.

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## **4 ANALYSIS AND DISCUSSION**

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### **4.1 GENERAL STRATIGRAPHY**

The subsurface conditions varied but were generally uniform throughout all test pit locations. In general, and to the depths excavated, the soil conditions encountered at the test pit locations generally consisted of topsoil overlying gravel. Sand, clay, and till strata were encountered in several test pits. The soil is relatively uniform with little variations; however, there are variations and the following soil properties depict the average characteristics. Mudstone extended to the maximum exploration depth in Test Pit TP116 and gravel extended to the maximum exploration depth in the remaining test pits.

Detailed soil descriptions are provided in the Test Pit Logs, appended to this report.

#### *4.1.1 Topsoil*

Topsoil, with an approximate thickness of 0.22 m, was encountered at surface in all thirty-two test pits.

The approximate topsoil thickness encountered in each test pit is shown in Table 4.1.

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**TABLE 4.1: SUMMARY OF TOPSOIL THICKNESS**

Test Pit No.	Topsoil Thickness (mm)
TP101	203
TP102	203
TP103	152
TP104	1,219
TP105	152
TP106	279
TP107	203
TP108	305
TP109	254
TP110	203
TP111	178
TP112	152
TP113	203
TP114	203
TP115	203
TP116	203
TP117	203
TP118	152
TP119	203
TP120	203
TP121	152
TP122	152
TP123	152
TP124	152
TP125	102
TP126	152
TP127	203
TP128	152
TP129	152
TP130	152
TP131	178
TP132	152
Average:	216

#### 4.1.2 Clay

Clay was encountered in Test Pits TP105, TP123, and TP129 at an average approximate depth of 0.15 m below ground surface and extended to an average approximate depth of 0.59 m below grade. The clay was silty and contained varying amounts of sand and gravel. It was brown, oxidized to non-oxidized, moist, and massive.

The moisture content of a clay sample obtained from Test Pit TP123 was 22.2%.

One MWS test was performed on a clay sample obtained from Test Pit TP123. The MWS result is summarized in Table 4.2.

**TABLE 4.2: SUMMARY OF CLAY MWS TEST RESULT**

Sample No. and Depth	Borehole No.	Gravel (%)	Sand (%)	Silt and Clay (%)	Moisture Content (%)
MW32 - 0.46 m	TP123	0.0	17.9	82.1	22.2
MW6 - 0.48 m	TP105	0.2	38.5	61.3	19.7
Average:		0.1	28.2	71.7	21.0

#### 4.1.3 Silt

Silt was encountered in Test Pit TP118 an approximate depth of 0.15 m below grade and extended to an approximate depth of 0.46 m below ground surface. The silt contained some clay and some sand. It was brown, oxidized, moist, and massive.

#### 4.1.4 Till

Till was encountered below the topsoil and/or sand in Test Pits TP120, TP125, TP126, TP128, and TP130 to TP132 at an average approximate depth of 0.16 m below ground surface and extended to an average approximate depth of 2.35 m below grade with the exception of Test Pit 128 where it extended to the maximum exploration depth. The till contained varying amounts of clay, silt, sand, and gravel. It was brown, non-oxidized, moist, massive, and contained coal chip inclusions.

#### 4.1.5 *Sand*

Sand, with an average thickness of 0.52 m, was encountered in Test Pits TP101, TP106 to TP108, TP114, TP117, TP120, and TP127 at an average approximate depth of 0.23 m below ground surface. The sand contained varying amounts of clay, silt, and gravel. It was brown, oxidized, moist to wet, compact, and massive.

#### 4.1.6 *Mudstone*

A weathered mudstone stratum was encountered in Test Pit TP116 at an approximate depth of 2.11 m below ground surface which extended to the maximum exploration. The mudstone was clayey, silty, and sandy, brown, non-oxidized, wet (seepage above), hard, and massive.

#### 4.1.7 *Gravel*

Gravel was encountered at an average approximate depth of 1.20 m below grade in thirty test pits. The gravel stratum extended to the maximum exploration depth in all thirty-two test pits with the exception of Test pit TP116, TP128, and TP129. The gravel was sandy to contained some sand, trace clay, and trace silt. It was brown to grey, oxidized to non-oxidized, moist to wet, massive, and contained cobble inclusions.

The moisture content of the gravel ranged from 3.4% to 19.4% with an average moisture content reading of 8.4%.

Eleven MWS analyses were performed on gravel samples obtained from Test Pits TP102, TP103, TP105, TP109, TP111, TP113, TP115, TP122, TP125, TP129, and TP130. The MWS results are summarized in Table 4.3.

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**TABLE 4.3: SUMMARY OF GRAVEL MWS TEST RESULTS**

Sample No. and Depth	Borehole No.	Gravel (%)	Sand (%)	Silt and Clay (%)	Moisture Content (%)
MW3 - 1.22 m	TP102	71.8	19.8	8.4	6.5
MW4 - 2.13 m	TP103	69.5	23.6	6.9	11.5
MW13 - 0.30 m	TP109	79.9	14.0	6.1	3.4
MW15 - 0.91 m	TP111	80.8	11.8	7.4	11.3
MW17 - 1.22 m	TP113	77.9	14.2	7.9	6.2
MW20 - 3.05 m	TP115	80.0	13.3	6.7	7.4
MW31 - 1.37 m	TP122	80.1	15.3	4.6	8.5
MW37 - 3.51 m	TP125	74.7	18.8	6.6	3.6
MW45 - 2.44 m	TP129	33.1	43.9	23.0	5.16
MW47 - 3.51 m	TP130	60.9	26.6	12.5	8.8
Average:		70.9	20.1	9.0	7.2

The Mechanical Wash Sieves are attached to this report.

## 4.2 GROUNDWATER

Standing water was observed in Test Pits TP101 to TP117, TP119, TP121 to TP123, TP126, and TP130 at an average approximate depth of 2.90 m below ground surface. Based on standing water encountered in the test pits, the groundwater table is likely 2.0 m to 4.0 m below ground surface. Groundwater levels are subject to meteorological events, seasonal variations, site gradient, and other salient factors resulting in the water table varying with time.

## 5 ANALYSIS AND CONCLUSION

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Based on discussions with Irwin Ranches Ltd., it is understood that the owner would like to sell the property. Therefore the exact end use of the gravel is unknown at this time, but it is assumed it would be used primary as a surfacing aggregate for roads, storage yards, lease sites, etc. and/or as a sub-base material for similar projects. Based on the results provided by the mechanical sieve analyses, we can describe the gravel material as well to poorly graded, free draining, and clean. The sieve results show us there is a low to moderate percentage of oversize material with an average

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68.6% of material passing the 25 mm sieve. Based on the sieve results, it is assumed that the gravel could be manufactured to meet Alberta Transportation's Designation 2 and 6 sieve specifications but this would likely depend on the exact specification required, manufacturer, and a variety of other unknown conditions.

Based on the average gravel layer thickness encountered in the test pits and an estimated 9.5 Ha area, the estimate volume of gravel was calculated to be 353,400 m<sup>3</sup> or 7.42 x 10<sup>8</sup> kg (assumed density of 2,100 kg/m<sup>3</sup>). This quantity is a conservative estimate as the majority of the test pit depths did not extend through the gravel stratum, the extents of the gravel stratum was not determined, and no surveying was performed.

Depending upon the products end use, it is recommended that additional laboratory testing be completed to determine the performance characteristics of the material. A summary of the recommended, but not inclusive, tests to be performed are provided in Table 5.1.

**TABLE 5.1: SUMMARY OF RECOMMENDED LABORATORY TESTING**

Title of Test	Reference	Application	Priority
<b>Gradation and Index Property Tests</b>			
Sand Equivalent Value of Soils and Fine Aggregate	ASTM D 2419	Surfacing	Medium
<b>Degradation, Soundness and Aggregate Quality Tests</b>			
Abrasion Loss by Micro Deval	ASTM D 6928	Surfacing	Medium
Soundness of Aggregate By Use of Magnesium Sulphate	ASTM C 88	Surfacing	Medium/Low
Fracture Count on Coarse Aggregate (once manufactured)	SS 202 Appendix 1 ASTM D 5821	Surfacing	Medium/Low High

## 6 CLOSURE

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Union Street Geotechnical Ltd. prepared this report for the use of Irwin Ranches Ltd., and their agents, for a gravel pit investigation within the N.W. ¼ of 22-35-04 W5M in Red Deer County, Alberta.

Samples obtained from this geotechnical investigation will be retained in our laboratory for 30 days following the date of the final report. Should no instructions be received to the contrary, these samples will then be discarded.

