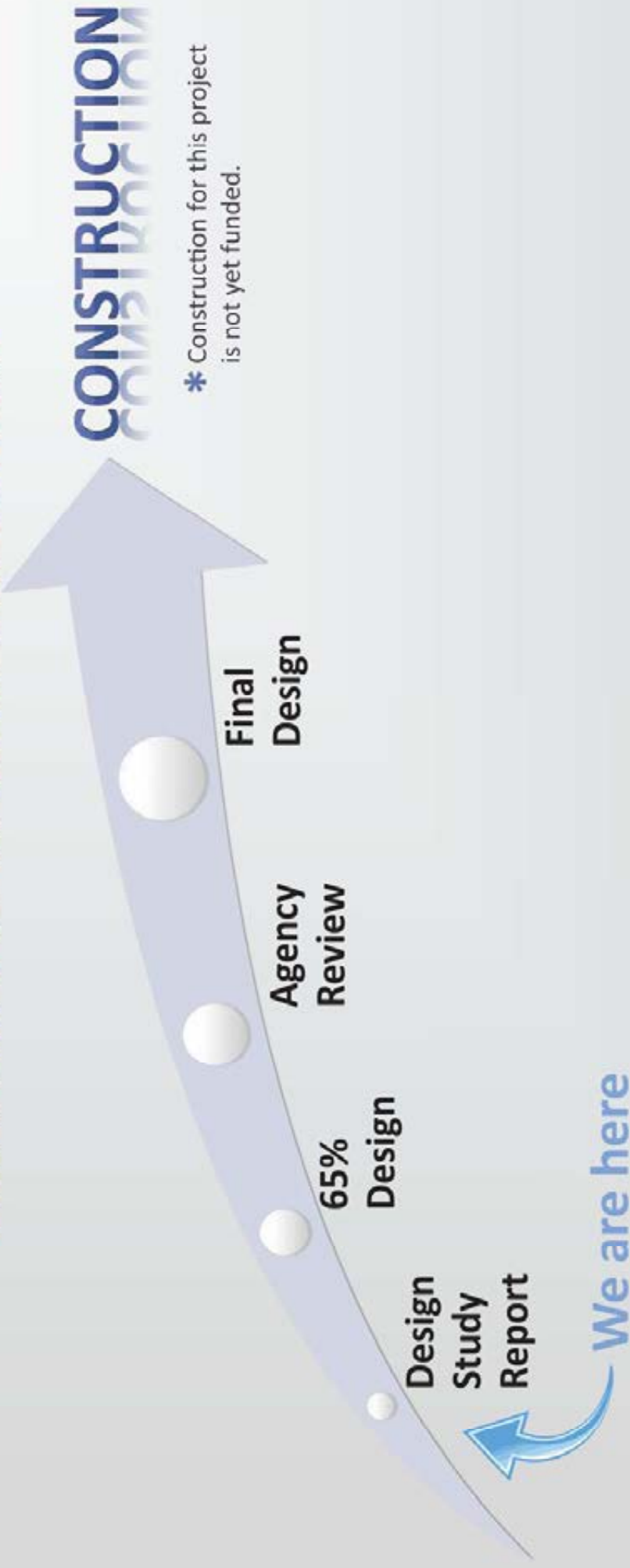




PROJECT TIMELINE

Municipality of Anchorage
Project Management & Engineering Department

IMAGE DRIVE / REFLECTION DRIVE AREA ROAD RECONSTRUCTION



* Construction for this project
is not yet funded.



IMAGE DRIVE / REFLECTION DRIVE AREA ROAD RECONSTRUCTION

Municipality of Anchorage
Project Management & Engineering Department

SUMMARY OF PROPOSED IMPROVEMENTS

- Roadway base and asphalt pavement
- Curb and gutter
- Piped drainage system
- Pedestrian facilities
- Street lighting
- Traffic calming elements





QUESTIONNAIRE RESPONSES (MAILED TO RESIDENTS IN JUNE 2016)

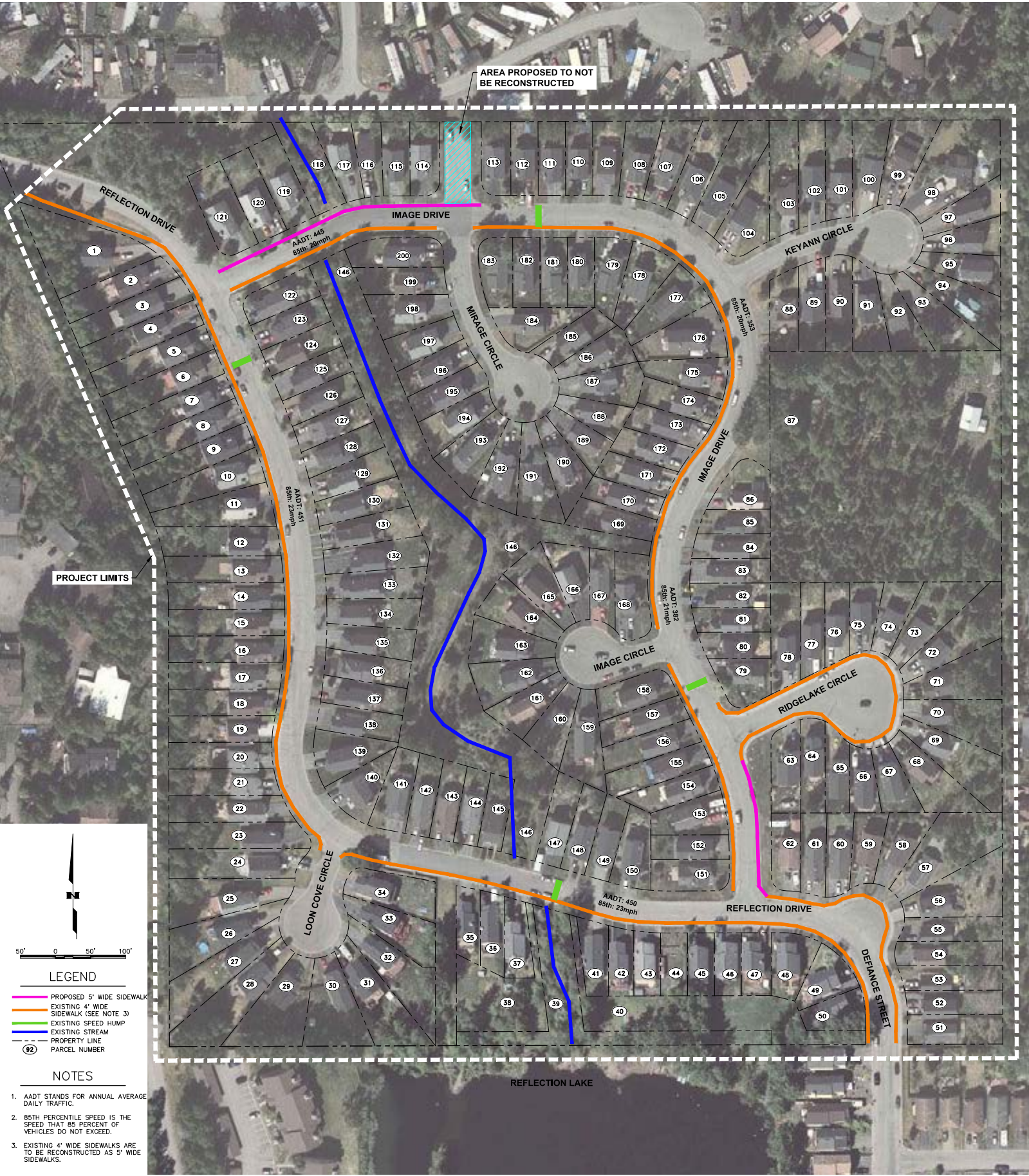
- 1 Have you ever experienced groundwater problems in your crawl space? **No (35)**, Yes (15)
- 2 Do you have a foundation drain or sump pump? **No (36)**, Yes (12)
- 3 Are you aware of any drainage problems within the project area that need to be corrected? **Yes (25)**, No (22)
- 4 Do you have any concerns about speeding in your neighborhood? **Yes (34)**, No (16)
- 5 Do you think additional space in the roadway is required for on-street parking? **No (36)**, Yes (13)
- 6 Are you aware of any sight distance problems that may need to be corrected as part of the project? **No (39)**, Yes (11)
- 7 Do you feel there is a need to construct additional sidewalks in the neighborhood? **No (38)**, Yes (11)