Yours truly,

Union Street Geotechnical Ltd.

APEGA Permit to Practice No.: P12644

Prepared By:

Michelle Clément, B.Sc.  
Project Manager

Reviewed By:



A circular green seal for a Professional Engineer in Alberta. The seal contains the text "PROFESSIONAL ENGINEER ALBERTA" around the perimeter and "JOSHUA WILSON" in the center. A blue ink signature is written across the seal, and the date "14 May, 2017" is written in blue ink to the right of the seal.

Joshua Wilson, P.Eng.  
Project Engineer

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**Drawings**









**LEGEND:**

SITE BOUNDARY 

ALBERTA TOWNSHIP SYSTEM 

COUNTY LIMITS 



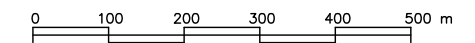
**NOTES:**


1 DRAWING COMPILED FROM:

NATIONAL ROAD NETWORK ALBERTA (AB) PUBLICATION DATE: 2014-06-30  
 TITLE: ALBERTA (AB) EDITION:11.0 PUBLISHED BY THE GOVERNMENT OF CANADA; NATURAL RESOURCES CANADA; EARTH SCIENCES SECTOR; CANADA CENTRE FOR MAPPING AND EARTH OBSERVATION,

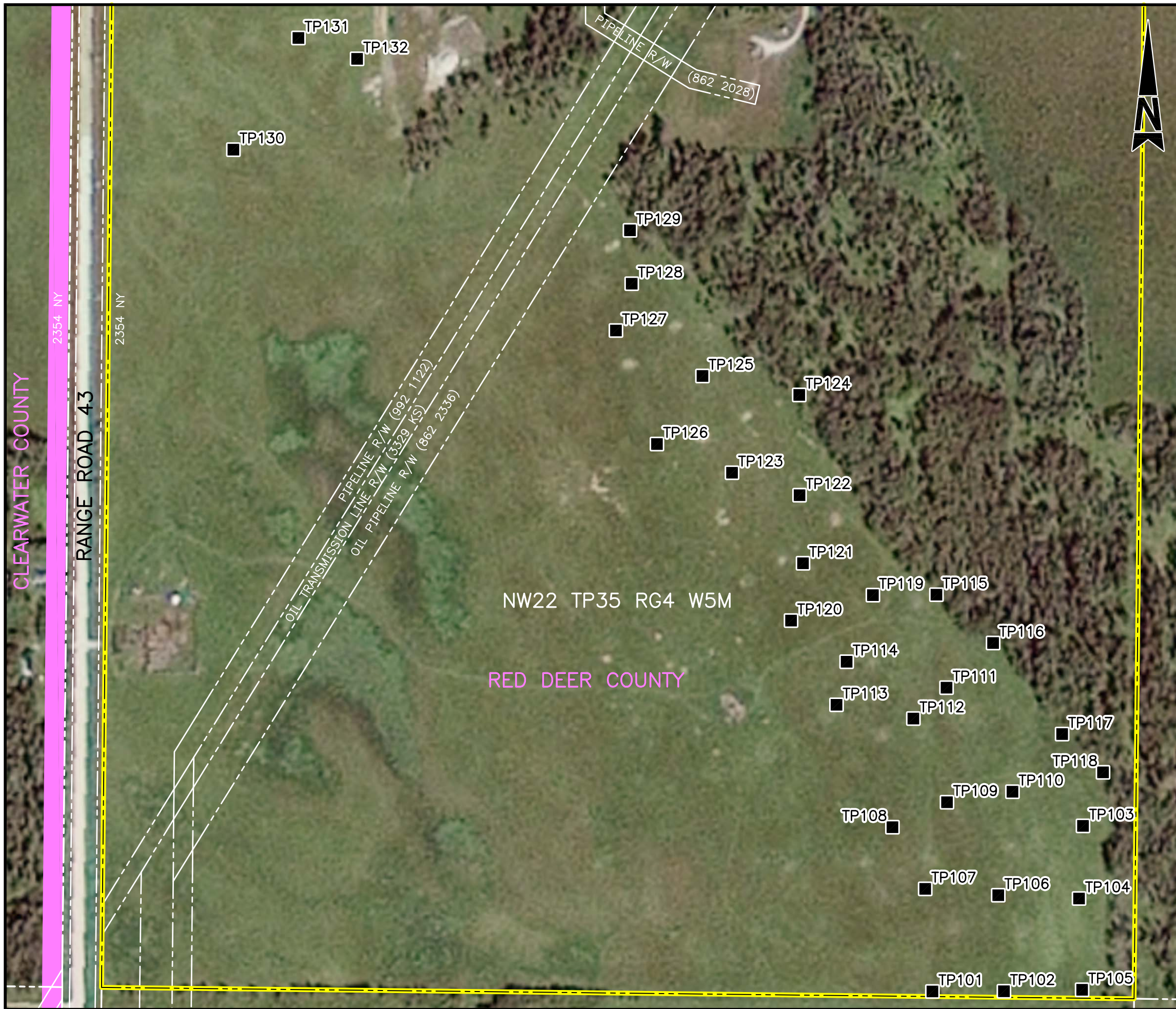
AERIAL PHOTOGRAPH OBTAINED THROUGH VALTUS IMAGING LTD.,  
 & UNION STREET GEOTECHNICAL SITE INVESTIGATION INFORMATION.

2 LEGAL DESCRIPTION:  
 THE NORTH WEST QUARTER OF SECTION TWENTY TWO (22) TOWNSHIP THIRTY FIVE (35) RANGE FOUR (4) WEST OF THE FIFTH MERIDIAN CONTAINING ONE HUNDRED AND SIXTY (160) ACRES MORE OR LESS EXCEPTING THEREOUT: NINETY EIGHT HUNDREDTHS (0.98) OF AN ACRE MORE OR LESS FOR ROAD AS SHOWN ON ROAD PLAN 2354 NY



			
Irwin Ranches Ltd.		GEOTECHNICAL INVESTIGATION NW22 TP35 RG4 W5M RED DEER COUNTY, ALBERTA	
TITLE <b>SITE LOCATION PLAN</b>			
DATE	2017/04/24	DWN. BY	SEC
SCALE	1:10 000	CHKD. BY	APPD. BY
		FILE NO.	DWG. NO.
		USG0396-A2A	<b>001</b>





**LEGEND:**

- TEST PIT LOCATION
- LEGAL LINE (WHITE)
- SITE BOUNDARY

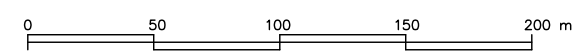
**NOTES:**


1 DRAWING COMPILED FROM:

NATIONAL ROAD NETWORK ALBERTA (AB) PUBLICATION DATE: 2014-06-30  
 TITLE: ALBERTA (AB) EDITION:11.0 PUBLISHED BY THE GOVERNMENT OF CANADA; NATURAL RESOURCES CANADA; EARTH SCIENCES SECTOR; CANADA CENTRE FOR MAPPING AND EARTH OBSERVATION,

AERIAL PHOTOGRAPH OBTAINED THROUGH VALTUS IMAGING LTD.,  
 & UNION STREET GEOTECHNICAL SITE INVESTIGATION INFORMATION.

2 LEGAL DESCRIPTION:  
 THE NORTH WEST QUARTER OF SECTION TWENTY TWO (22) TOWNSHIP THIRTY FIVE (35) RANGE FOUR (4) WEST OF THE FIFTH MERIDIAN CONTAINING ONE HUNDRED AND SIXTY (160) ACRES MORE OR LESS EXCEPTING THEREOUT: NINETY EIGHT HUNDREDTHS (0.98) OF AN ACRE MORE OR LESS FOR ROAD AS SHOWN ON ROAD PLAN 2354 NY



			
Irwin Ranches Ltd.		GEOTECHNICAL INVESTIGATION NW22 TP35 RG4 W5M RED DEER COUNTY, ALBERTA	
<b>TITLE</b>			
<b>TEST PIT LOCATION PLAN</b>			
DATE	2017/04/24	DWN. BY	SEC
SCALE	1:3000	FILE NO.	USG0396-A2A
CHKD. BY		APPD. BY	
DWG. NO.			<b>002</b>





## Photographs

**Photographs - Geotechnical Investigation  
NW22 TP35 RG4 W5M  
Red Deer County, Alberta**



**Photograph No. 1:** Photograph taken near Test Pit TP122, facing northwest, showing excavated stockpiles and site conditions at the time of drilling. Photograph taken on 19<sup>th</sup> April, 2017.



**Photograph No. 2:** Photograph taken near Test Pit TP103, facing southwest, showing excavated stockpiles and site conditions at the time of drilling. Photograph taken on 19<sup>th</sup> April, 2017.

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**Photographs Cont'd - Geotechnical Investigation  
NW22 TP35 RG4 W5M  
Red Deer County, Alberta**



**Photograph No. 3:** Photograph showing excavated material from Test Pit TP104. Photograph taken on 19<sup>th</sup> April, 2017.



**Photograph No. 4:** Photograph showing subgrade conditions in Test Pit TP109 at the time of excavation. Photograph taken on 19<sup>th</sup> April, 2017.



## Test Pit Logs



# FIELD TEST PIT LOG

TEST PIT NUMBER

TP101

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		SAND: Clayey, silty. Brown. Oxidized. Moist. Massive.		MW01								
2.0		GRAVEL: Some clay, some silt, some sand. Greyish brown. Non-oxidized to oxidized. Moist to wet. Compact. Massive. @ 1.73 m, water.		MW02								▼
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP102

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Some sand, trace silt, trace clay. Brown. Oxidized. Compact. Dry. Massive.										
2.0												
3.0		@ 3.25 m, water.										▼
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP103

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Sandy, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.										
2.0												
3.0												
4.0		@ 3.48 m, water.									▼	
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												



# FIELD TEST PIT LOG

TEST PIT NUMBER

TP104

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Some to trace clay, some sand, trace silt. Brown. Oxidized. Moist. Compact. Massive.										
2.0				MW5		.						
3.0												
4.0		@ 3.81 m, water.									▼	
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD BOREHOLE LOG

BOREHOLE NUMBER

TP105

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.0 - 1.0		CLAY AND SAND: Silty. Brown. Non-oxidized. Moist. Loose. Massive.		MW6		19.7						
1.0 - 2.0		GRAVEL: Sandy, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.		MW7		-						
2.0 - 3.12		@ 3.12 m, water.										▼
3.12 - 5.79												
5.79 - 10.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP106

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		SAND: Silty, gravelly, some clay. Brown. Oxidized. Moist. Loose. Massive.										
2.0		GRAVEL: Sandy, some silt, trace clay. Brown. Oxidized. Moist. Compact. Massive.	MW8			-						
3.0												
4.0		@ 4.19 m, water.	MW9			-						
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP107

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		SAND: Clayey, silty. Brown. Oxidized. Moist to wet. Loose. Massive.										
2.0		GRAVEL: Some clay, some silt, some sand. Mottled brown and grey. Oxidized. Moist. Compact. @ 1.93 m, water.										▼
3.0												
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP108

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.5		SAND: Silty, some clay. Brown. Oxidized. Moist. Loose. Massive.										
1.5		GRAVEL: Clayey, silty, sandy. Grey. Oxidized. Dense. Massive.										
1.96		@ 1.96 m, water.										▼
5.79		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP109

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Some sand, trace clay, trace silt. Grey. Moist to wet. Compact. Massive.		MW13		3.4		GW/GP				
2.0		@ 1.85 m, water.									▼	
3.0												
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP110

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Sandy, some clay, some silt. Brown to grey. Oxidized. Moist. Compact. Massive.	MW14									
2.0												
3.0												
4.0		@ 3.61 m, water.									▼	
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD BOREHOLE LOG

BOREHOLE NUMBER

TP111

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Some sand, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.	MW15			11.3		GW/GP				
2.0		@ 2.24 m, water.									▼	
3.0												
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. No seepage or sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												



# FIELD TEST PIT LOG

TEST PIT NUMBER

TP112

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Sandy, some clay, some silt. Brown. Oxidized. Moist. Compact. Massive.		MW16		-						
2.0		@ 2.18 m, water.										
3.0												
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP113

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Some sand, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.										
2.0			MW17			6.2		GW/GP				
3.0		@ 2.74 m, water.									▼	
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP114

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.0 - 1.0		SAND: Trace clay, trace silt. Brown. Non-oxidized. Moist. Loose. Massive.		MW18			-					
1.0 - 2.0		GRAVEL: Sandy, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.		MW19			-					
2.0 - 2.49		@ 2.49 m, water.										▼
2.49 - 5.79												
5.79 - 10.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP115

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Sandy, trace clay, trace silt. Brown to grey. Oxidized. Moist. Compact. Massive. @ 0.91 m, cobbles.										
2.0												
3.0		@ 2.54 m, water.									▼	
4.0				MW20		7.5		GW/GP				
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP116

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.0 - 2.0		GRAVEL: Sandy, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.										
2.0 - 6.0		MUDSTONE: Clayey, silty, sandy. Brown. Non-oxidized. Wet. Hard. Massive. @ 2.48 m, water										▼
6.0 - 10.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP117

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.0 - 1.0		SAND: Clayey, silty. Brown. Oxidized. Moist. Compact. Massive.										
1.0 - 2.0		GRAVEL: Sandy, some silt, trace clay. Brown. Oxidized. Moist. Compact. Massive.										
2.0 - 3.0		@ 2.59 m, water.										
3.0 - 4.0												
4.0 - 5.0												
5.0 - 6.0												
6.0 - 7.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0 - 8.0												
8.0 - 9.0												
9.0 - 10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP118

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **3.86 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		SILT: Some clay, some sand. Brown. Oxidized. Moist. Firm. Massive.		MW24			-					
2.0		GRAVEL: Sandy, some silt, trace clay. Brown. Oxidized. Compact. Massive. Cobble inclusions.		MW25			-					
4.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
5.0												
6.0												
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP119

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Sandy, some clay, trace silt. Dark brown. Oxidized. Moist. Compact. Massive. @ 0.91 m, white clay seam 0.05 m thick. @ 1.07 m, trace clay, light brown. @ 2.18 m, water.	MW26			-						▼
2.0												
3.0												
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												



# FIELD TEST PIT LOG

TEST PIT NUMBER

TP120

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.88 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.5		SAND: Some clay, some silt. Brown. Oxidized. Moist. Loose. Massive.		MW27								
1.0		TILL: Clayey, silty, some sand. Brown. Oxidized. Moist. Firm to stiff. Massive.		MW28								
2.0		GRAVEL: Sandy, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.		MW29								
5.0		NOTES: End of test pit at 4.88 m below ground. No seepage or sloughing encountered. Test pit to be backfilled to surface by others.										
6.0												
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP121

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Sandy, trace clay, trace silt. Brown. Oxidized. Moist. Compact. Massive.	MW30									
2.0												
3.0												
4.0		@ 3.54 m, water.										▼
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled to surface by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP122

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Clayey, silty, some sand. Brown. Oxidized. Moist. Compact. Massive.  @ 0.45 m, some sand, cobble inclusions.		MW31		8.5		GW/GP				
2.0												
3.0		@ 3.07 m, water.									▼	
4.0												
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled to surface by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP123

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.0 - 1.0		CLAY: Silty, some sand. Brown. Oxidized. Moist. Firm. Massive.		MW32			22.2					
1.0 - 2.0		GRAVEL: Some sand, trace clay, trace silt. Brown. Oxidized. Compact. Massive.		Mw33			-					
4.0		@ 4.01 m, water.										▼
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled to surface by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP124

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **3.81 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		GRAVEL: Clayey, some silt, some sand. Dark brown. Oxidized. Moist. Compact. Massive. @ 0.61 m, sandy.										
2.0				MW34		-						
3.0												
4.0				MW35		-						
5.0		NOTES: End of test pit at 3.81 m below ground. No seepage, but sloughing encountered. Test pit to be backfilled by others.										
6.0												
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP125

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.52 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		TILL: Sandy, some clay, some silt, some gravel. Brown. Oxidized. Moist. Firm. Massive. Coal chip inclusions.		MW36			-					
2.0												
3.0		GRAVEL: Some sand, trace clay, trace silt. Brown. Oxidized. Dry to moist. Compact. Massive.		MW37			3.6	GW/GP				
4.0												
5.0		NOTES: End of test pit at 4.52 m below ground. No seepage or sloughing encountered. Test pit to be backfilled by others.										
6.0												
7.0												
8.0												
9.0												
10.0												



# FIELD TEST PIT LOG

TEST PIT NUMBER

TP126

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.79 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		TILL: Clayey, silty, sandy, trace gravel. Brown. Oxidized. Firm to stiff. Massive.		MW38			-					
2.0												
3.0		GRAVEL: Clayey, silty, sandy. Brown. Non-oxidized. Moist. Compact. Massive.		MW39			3.58				▼	
4.0		@ 3.56 m, water.										
5.0												
6.0		NOTES: End of test pit at 5.79 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP127