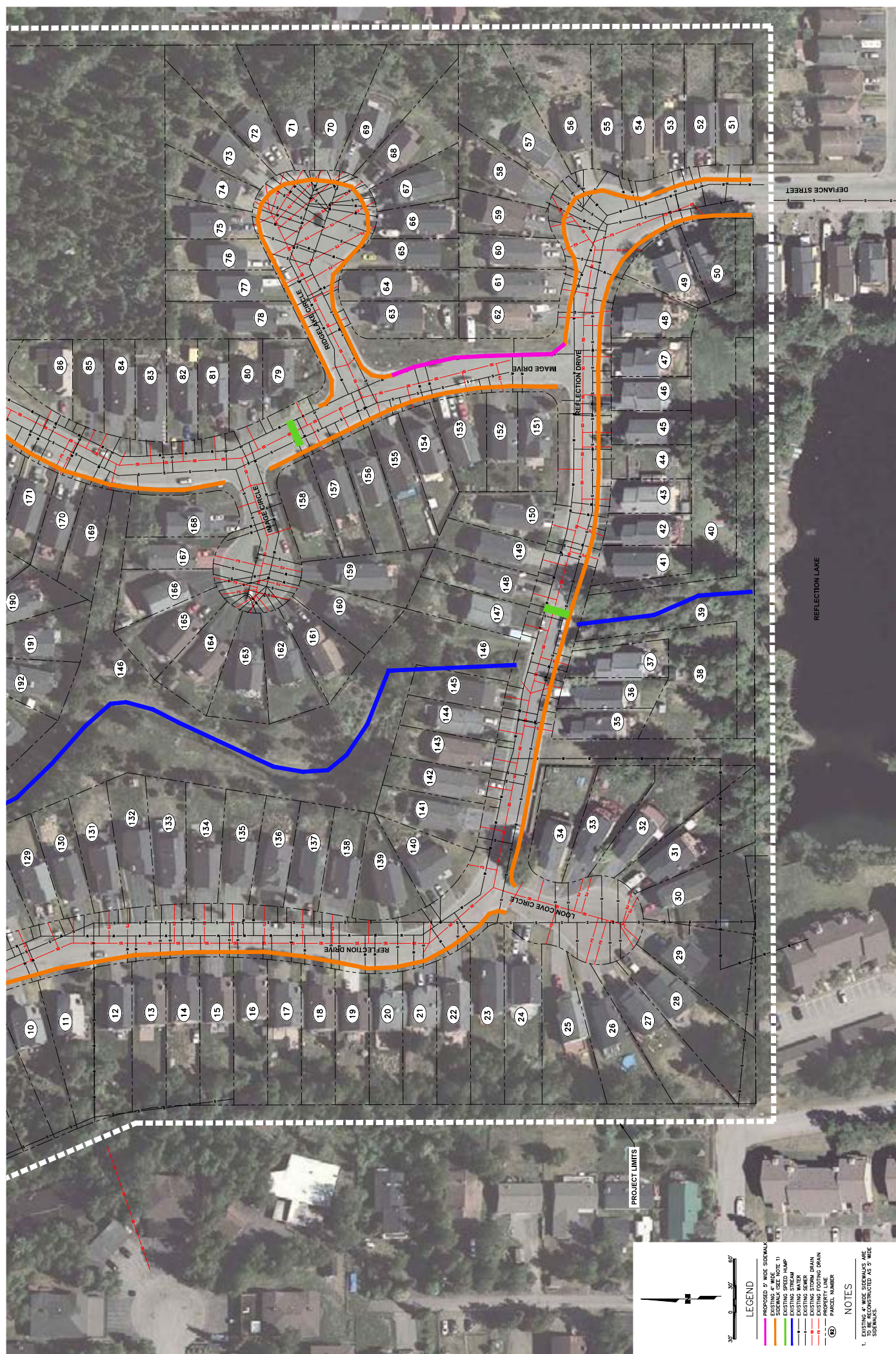


Municipality of Anchorage
Project Management & Engineering Department



CONCEPTUAL CROSS SECTION (IMAGE DRIVE AND REFLECTION DRIVE)





Justin Keene

From: Image/Reflection Area Road Reconstruction Project <cevans@crweng.ccsend.com> on behalf of Image/Reflection Area Road Reconstruction Project <comments@crweng.com>
Sent: Wednesday, December 14, 2016 4:46 PM
To: Justin Keene
Subject: Image/Reflection Project - Open House #1 Materials on Website
Categories: Filed by Newforma



Thank You for Joining Us!

The project team would like to thank you for attending Open House #1 on December 8, 2016. If you were unable to attend or would like to review the materials again, we've posted the open house graphics and comments received on the project website.

www.ImageReflectionDrive.com

For more information and to sign up for e-mail updates, please visit the web page or contact:

Justin Keene, Project Manager

CRW Engineering Group LLC

562-3252 • comments@crweng.com

Jennifer Noffke, Project Administrator

Municipality of Anchorage

343-8130 • noffkejl@muni.org

CRW Engineering Group LLC, 3940 Arctic Boulevard, Suite 300, Anchorage, AK 99503

[SafeUnsubscribe™ jkeene@crweng.com](#)

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Sent by [comments@crweng.com](#) in collaboration with



Try it free today



April 11, 2017

Alaska Communications Systems
600 Telegraph Avenue
Anchorage, AK 99503

Attn: Larry Smith

Re: Image Drive/Reflection Drive Area Road Reconstruction
PM&E Project No. 14-501

Dear Mr. Smith,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

At this time we are analyzing the improvements needed throughout the project area. In order to help address the comprehensive needs of adjacent property owners and businesses, utilities infrastructure, pedestrian facilities, and the community as a whole, we would greatly appreciate any comments from your department regarding the project. In particular, please notify us if you plan any utility extensions or improvements in the project area so that utility work can be coordinated with the roadway and storm drainage improvements. Comments can be mailed, faxed, or emailed (contact information shown below). We would like to include your comments in the project DSR and thank you in advance for your timely response. Please provide comments by Wednesday, May 17th.