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.37 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		SAND: Trace clay, trace silt, trace gravel. Brown. Oxidized. Loose. Massive.	MW40									
2.0												
3.0		GRAVEL: Sandy, trace clay, trace silt. Yellowish brown. Oxidized. Moist. Compact. Massive.	MW41									
4.0												
5.0		NOTES: End of test pit at 4.37 m below ground. No seepage or sloughing encountered. Test pit to be backfilled by others.										
6.0												
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP128

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.29 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		TILL: Sand, clayey, silty, trace gravel. Brown. Non-oxidized. Moist. Compact. Massive. Cobble inclusions.		MW42		-						
2.0												
3.0		@ 2.44 m, gravel seam 0.03 m thick.		MW43		-						
4.0												
5.0		NOTES: End of test pit at 4.29 m below ground. No seepage, but sloughing encountered. Test pit to be backfilled by others.										
6.0												
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP129

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: ?  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.47 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
0.0 - 1.0		CLAY: Silty, some sand, some to trace gravel. Brown. Oxidized. Moist. Firm to stiff. Massive.		MW44								
1.0 - 2.0		SAND: Gravelly, some clay, trace silt. Yellowish brown. Oxidized. Moist. Compact. Massive.		MW45		5.2		SM/SC				
4.47		NOTES: End of test pit at 4.47m below ground. Sloughing, but no seepage encountered. Test pit to be backfilled by others.										

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP130

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.06 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		TILL: Clayey, sandy, gravelly, some silt. Yellowish brown. Oxidized. Moist. Massive.		MW46		-						
3.0		GRAVEL: Sandy, trace silt, trace clay. Greyish brown. Oxidized. Moist. Compact. Massive. @ 4.06 m, water.		MW47		8.8		GP/GW				▼
4.0		NOTES: End of test pit at 4.06 m below ground. Seepage and sloughing encountered. Test pit to be backfilled by others.										
5.0												
6.0												
7.0												
8.0												
9.0												
10.0												

# FIELD TEST PIT LOG

TEST PIT NUMBER

TP131

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **4.70 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		TILL: Clayey, sandy, gravelly, some silt. Brown. Oxidized. Moist. Firm to stiff. Massive.		MW48		-						
3.0		GRAVEL: Silty, sandy, trace clay. Greyish brown. Oxidized. Moist. Compact. Massive.		MW49		-						
5.0		NOTES: End of test pit at 4.70 m below ground. Sloughing, but no seepage encountered. Test pit to be backfilled by others.										
6.0												
7.0												
8.0												
9.0												
10.0												



# FIELD TEST PIT LOG

TEST PIT NUMBER

TP132

PROJECT NUMBER: **USG396**  
 PROJECT NAME: **Geotechnical Investigation**  
 LOCATION: **N.W. 1/4 of 22-35-04 W5M**  
 CLIENT: **Irwin Ranches Ltd.**  
 DRILLING METHOD: **Hitachi 200 Excavator**  
 LOGGED BY: **M.W./N.T.**  
 DATE BEGUN: **19 April, 2017**  
 DATE COMPLETED: **19 April, 2017**

CASING STICKUP: **N/A**  
 TOTAL DEPTH: **5.28 m**  
 GROUND SURFACE ELEVATION: **N/A**



DEPTH (m)	LITHOLOGY	DESCRIPTION	SAMPLE			POCKET PEN (kPa)	MOISTURE CONT. (%)	SULPHATE (%)	USC	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	WELL INSTALLATION
			TYPE	No.	SPT "N"							
0.0		TOPSOIL										
1.0		TILL: Sand, some clay, some silt, trace gravel. Yellowish brown. Oxidized. Moist. Massive.		MW50		-						
2.0												
3.0		SAND AND GRAVEL: Trace clay, trace silt. Greyish brown. Oxidized. Moist. Compact. Massive.										
4.0												
5.0				MW51		-						
6.0		NOTES: End of test pit at 5.28 m below ground. No seepage or sloughing encountered. Test pit to be backfilled by others.										
7.0												
8.0												
9.0												
10.0												



## **Laboratory Analyses**

# Laboratory Sieve

# Sample No.: MW3

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: some sand, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

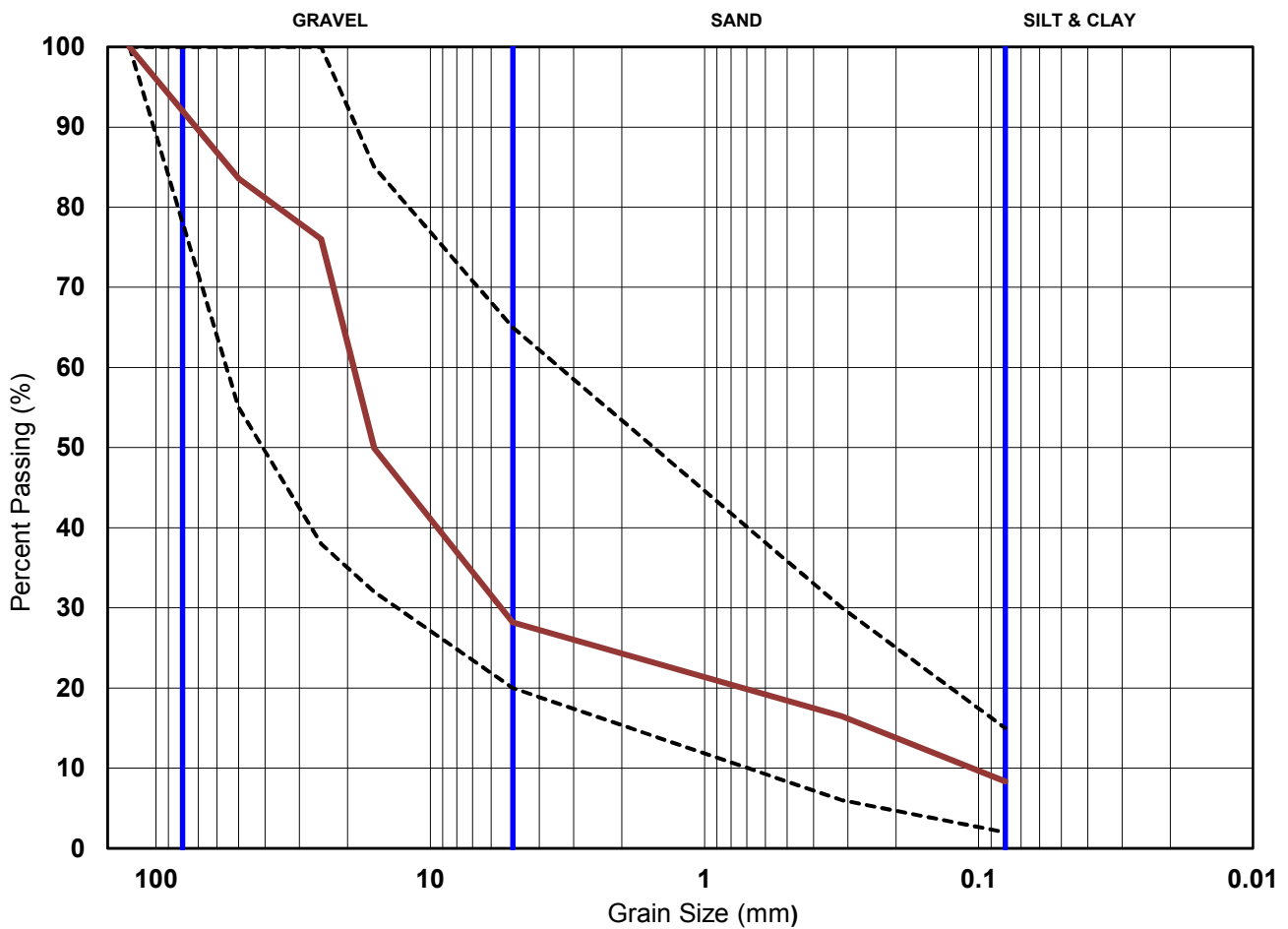
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	83.6	76.0	49.9	28.2	16.5	8.4
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 71.8%      Sand = 19.8%      Silt & Clay = 8.4%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW

# Laboratory Sieve

# Sample No.: MW4

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: sandy, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

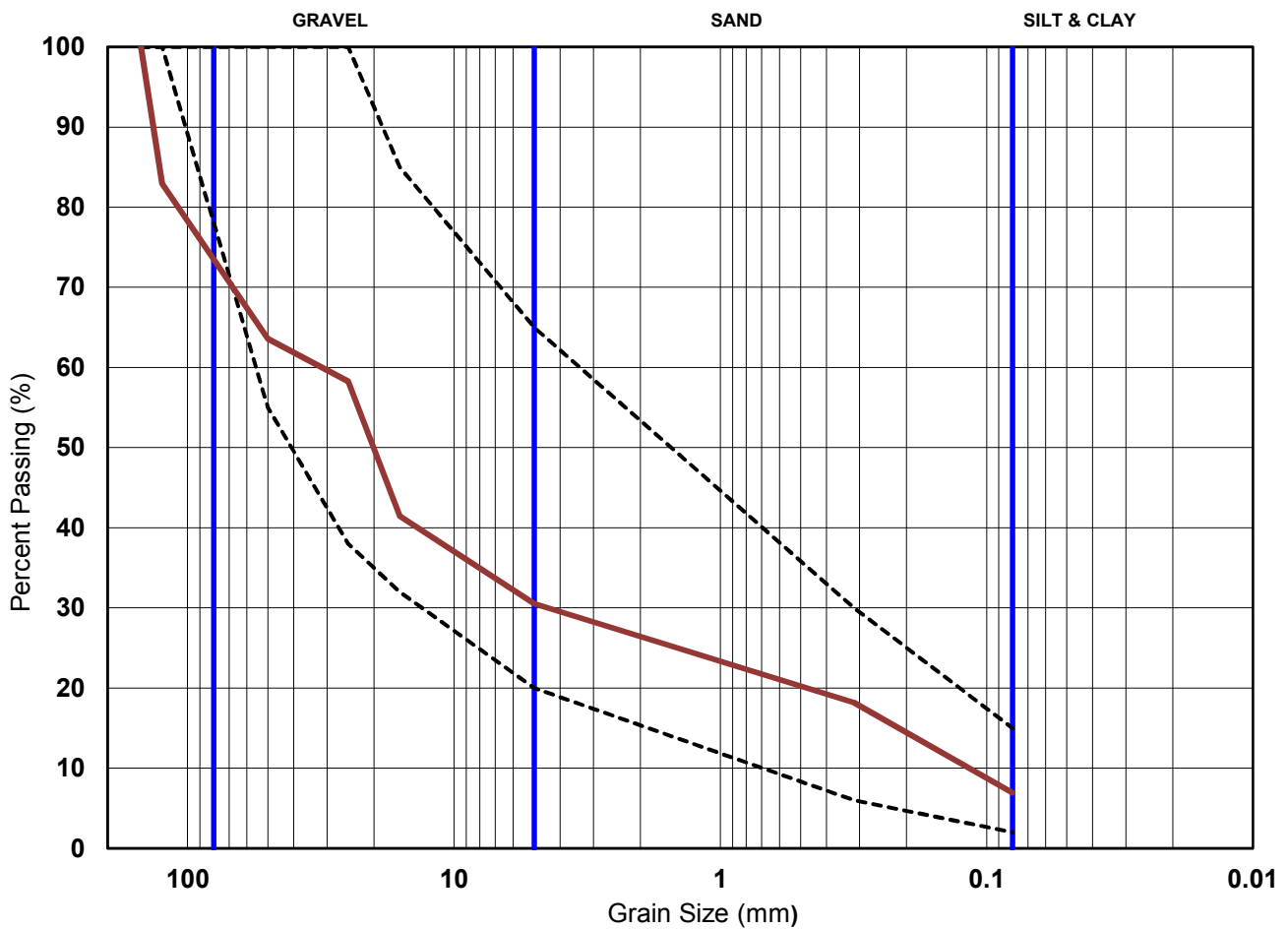
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	150.00	125.00	50.00	25.00	16.00	5.00	0.315	0.080
Passing (%)	100.0	83.0	63.6	58.3	41.4	30.5	18.2	6.9
Spec (%)	N/A	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 69.5%      Sand = 23.6%      Silt & Clay = 6.9%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW



# Laboratory Sieve

# Sample No.: MW15

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: some sand, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

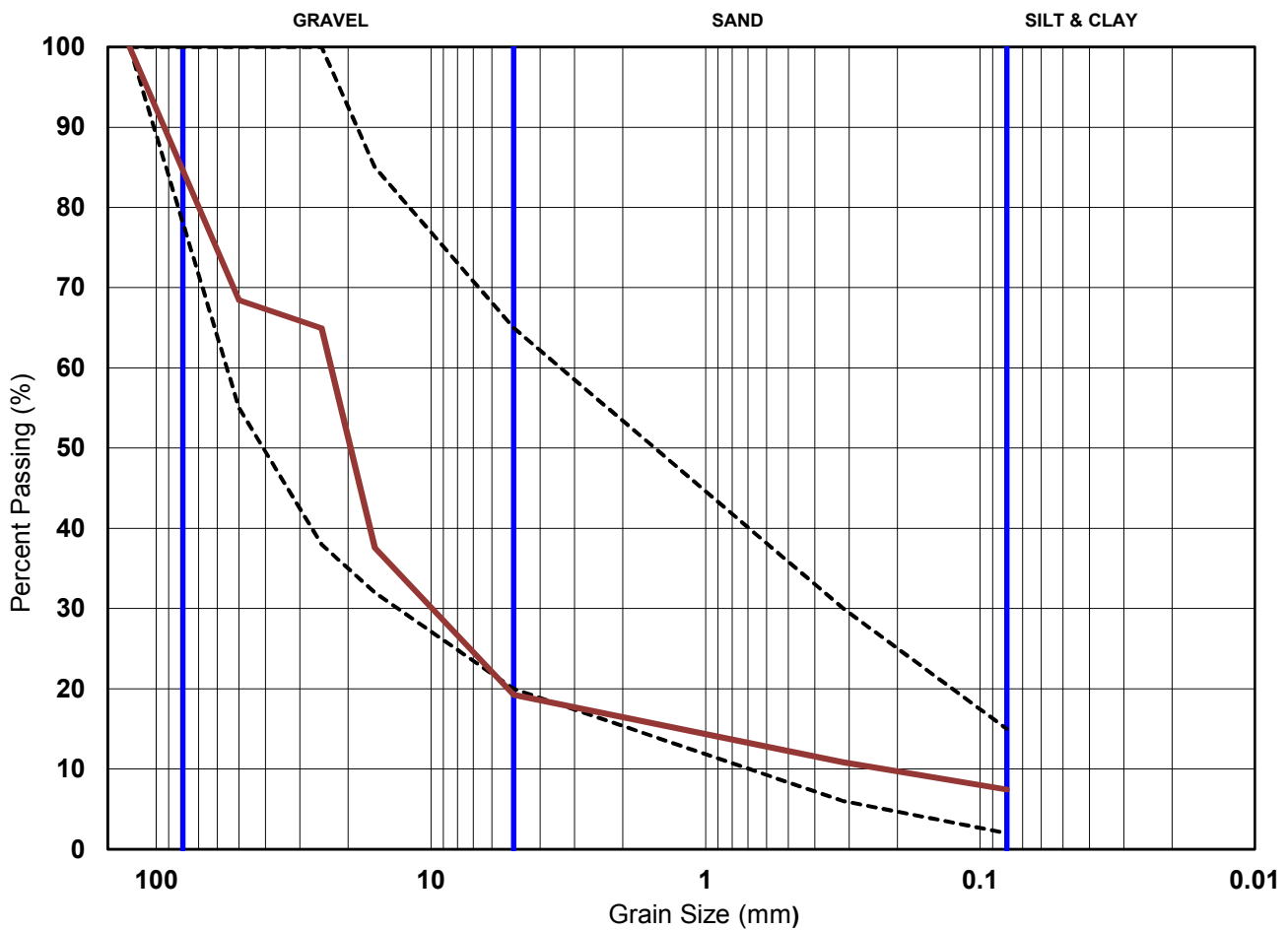
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	68.5	65.0	37.5	19.2	10.8	7.4
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 80.8%      Sand = 11.8%      Silt & Clay = 7.4%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW



# Laboratory Sieve

# Sample No.: MW17

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: some sand, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