Sincerely,

CRW Engineering Group, LLC

A handwritten signature in black ink, appearing to read 'Mariëse von Huene'.

Mariëse von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com

J:\Jobs\Detail\10-13-00 Image Reflection Area Reconstruction\00 CAD\024 GIS\03 DSR\Project Area Map.mxd



IMAGE DRIVE/REFLECTION DRIVE AREA
ROAD RECONSTRUCTION

PROJECT AREA MAP

Project No: 14-50
Drawn By: MvH
Scale: NTS
Date: April 2017
Figure: 1



April 11, 2017

Anchorage Water & Wastewater Utility
3000 Arctic Boulevard
Anchorage, AK 99503

Attn: Joe Sanks

Re: Image Drive/Reflection Drive Area Road Reconstruction
IPWSE Project No. 14-501

Dear Mr. Sanks,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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Sincerely,

CRW Engineering Group, LLC

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Marijse von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

Chugach Electric Association, Inc.
P.O. Box 196330
Anchorage, AK 99513

Attn: Janet Boling

Re: Image Drive/Reflection Drive Area Road Reconstruction
[PMSE Project No. 14-5C]

Dear Mr. Boling,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report [DSR] for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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Sincerely,

CRW Engineering Group, LLC

A handwritten signature in black ink, appearing to read "Marliese von Huene".

Marliese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

Enstar
401 E. 1st Airport Road
Anchorage, AK 99518

Attn: Jeff Hebert

Re: Image Drive/Reflection Drive Area Road Reconstruction
(PM&E Project No. 14-50)

Dear Mr. Hebert,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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Sincerely,

CRW Engineering Group, LLC

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Marliese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

GCI
5151 Fairbanks Street
Anchorage, AK 99503

Attn: Rebecca Colton

Re: Image Drive/Reflection Drive Area Road Reconstruction
IPM&E Project No. 14-501

Dear Ms. Colton,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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Sincerely,

CRW Engineering Group, LLC

A handwritten signature in black ink, appearing to read 'Marliese von Huene', is written over the printed name.

Marliese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

Municipality of Anchorage
Fire Department
100 E. 4th Avenue
Anchorage, AK 99501

Attn: Chief Denis LeBlanc

Re: Image Drive/Reflection Drive Area Road Reconstruction
[PM&E Project No. 14-50]

Dear Chief LeBlanc,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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CRW Engineering Group, LLC

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Marliese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

Municipality of Anchorage
Police Department
4501 Elmore Road
Anchorage, AK 99507

Attn: Chief Christopher Tolley

Re: Image Drive/Reflection Drive Area Road Reconstruction
(PM&E Project No. 14-50)

Dear Chief Tolley,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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CRW Engineering Group, LLC

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Marliese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

Anchorage School District
Transportation Department
3580 Tudor Road
Anchorage, AK 99507

Attn: Dan Merrigan

Re: Image Drive/Reflection Drive Area Road Reconstruction
(P&E Project No. 14-50)

Dear Mr. Merrigan,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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Sincerely,

CRW Engineering Group, LLC

A handwritten signature in black ink, appearing to read "Martiese von Huene", written over a horizontal line.

Martiese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



April 11, 2017

Municipality of Anchorage
Transit Department
3600 Dr. Martin Luther King Jr. Avenue
Anchorage, AK 99507

Attn: Abu Hassan

Re: Image Drive/Reflection Drive Area Road Reconstruction
(PMSE Project No. 14-50)

Dear Mr. Hassan,

CRW Engineering Group, LLC is currently under contract with the Municipality of Anchorage Project Management & Engineering Division to complete a design study report (DSR) for roadway and storm drainage improvements in the area of Image Drive and Reflection Drive from Defiance Street to Boniface Parkway. The project area is shown in the attached figure. The earliest construction could begin is during the summer of 2018.

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Sincerely,

CRW Engineering Group, LLC

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Marliese von Huene, E.I.T.

Project Engineer

E-Mail: mvonhuene@crweng.com

Attachment: Project Area Map

Project Website: www.imagereflectiondrive.com



Meeting Summary

Date: November 6, 2017; 1:30 – 2:30 pm
Attendees: Jennifer Noffke, Russ Oswald (PM&E); Steve Ellis (MOA WMS); Bill Johnson, Justin Keene (CRW)
Location: MOA PM&E Conference Room B
Project: Image Drive/ Reflection Drive Area Reconstruction
Project No: PM&E# 14-50 (CRW#10133.00)
Subject: Improvements in the Flood Plain

I. Purpose of Project, Background & Schedule

- A. The purpose of the project is to reconstruct the failing storm drain system and upgrade the roadways to meet current MOA standards.
- B. MOA PM&E Riviera project replaced undersized culverts in project area and pipe outfall to South Fork Chester Creek in 2013. The flood plain was not re-mapped after project completion.
- C. No base flood elevation is established in project area on FEMA maps. However Steve Ellis stated that base flood elevation is 198.0' mean sea level within our project area.
- D. Currently working on Draft DSR, construction scheduled in 2019 or 2020 pending funding.

II. Existing Storm Drain Layout & Roadway Grade

- A. Existing storm drain pipes are corroded and failing which are causing roadway heaving in places.
- B. Two separate storm drain outfalls, both flow into Riviera storm drain pipe and outfall to Chester Creek:
 - 1. Image storm drain system discharge into Reflection Creek, submerged outlet
 - 2. Reflection storm drain system discharge into west bog
- C. Roadway is flat and less than 0.5% grade in many locations

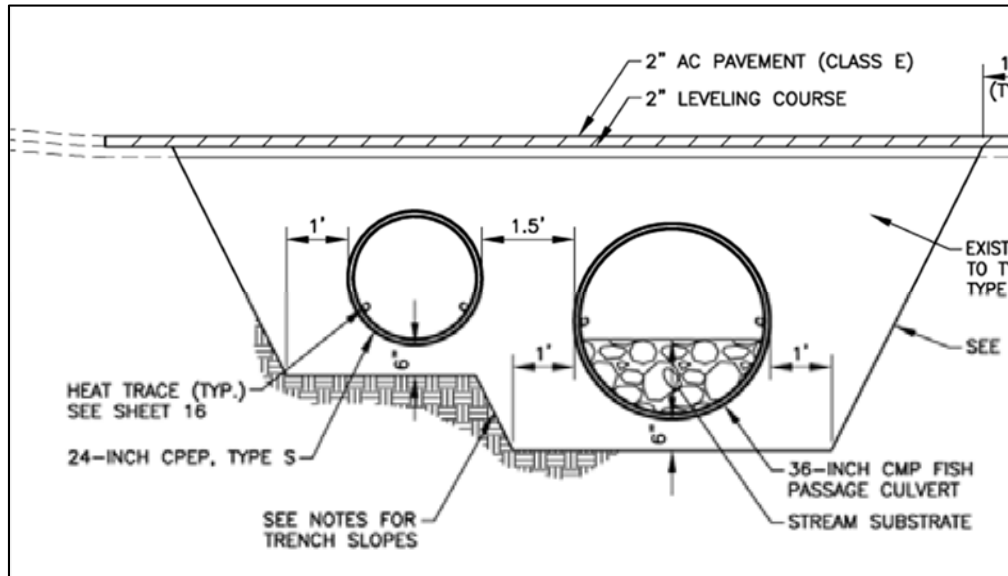
III. Proposed Improvements in Flood Plain and Limitations

- A. Lift station can be installed in flood plain, but electrical control panel and all equipment in or supporting the lift station that cannot function submerged needs to be above elevation 198.0'.
- B. Roadway grade changes are okay in flood plain as long as the grade isn't raised within 30 feet of the Reflection Lake stream crossings at Image Drive and Reflection Drive.
- C. Sewer manhole covers within floodplain need to either be raised above elevation 198.0' or be sealed.
- D. Storm drain pipe, storm drain manholes/catch basins and footing drains will be replaced/installed but there are no limitations regarding placing these items in the flood plain.

IV. Reflection Lake Stream Culverts

- A. If the Image/Reflection project needs to remove and re-install a portion of a culvert in order to facilitate construction, it can be replaced in kind since the MOA PM&E Riviera project recently replaced the culverts. The Image/Reflection project would still need to attain a flood hazard permit and other appropriate permits as required to perform work in the stream.

- B. CRW confirmed after the meeting that the Reflection Lake stream culverts that were installed with the MOA PM&E Riviera project did have stream substrate installed in one of the culverts to facilitate fish passage (see Typical Culvert Crossing Detail from the plan set below).



V. Flood Plain Re-Mapping

- A. Re-mapping the flood plain is not currently in the scope of the Image/Reflection project but if funds become available this work could be added.



Meeting Summary

Date: September 8, 2017; 9:00 – 10:00 am
Attendees: Jennifer Noffke, Russ Oswald (PM&E); Paul VanLandingham (MOA Street Maintenance); Bill Johnson, Joey Hegna, Justin Keene (CRW)
Location: MOA PM&E Conference room B
Project: Image Drive/ Reflection Drive Area Reconstruction
Project No: 14-50 (CRW#10133.00)
Subject: Existing Drainage & Proposed Lift Station

I. Purpose of Project

- A. The purpose of the project is to reconstruct the failing storm drain system and upgrade the roadways to meet current MOA standards.

II. Existing Storm Drain Layout

- A. Existing storm drain pipes are corroded and failing which are causing roadway heaving in places.
- B. Two separate storm drain outfalls, both flow into Riviera storm drain pipe and outfall to Chester Creek:
 - 1. Image storm drain system discharge into Reflection Creek, submerged outlet
 - 2. Reflection storm drain system discharge into west bog
- C. No existing storm drain piped system from Loon Cove currently, but new system proposed with MOA PM&E Loon Cove Drainage Improvements project
 - 1. Reflection Lake is privately owned, thus Loon Cove flows cannot be routed to lake without owner approval. This is likely the reason designer opted to route flows to Reflection Drive system.
- D. Existing Riviera storm drain pipe capacity = 64.9 cfs (60" CMP with 2' stream substrate)

III. Proposed Typical Roadway Section

- A. Subdrain installed below structural section results in existing outfalls being higher in elevation than the proposed subdrain which will require lift station to be installed.

IV. Proposed Lift Station

- A. Discussed the following location options:
 - 1. South of west bog, will discuss with Joe Sanks the existing manhole in the area to see if it has been located recently
 - 2. Mirage Circle dead end
 - 3. Will also consider within the roadway of Image/Reflection intersection
- B. Reviewed the initial matrix list of what the best/worst option is from CRW's opinion regarding options 1 and 2 above, attached to this summary
- C. Utilize detention systems listed below to minimize overall size of lift station and related components (wet well, pumps, etc.)

V. Proposed Drainage Concept

- A. Goal of our project is to maintain pre-development flows into Riviera storm drain pipe.
- B. Reviewed options to maintain pre-development flow to alleviate capacity and flooding concerns of downstream systems (Riviera 60" CMP pipe):
 - 1. Chamber System (Mirage Circle dead end), Paul mentioned that we should not replace with curb and pavement in this area. Could just provide maintenance access. Also CRW will investigate what the ideal pipe size is for cleaning a chamber system as well as access points.
 - a. CRW to review existing water line along east side of Mirage Circle dead end. Plans currently show pipe terminating at dead end, but need to verify and update in plans.
 - 2. Oversized Piping
 - 3. Sedimentation Basin Improvements (West Bog)
 - 4. Combination of stormwater controls
 - 5. Below ground vault with access hatches for cleaning
- C. Paul stated that whatever option we go with for detention it needs to account for being able to access it for maintenance/cleaning. Paul also stated that the project needs to provide any special equipment necessary for maintenance/cleaning to Street Maintenance.
 - 1. CRW will review O&M requirements for detention options and research if specialty equipment is necessary.
- D. Water Quality Treatment
 - 1. Sedimentation Basin
 - 2. OGS/Pre-treatment
 - 3. Location
 - 4. Meter flows into pump station
 - 5. Discharge to Sedimentation Basin

VI. Proposed Storm Drain Route

- A. CRW will investigate routing the proposed upper portion of the Reflection Drive gravity storm drain system near Defiance Street into the Image Drive system instead to reduce lift station flows.
- B. CRW will investigate routing force main storm drain piping on the property (Riviera Terrace Trailer Court) north of the project limits, including ensuring a gravity line won't be feasible to install and outfall all the way to Chester Creek.
- C. CRW will investigate utilizing the existing utility easement along the north side of the properties west of the Mirage Circle dead end to install force main storm drain piping.

VII. Drainage Analysis Results

September 8, 2017

Image Drive/ Reflection Drive Area Reconstruction

Existing Drainage & Proposed Lift Station

Peak Flows: 10-Year, 24-hour Design Storm (Pipe Design)					
Map Location	Existing System (old storm)	Existing System (new storm)	Proposed System (old storm)	Proposed System (new storm)	Description
Design Point B	4.77 cfs	7.34 cfs*	-	-	Reflection Drive Outfall
Design Point C	3.74 cfs	6.26 cfs*	-	-	Image Drive Outfall
Design Point D	-	-	1.39 cfs	2.06 cfs	Proposed Loon Cove Project
Design Point E	-	-	8.51 cfs	15.25 cfs	Combined Outfall (B+C+D)
* Overtopping conditions predicted by drainage model					
Peak Flows: 50-Year, 24-Hour Design Storm (Stream Design)					
Map Location	Existing System (old storm)	Existing System (new storm)	Proposed System (old storm)	Proposed System (new storm)	Description
Design Point A	39 cfs*	50.2 cfs**	39 cfs*	50.2 cfs**	Reflection Creek Flows
Design Point B	3 cfs*	8.16 cfs***	-	-	Reflection Drive Outfall
Design Point C	4 cfs*	7.93 cfs***	-	-	Image Drive Outfall
Design Point D	-	-	-	3.15 cfs	Proposed Loon Cove Project
Design Point E	-	-	-	28.0 cfs****	Combined Outfall (B+C+D)
* Peak flow results from Riviera Terrace DSR					
** Estimated peak flow from Riviera Terrace DSR for new design storm (ratio of new storm over old storm)					
*** Overtopping conditions predicted by drainage model					
**** Surcharged conditions predicted by drainage model					
60" SPP (Riviera Terrace System) Capacity = 64.9 cfs					

	Lift Station Location Options	
Design Factor	Mirage Circle Dead End	South of West Bog
Accessibility	1	0
Minimal Site Work	1	0
Outfall Pipe Drains to Lift Station	0	1
Outfall Pipe Straightforward Route	0	1
Allows Direct Outfall to West Bog	0	1
Minimize Depth of Lift Station	1	0
Utility Impacts	0	1
Easements Required	0	1
Cost	?	?