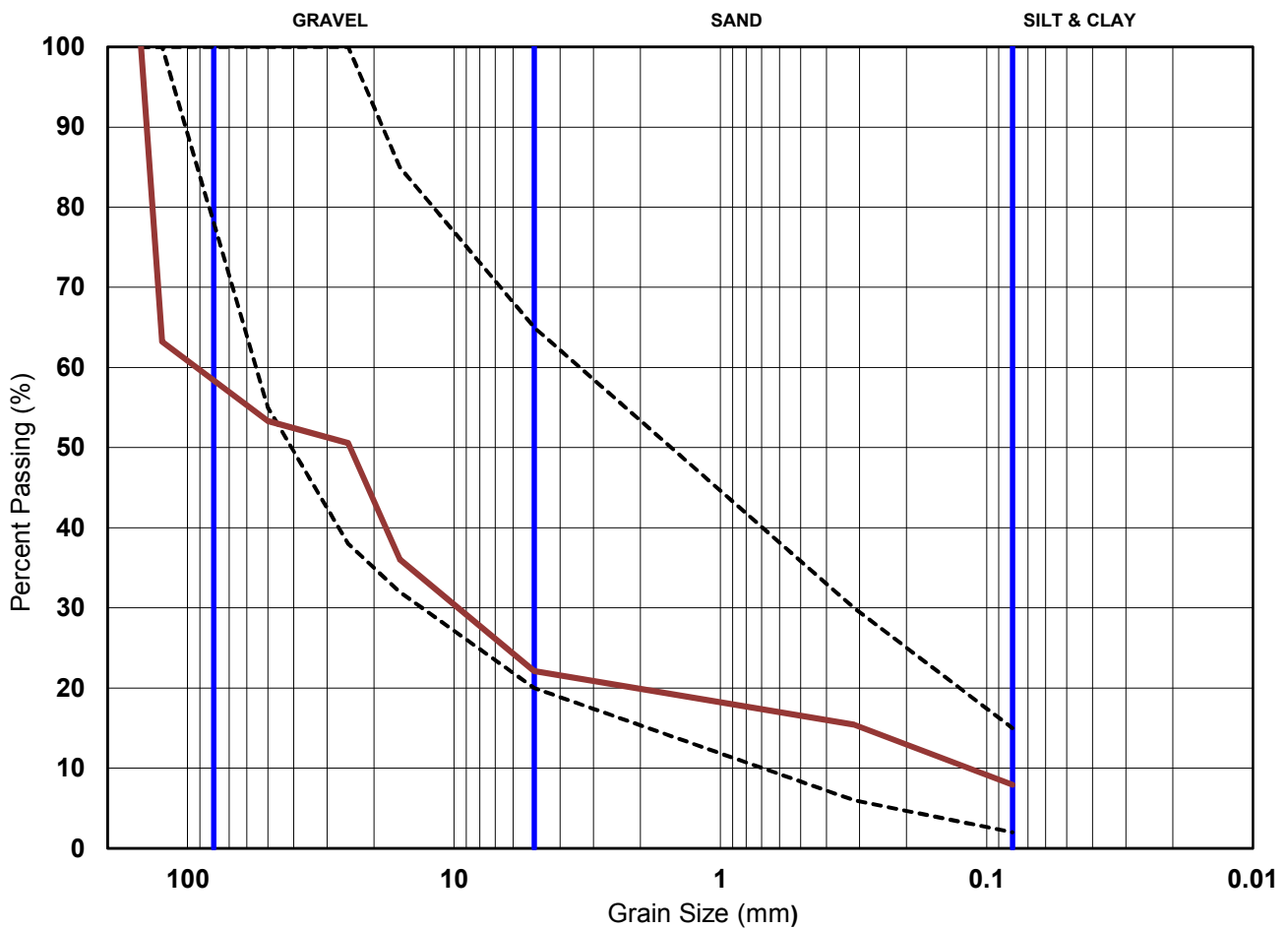
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	150.00	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	63.2	53.3	50.6	36.1	22.1	15.5	7.9
Spec (%)	N/A	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 77.9%      Sand = 14.2%      Silt & Clay = 7.9%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW

# Laboratory Sieve

# Sample No.: MW20

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Bag  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: some sand, trace clay, trace silt.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

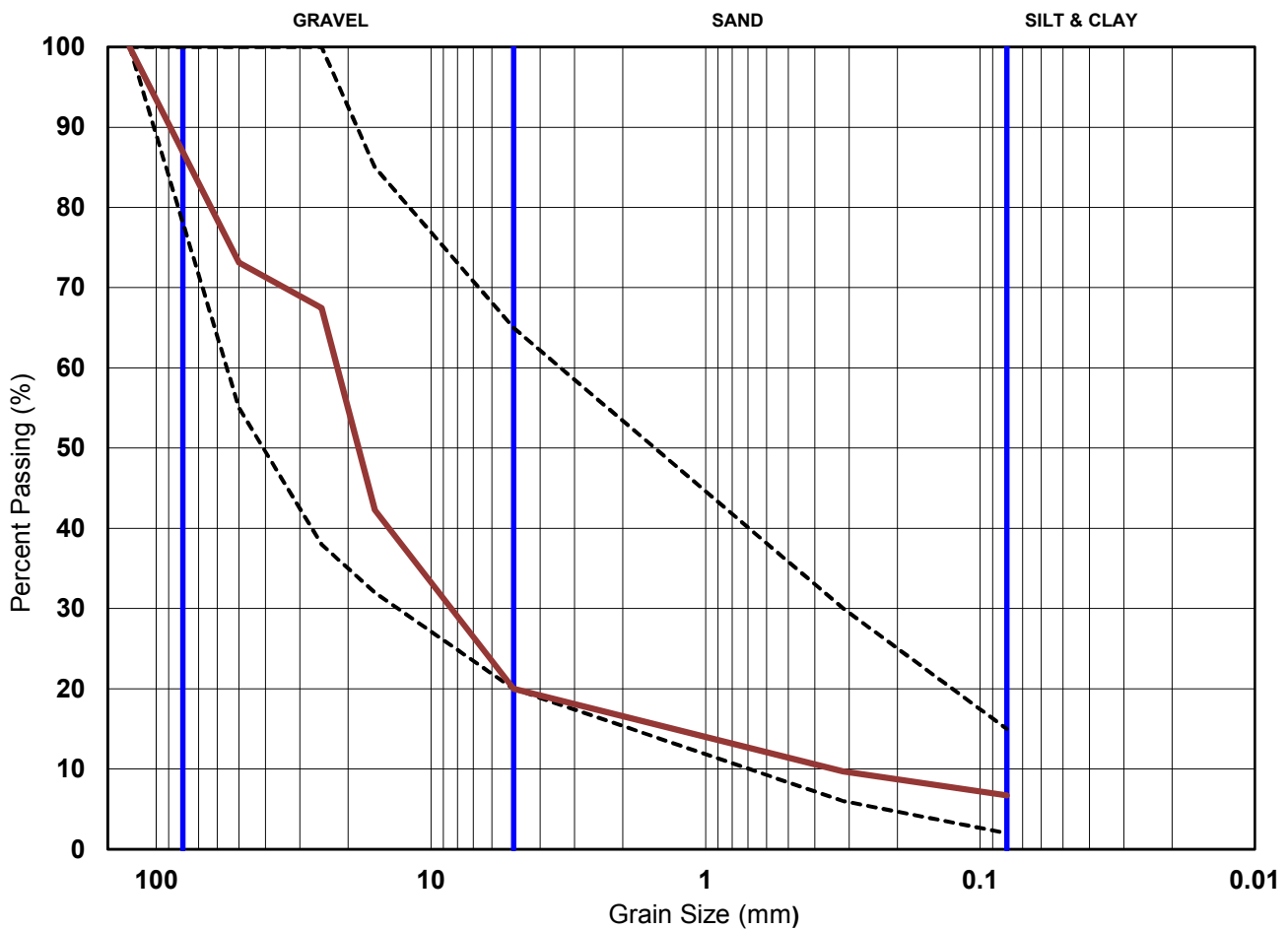
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	73.1	67.5	42.3	20.0	9.7	6.7
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 80.0%      Sand = 13.3%      Silt & Clay = 6.7%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW

# Laboratory Sieve

# Sample No.: MW31

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: some sand, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

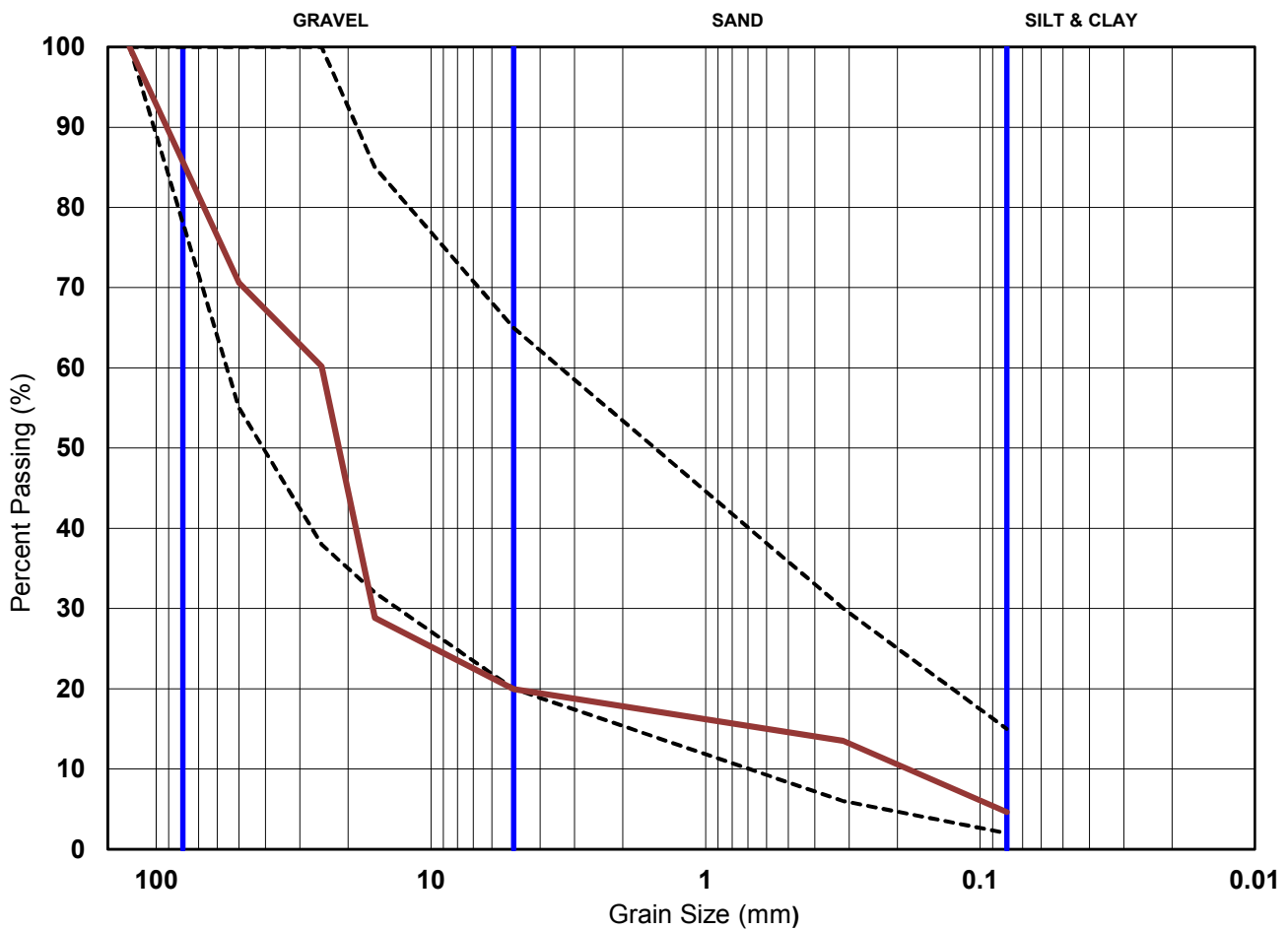
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	70.6	60.2	28.9	19.9	13.5	4.6
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 80.1%      Sand = 15.3%      Silt & Clay = 4.6%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW

# Laboratory Sieve

# Sample No.: MW37

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: some sand, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

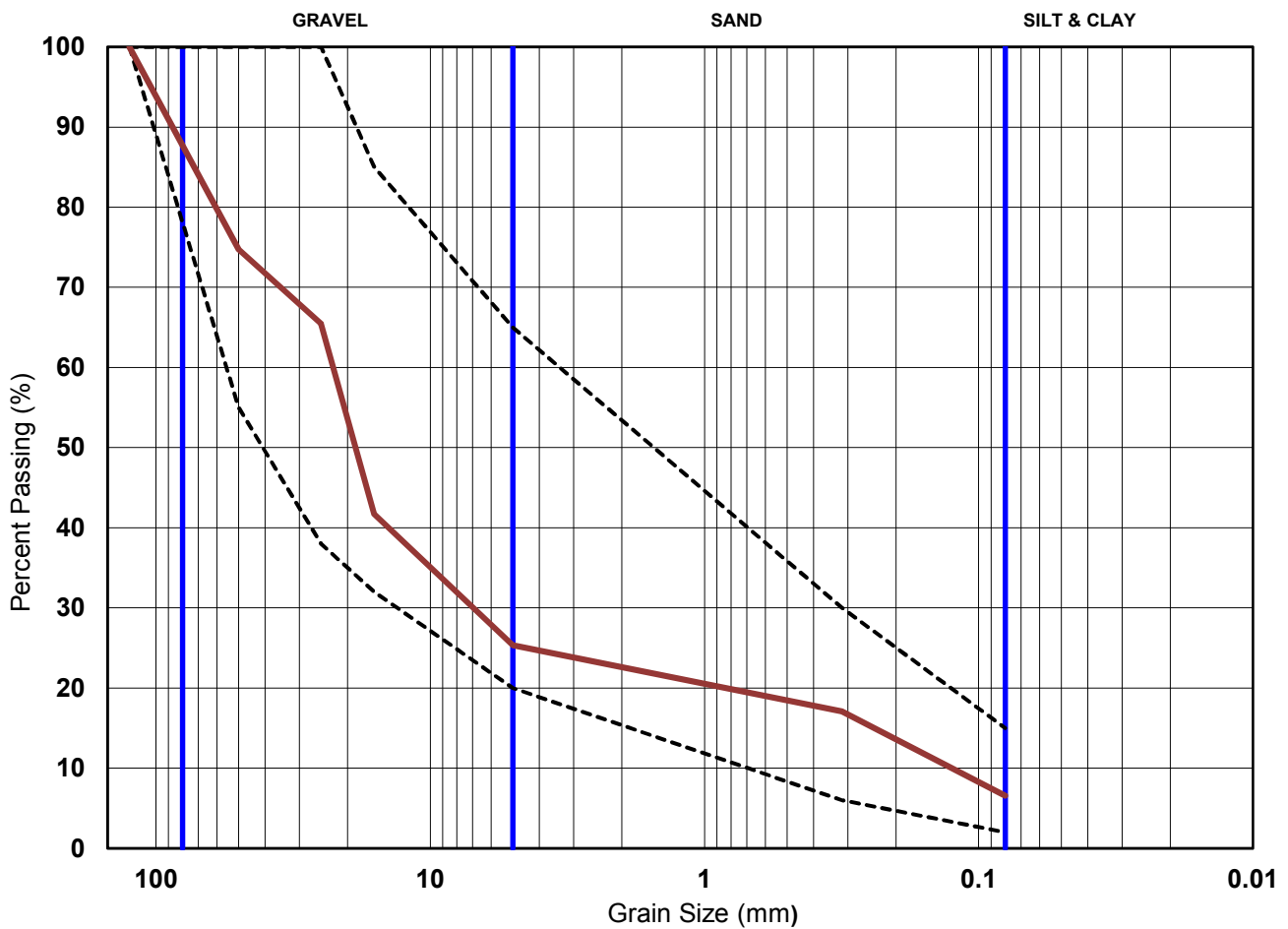
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	74.7	65.4	41.7	25.3	17.1	6.6
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 74.7%      Sand = 18.8%      Silt & Clay = 6.6%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW

# Laboratory Sieve

# Sample No.: MW45

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. of:      **USG**      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Sand: gravelly, some clay, trace silt.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