Total

3

5

Rating Scale:

0 no (worst)

1 yes (best)



Meeting Summary

Date: September 6, 2017; 1:30 – 3:00 pm
Attendees: Jennifer Noffke, Russ Oswald (PM&E); Jeff Urbanus, Kristi Bischofberger (MOA WMS); Bill Johnson, Joey Hegna, Justin Keene (CRW)
Location: MOA PM&E Conference room B
Project: Image Drive/ Reflection Drive Area Reconstruction
Project No: 14-50 (CRW#10133.00)
Subject: Existing Drainage & Proposed Lift Station

I. Purpose of Project

- A. The purpose of the project is to reconstruct the failing storm drain system and upgrade the roadways to meet current MOA standards.

II. Existing Storm Drain Layout

- A. Existing storm drain pipes are corroded and failing which are causing roadway heaving in places.
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 - 1. Chamber System (Mirage Circle dead end)
 - 2. Oversized Piping
 - 3. Sedimentation Basin Improvements (West Bog)
 - 4. Combination of stormwater controls
- C. Water Quality Treatment
 - 1. Sedimentation Basin
 - 2. OGS/Pre-treatment

- D. There is an existing large undeveloped lot south of Keyann Circle that could help retain some of the storm drain flows. This lot is currently for sale. Upon further review it was determined that this lot may not help retain enough flow to make it worth pursuing to purchase it.

V. Proposed Lift Station

- A. Utilize detention systems listed above to minimize overall size of lift station and related components (wet well, pumps, etc.)
1. We discussed 2 possible locations: south of west bog & Mirage Circle dead end. There was also a question of whether two lift stations should be installed. CRW will investigate these options further.
 2. Meter flows into pump station
 3. Discharge to Sedimentation Basin

VI. Proposed Storm Drain Route

- A. CRW will investigate routing the proposed upper portion of the Reflection Drive gravity storm drain system near Defiance Street into the Image Drive system instead to reduce lift station flows.
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Design Point D	-	-	1.39 cfs	2.06 cfs	Proposed Loon Cove Project
Design Point E	-	-	8.51 cfs	15.25 cfs	Combined Outfall (B+C+D)

* Overtopping conditions predicted by drainage model

Peak Flows: 50-Year, 24-Hour Design Storm (Stream Design)					
Map Location	Existing System (old storm)	Existing System (new storm)	Proposed System (old storm)	Proposed System (new storm)	Description
Design Point A	39 cfs*	50.2 cfs**	39 cfs*	50.2 cfs**	Reflection Creek Flows
Design Point B	3 cfs*	8.16 cfs***	-	-	Reflection Drive Outfall
Design Point C	4 cfs*	7.93 cfs***	-	-	Image Drive Outfall
Design Point D	-	-	-	3.15 cfs	Proposed Loon Cove Project
Design Point E	-	-	-	28.0 cfs****	Combined Outfall (B+C+D)

* Peak flow results from Riviera Terrace DSR

** Estimated peak flow from Riviera Terrace DSR for new design storm (ratio of new storm over old storm)

*** Overtopping conditions predicted by drainage model

**** Surcharged conditions predicted by drainage model

60" SPP (Riviera Terrace System) Capacity = 64.9 cfs

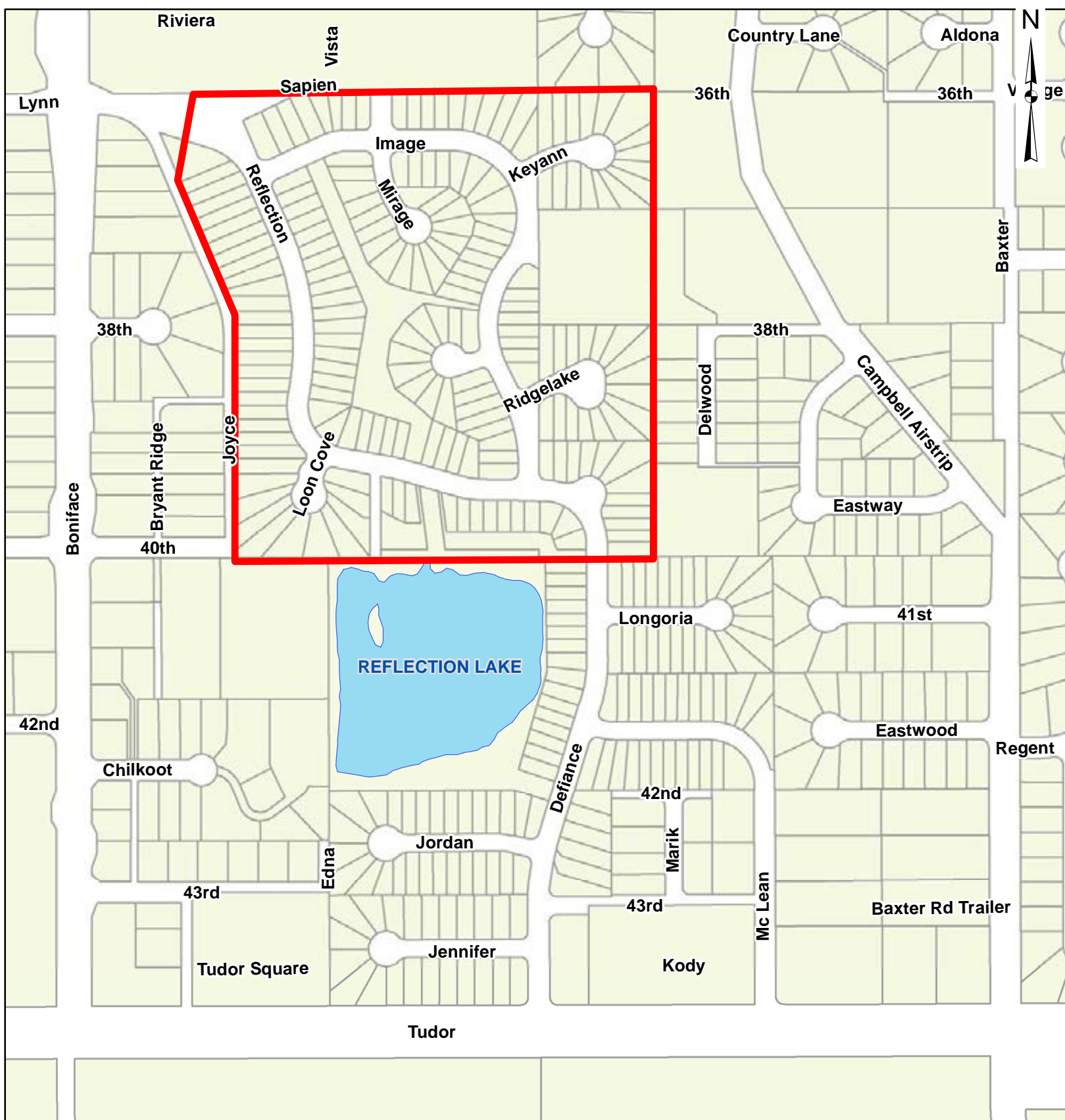


Image Drive / Reflection Drive Area Road Reconstruction
PM&E Project No. 14-50
Mailing Boundary Map

March 2016



Phone Call

PROJECT Image Reflection Area Reconstruction DATE 3/15/2016 4:30 PM - 5:00 PM
10133.00

ORGANIZER Justin Keene SUBJECT [REDACTED]

LOCATION

INVITEES Justin Keene

ATTENDEES

CC

MEETING COMMENTS [REDACTED] called me today regarding the Image/Reflection project. Her cell phone number is [REDACTED] below is a brief summary:

- She lives on Reflection Drive and has been calling the MOA complaining about the failing roadway/sidewalk in front of her home since 2013 when she moved in.
- She asked when construction may occur. I explained that there is no construction funding available currently for this project so it is unknown when construction may occur but the draft design study report is funded so we are making progress by moving the project forward. She was frustrated but understood the current economic challenges across the State of Alaska which affects funding to all municipalities in the state. I explained that this project may acquire additional funds through future MOA roadway bonds and encouraged her to vote. I also mentioned that the project may be constructed in phases depending on the construction funds.
- She has a sump pump but doesn't have much water in her crawl space, she noted here home is higher than the roadway.
- She has the following concerns:
 - Roadway doesn't drain in front of her home, it pools up with water in the curb line.
 - There are lots of heaves in the roadway and it is dangerous to drive. She thinks the heaves are getting worse every year.
 - There are many cracks in the sidewalk which are not safe for pedestrians.
- She ideally would like two sidewalks included in the design.
- I encouraged her to fill out the future questionnaire that we will be sending out this spring and also to attend the future open houses as well.
- Overall she was pretty happy that the project is moving forward.

Draft Geotechnical Report

Appendix L



REPORT

GEOTECHNICAL INVESTIGATION – IMAGE DRIVE / REFLECTION DRIVE AREA ROAD UPGRADE

Image Drive and Reflection Drive, Anchorage, Alaska
(MOA PM&E Project No. 14-50)

Submitted To: Mr. Justin Keene, PE
CRW Engineering Group, LLC
3940 Arctic Blvd., Suite 300
Anchorage, AK 99503

Submitted By: Golder Associates Inc.
2121 Abbott Road, Suite 100
Anchorage, AK 99507 USA

Distribution:
4 Copies – CRW Engineering Group, LLC
2 Copies – Golder Associates Inc.

August 15, 2016

1523636





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1.0 INTRODUCTION

Golder Associates Inc. (Golder) is pleased to present our geotechnical study to support the design and construction of the proposed road upgrades of Image Drive and Reflection Drive in Anchorage, Alaska (Figure 1). We understand that the goal of this project is to reconstruct the existing local roads to current standards. Expected improvements include upgrades to the road structural section including subdrain systems, curb and gutter improvements, and improvements to the existing pedestrian facilities, which may include widening the sidewalk to meet current design standards. Upgrades to the existing storm drain system will also occur, including potentially replacing a storm drain outfall near the intersection of Reflection Drive and Image Drive. The project alignment begins north of the intersection of Reflection Drive and Image Drive and ends along Defiance Street, south of the Image Drive, Reflection Drive, and Defiance Street intersection (Figure 1).

Image Drive and Reflection Drive are characterized as local streets, and currently exist as two 14.5-foot wide paved lanes with Type 2 curb and gutter, and with 4-foot sidewalks on one side of the road. Storm drains exist along both Image Drive and Reflection Drive.

The work presented in this report was performed in general accordance with our agreement for professional services dated March 8, 2016 (10133.00 Image Drive/Reflection Drive Area Road Reconstruction) with CRW Engineering Group, LLC (CRW), who is preparing the project plans and specifications on behalf of the Municipality of Anchorage (MOA).

Our scope of work for this project included:

- Review historical geotechnical investigations within and near the project area
- Perform a site reconnaissance to identify areas of poor pavement performance or distress and observation of the roadway corridor for possible geotechnical concerns
- Perform a field investigation, which included advancing 15 boreholes and soil sampling (Appendix A – Borehole Logs)
- Install 10 standpipes to observe groundwater levels within the project area
- Laboratory testing, including moisture content analysis, grain size distribution by sieve analysis, and hydrometer analysis for frost classification (Appendix B – Laboratory Data)
- Analysis of field observations and testing results, including thermal analysis for design of pavement sections, subdrain requirement evaluation, need for geotextiles, and consideration for reuse of existing materials



2.0 HISTORICAL GEOTECHNICAL INVESTIGATIONS

A search and review of publically available data was completed for the project. The following information presents a summary of applicable data.

- **JMLamb and Associates, Inc. (1984):** Two test pits were advanced on Keyann Circle, presumably for housing developments in the area. One test pit, TP-1, was advanced approximately 50 feet north of the existing paved section of Keyann Circle, and the other test pit, TP-2, was advanced in the center of the circle. Subsurface conditions in both test pits consisted of sand and gravel, with little to no fines encountered. The groundwater was measured at 9.5 feet in each test pit.
- **1984 through 1986 As-Built Records for Water, Sewer, and Storm Drain Improvements:** As-built drawings for the utilities installed during the initial subdivision construction show 18 basic test hole logs in the current project area. The data on the test hole logs is limited to brief soil descriptions, and based on the information presented, the test holes appear to have been advanced prior to site development. The subsurface conditions depicted on the test hole logs show that the project area typically contained a layer of surficial peat that extended to depths up to 5 feet below ground surface (bgs). Below the peat layer, sand and gravel was noted in most areas. Groundwater was not indicated on all test hole logs, but where present, it was generally less than 5 feet bgs.
- **Historical Imagery:** Historical aerial photographs were reviewed to help identify the history of the development in the project area. The aerial photographs were provided by CRW or obtained from other public sources for the years 1973, 1985, 1988, 1996, 2002, and 2015, and copies are presented in Appendix C. The approximate location of boreholes drilled for this study are shown on the aerial photographs for reference.

Based on the reviewed photography, the project area appears to be undeveloped in 1973, and the stream flowing north from Reflection Lake through the subdivision is not evident. In the 1985 photograph, the existing stream channel is present, but the general project area is still not developed. The photograph from 1988 shows that Image Drive and Reflection Drive are both under construction, and several homes are built in the area. The 1996 photography shows that most of the homes in the area have been built, and there is little change in the area between 2002 and 2015.



3.0 SITE RECONNAISSANCE

Golder conducted a visual reconnaissance of the general roadway corridor conditions prior to commencing our field investigation. Image Drive and Reflection Drive provide access to residential, single-family properties. Photographs of the general road conditions are presented in Appendix D.