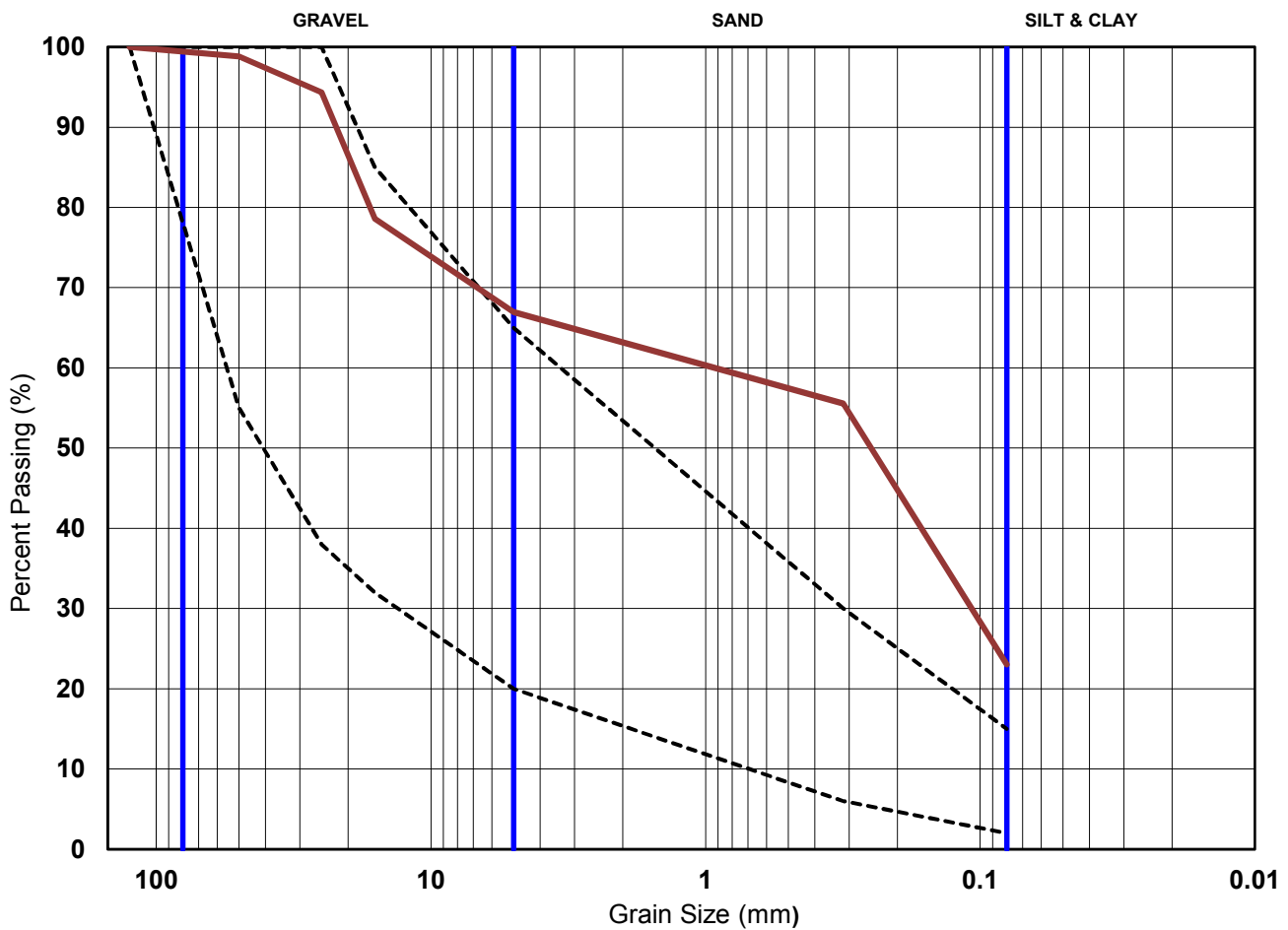
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	98.8	94.3	78.6	66.9	55.5	23.0
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 33.1%      Sand = 43.9%      Silt & Clay = 23.0%



<b>CLIENT:</b> Irwin Ranches Ltd.	<b>FILE No.:</b> USG396
<b>PROJECT:</b> Geotechnical Investigation	<b>DATE:</b> 20-Apr-17
<b>LOCATION:</b> Red Deer, Alberta	<b>TECH:</b> MC/NT/MW

# Laboratory Sieve

# Sample No.: MW47

## Sample Information

**Date:** 19-Apr-17      **By:** N.T../M.W. **of:** USG      **Type:** Pail  
**Location:** Red Deer County, Alberta      **Specification:** ASTM C 136  
**Description:** Gravel: sandy, trace silt, trace clay.

**Specifications:** Alberta Transportation, Standard Specifications for Highway Construction, Section 3.2.  
 Table 3.2.3.1, Specifications for Aggregate, Designation 6, Class 125

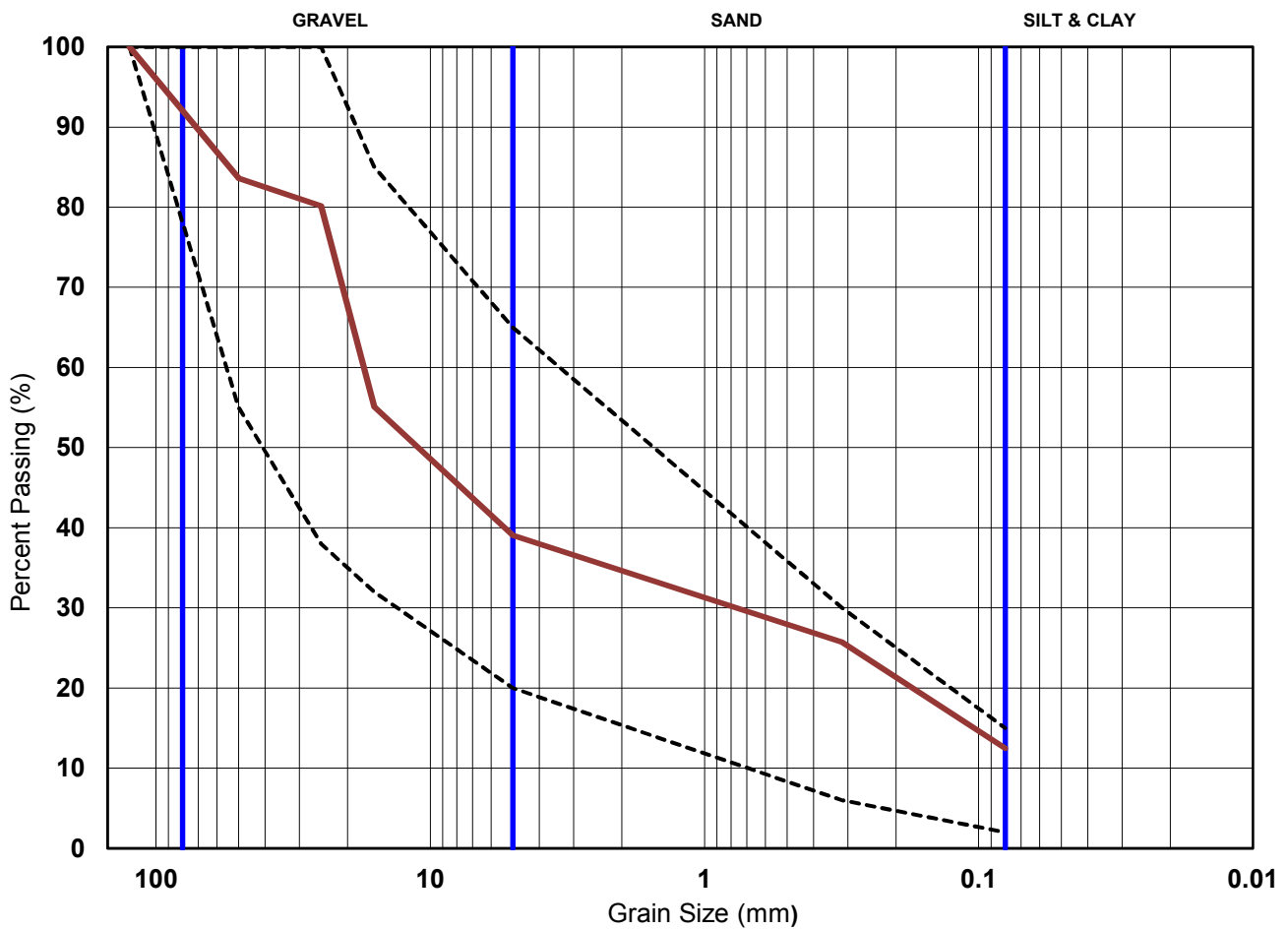
**Comments:** \_\_\_\_\_

Fracture	Method
N/A	N/A

## Sieve Results:

Sieve (mm)	125.00	50.00	25.00	16.00	5.00	0.315	0.08
Passing (%)	100.0	83.6	80.2	55.1	39.1	25.7	12.5
Spec (%)	100	55-100	38-100	32-85	20-65	6-30	2-15

**By Type**      Gravel = 60.9%      Sand = 26.6%      Silt & Clay = 12.5%



**CLIENT:** Irwin Ranches Ltd.

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**PROJECT:** Geotechnical Investigation

**DATE:** 20-Apr-17

**LOCATION:** Red Deer, Alberta

**TECH:** MC/NT/MW