Both Image Drive and Reflection Drive currently have 4-foot wide sidewalks on one side of the road. The existing roadway surface width is approximately 33 feet wide (measured to back of curb), providing two lanes of vehicle traffic. Road conditions include moderate frost cracking, especially on the west and north parts of the project, as well as persistent transverse cracks in the pavement that are likely related to the many utility connections seen in the as-built plans and differential frost heave within the trench backfill. Insulation was noted on the as-built plans for Reflection Circle over a shallow storm drain. Differential movement between insulated and uninsulated areas may contribute to the observed pavement cracking in this area, but the extent of the insulation is unclear from the available data.

There are frequent pavement patches at manholes, indicative of movement of the manholes relative to the road surface, as well as periodic depressions along the curb and over the branch of Chester Creek culvert. In addition, the Portland cement concrete sidewalks are badly broken in many areas. The broken sidewalk is likely related to poor subgrade conditions or frost movement, which is exacerbated by vehicles that were seen parking on the sidewalks in some areas and any drainage from the lots that may concentrate water to the sidewalk areas.



4.0 FIELD INVESTIGATION

The field investigation consisted of drilling and sampling 15 geotechnical boreholes (BH-01 through BH-15) on March 22 and 23, 2016 at the locations shown in Figure 2. Borehole locations were selected in consultation with CRW and followed the guidelines presented in the 2007 MOA Project Management and Engineering (PM&E) Design Criteria Manual (DCM) (Section 1.7 – Soil Investigation Standards). Prior to drilling, borehole locations were cleared by local utilities.

4.1 Subsurface Drilling

Drilling was performed by Discovery Drilling Inc. (Discovery) of Anchorage, Alaska, using a truck-mounted CME-75 drill rig equipped with nominal 8-inch outside diameter (OD) hollow-stem augers. When drilling through the asphalt pavement, an approximately 12-inch diameter hole was cut in the pavement with a saw tooth bit prior to advancing the borehole.

Golder geologist, Ms. Jessica Feenstra, supervised the field exploration program. She logged the recovered soil samples and managed the field operations. Most boreholes were advanced to a nominal depth of 15 feet bgs. The borehole located north of the intersection of Reflection Drive and Image Drive (BH-1) was advanced to 25 feet bgs. Soil samples were visually classified in the field according to the Unified Soil Classification System (USCS), which is summarized in Figure A-1 of Appendix A. The frost classification of the soil samples are described using the designations summarized in Figure A-2, which are consistent with the classification system outline in the MOA DCM (DCM, 2007). Additional soil characteristics such as consistency, moisture, texture, and relative density are noted on the borehole logs, which are presented in Appendix A (Figures A-3 through A-17).

4.2 Sample Collection

Representative disturbed samples of the soils encountered were obtained by driving a split-spoon sampler into the soil ahead of the auger, 18-inch samples were attempted at 2.5-foot intervals to 10 feet bgs with additional samples collected at 5-foot intervals thereafter. In addition, auger cuttings were collected from the surface to 24 inches bgs to evaluate materials in the existing road structural section. Recovered soil samples were visually classified before being individually sealed in polyethylene bags and transported to Golder's Anchorage laboratory for further examination, classification, and testing.

Drive samples were collected using a 3-inch OD split-spoon sampler. The sampler was driven using an auto-hammer with a 340-pound drop weight and a free fall distance of 30 inches. The number of blows required to drive the sampler through each 6-inch interval of the sampling attempt, and the number of total blows required to advance the sampler, are recorded on the borehole logs. Blow counts shown on the borehole logs are field values that have not been corrected for overburden, sampler size, or other factors.



4.3 Standpipes and Borehole Completion

Following the completion of drilling and sampling, water level monitoring standpipes were installed in 10 boreholes (Boreholes BH-02 through BH-05, BH-07, BH-09 through BH-11, BH-13, and BH-14). The standpipes consist of 1-inch PVC pipe with hand-slotting starting approximately 5 feet above the water depth encountered during drilling and continued to the bottom of the PVC. The annular space around the standpipes was backfilled with cuttings to within 2 feet of the surface, with pea gravel added to the bottom of pavement. The holes were sealed by placing cold-patch asphalt around a 7-inch flush mounted cover. Boreholes where standpipes were not installed were completed by backfilling with drill cuttings and pea gravel, and then capped with cold patch asphalt matching the existing pavement surface. Several boreholes were advanced off the road surface. In these locations, native soil was placed at ground surface. Potentially contaminated soils were encountered in Borehole BH-08, and therefore, the borehole was backfilled with chipped bentonite that were allowed to hydrate in place.

4.4 Groundwater Monitoring

Groundwater was noted when observed while drilling. Additional groundwater levels in the standpipes were measured and recorded on April 5, 2016 and again on July 15, 2016. Groundwater measurements will be collected again in the fall. Groundwater levels observed during drilling and measurements made thus far are presented on the borehole logs in Appendix A, and also in Table 1.

4.5 PID Field Testing

Collected soil samples were screened immediately after being placed into a polyurethane bag with a Photo Ionization Detector (PID) to estimate the presence of volatile organic compounds (VOC). The PID was calibrated at the beginning of each field day with 100-parts per million (ppm) isobutylene calibration gas. The PID used was equipped with a 10.6-eV lamp. Prior to screening, each sample was shaken or agitated for 15 seconds to assist volatilization. After vapor development, the PID sampling probe was inserted to about one-half the headspace depth and the highest measurement was recorded, which was normally between 2 and 5 seconds after probe insertion. Care was taken when inserting the sampling probe into the bag to avoid uptake of any moisture or soil particles. The field PID measurements are presented on the borehole logs in Appendix A.



5.0 LABORATORY TESTING

Laboratory tests were performed to measure index properties of the soil samples, which are used to develop correlations with the engineering properties of the soil. Moisture content tests were run on each soil sample and were conducted according to procedures described in ASTM D 2216. In addition, the grain size distribution (ASTM D 6913), grain size distribution with a hydrometer (ASTM D 422), Atterberg Limits (ASTM D4318), and Organic Content (ASTM D2974) were determined for selected samples.

Laboratory test results are summarized in Appendix B, Table B-1. Selected laboratory testing results are also presented on the borehole logs. Results of particle size analyses tests are presented graphically in Figures B-2 through B-5.



6.0 SITE CONDITIONS

6.1 Surficial Geology

The Image Drive/Reflection Drive subdivision is situated along the South Branch of the South Fork of Chester Creek. Historically, this area was poorly drained with shallow groundwater and several feet of peat along portions of the road, as shown in utility drawings. The peat was probably removed during construction but may be present on some of the lots and near the back of the sidewalk and curb at some locations. Below the peat, geologic mapping by R.A. Combellick with the Alaska Division of Geologic and Geophysical Surveys in 1999 indicates the presence of alluvial material overlying glacial drift, which also bounds the area on the east and west. The alluvial material is expected to be relatively free draining compared to the glacial drift.

6.2 Subsurface Conditions

Subsurface conditions encountered along the alignment primarily consisted of sand and gravel with silt to silty sand with gravel fill to depths of about 5 feet, underlain by sand and gravel with varying silt contents. Isolated zones of organic material were observed in several boreholes below the fill material. Based on our review of historic geotechnical data in the project area, the fill material was likely imported to the project site after removal of organics from beneath the roadway. The only borehole that contained significantly different soil conditions was Borehole BH-01, which silt was observed from 12.5 to 26.5 feet bgs.

The average moisture content of the fill material was measured to be approximately 5 percent. The averages fines content of the tested fill material was approximately 12 percent, and ranged from approximately 8 to 16.5 percent.

Three boreholes, Borehole BH-06, BH-08 and BH-12, were advanced off the road section, beyond the curb on the side of the road. In these boreholes, granular material was observed to the depths explored. Organic material was observed intermixed with the granular material in two of the three boreholes.

Groundwater levels were observed at the time of drilling, and measured approximately two week after completion of drilling in the ten boreholes with installed PVC standpipes. Observed and measured groundwater levels are presented below in Table 1.

**Table 1: Summary of Groundwater Measurements**

Borehole Number	Borehole Depth (feet)	While Drilling ⁽¹⁾ Groundwater Depth (feet)	4/5/2016 Groundwater Depth (feet)	7/15/2016 Groundwater Depth (feet)
BH-01	26.5	Not Observed	No PVC installed	No PVC installed
BH-02	16.5	4	3.4	4.0
BH-03	16.5	5	4.4	5.5
BH-04	16.5	5.3	3.9	4.3
BH-05	16.5	4.5	3.0	3.7
BH-06	16.5	5.8	No PVC installed	No PVC installed
BH-07	16.5	3.7	3.6	3.7
BH-08	16.5	5	No PVC installed	No PVC installed
BH-09	16.5	5	2.9	3.1
BH-10	16.5	5	3.8	3.5
BH-11	16.5	7	3.5	3.6
BH-12	16.5	5	No PVC installed	No PVC installed
BH-13	16.5	5	4.8 ⁽²⁾	4.8
BH-14	16.5	7.5	5.9	6.0
BH-15	16.5	7.5	No PVC installed	No PVC installed

Notes:

- 1) Water level depth observations were collected while drilling.
- 2) Measured on 4/13/2016 due to access constraints on 4/5/2016.

6.2.1 Potential Contaminated Soils

During the geotechnical field program, indications of potential hydrocarbon contamination in the soil was observed in a sample collected from Borehole BH-08. The sample collected from 10 to 11.5 feet bgs (Sample # 5) had a PID reading of 33.8 ppm and had a slight petroleum hydrocarbon odor. CRW was contacted immediately after encountering the potentially contaminated soil, and after discussions with CRW, the borehole was backfilled with bentonite chips.

Our scope of services did not include collecting petroleum contaminated soil samples in accordance with Alaska Department of Environmental Conservation (ADEC) guidelines and requirements. However, at the request of CRW, we submitted to the SGS North America, Inc. (SGS) laboratory in Anchorage, Alaska for chemical analysis based on the elevated PID reading and slight petroleum hydrocarbon odor. The sample was submitted for chemical analysis approximately two weeks after sampling. The sample was analyzed for Gasoline Range Organics (GRO), Diesel Range Organics (DRO), Residual Range Organics (RRO) and Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX) using the respective methods AK101, AK102, AK103, and SW8021B. The chromatogram provided by SGS for this sample indicates that the fuel present is a weathered diesel fuel. Results of the testing are presented in Appendix E.



7.0 ENGINEERING DISCUSSION AND RECOMMENDATIONS

7.1 Road Structural Section Options

Based on the findings discussed previously, we developed several road structural section options, utilizing the current version of the DCM as the reference.

7.1.1 Minimum Section Thickness

Section 1.10, "Road Structural Fill Design", of the DCM states that the mandatory road structural section design objectives are to minimize frost penetration into frost susceptible subgrade soil, movement of fine-grained soil into the structural section, and differential frost heaving. Two design methodologies for determining the minimum structural section based on frost penetration are presented in the DCM and summarized below.

- **Complete Protection Method** – this method involves estimating the depth of frost penetration in order to determine the depth of soil that should be removed in order to contain seasonal frost penetration within the structural section.
- **Limited Subgrade Frost Penetration Method** – this method allows for limited frost penetration in to the subgrade soil, and is based on the assumption that limited subgrade frost penetration will restrict roadway surface movements to levels that will not adversely affect pavement life or surface quality. The DCM allows for frost penetration up to 10 percent of the pavement structural section design thickness.

The Berg2 computer software program was used to calculate the estimated total frost penetration depth and required section thickness necessary to comply with the requirements of the DCM. The program uses climate parameters for Anchorage along with typical thermal parameters for the soils encountered along the road alignment. The Berg2 analysis indicated the potential for up to 10 feet of frost penetration into the sand and gravel that is typical below the existing road section. However, rigid board insulation can be used to reduce the overall depth of gravel required in the structural section.

The calculated frost penetration is related to the design freezing indices used in the Berg 2 Program, and is also affected by the moisture content of the soil during freezing, which may vary with changes in groundwater level. In addition, the calculated depth of frost penetration does not account for the effects of convective heat transfer associated with groundwater flow and the details of the site hydrogeology that could be determined with additional field investigation.

Based on our experience in the Anchorage area we expect that a reconstructed road section incorporating insulation and allowing for insulation will be less costly than a road without insulation and replacement of in situ soil with non-frost susceptible (NFS) soil for the full depth of potential frost penetration. In addition, an uninsulated section will have more potential for differential frost heave than an insulated section. Therefore, we recommend the insulated structural sections shown in Figures 3 through 5 as a base case for design. The base case section includes a minimum two inch pavement thickness, which is required by the



Municipality of Anchorage Standard Specification (MASS) for roads like those in the project area that are classified as 'Secondary Streets'.

Base Case Structural Section to Limit Frost Penetration

■ Asphalt Pavement	2 inches
■ Leveling Course	2 inches
■ MOA Type II-A	18 inches
■ Board Insulation	2 inches
■ MOA Type II	24 inches
■ MOA Type A Geotextile	--
■ <u>Total Section Thickness</u>	<u>48 inches</u>

The calculated frost penetration with this section is 52 inches, is consistent with the allowable frost penetration described in the DCM.

Organic soils were observed in Boreholes BH-07 and BH-13 below the fill material and also observed in historical boreholes advanced in the area. Based on these findings and the prevalence of organic soils observed in the historic boreholes, we conclude that organic soils may exist at other locations along the road. All organic material encountered in road excavations should be removed and replaced with material meeting MOA Type II specifications.

7.1.2 Subdrainage

It is recommended that the road sections are constructed with subdrains. In general, water level readings suggest the groundwater table is within or just below the anticipated structural section thickness, with water measured as shallow as 2.9 feet bgs in Borehole BH-09. It is possible that seasonal or annual fluctuations in this water table can occur with the groundwater level rising into the pavement structural section in the areas where it was not encountered during the exploration. Infiltrating water and subsurface water will tend to collect in the more permeable pavement structural section fill soils. Installing subdrains will improve overall road performance where groundwater has the potential to infiltrate into the structural section.

The best overall drainage in areas of relatively shallow groundwater like at this site is typically provided by subdrains located on both sides of the road and at depths sufficient to maintain groundwater levels below the insulation and to prevent seasonal freezing of the subdrain, like those shown in Figure 3. However, the resulting subdrains are frequently relatively deep and may not be economical, especially if they do not flow by gravity and require use of lift stations, as we understand may be required at this site. A less costly drainage option that is often used in Anchorage because of limits on project funding or consideration of subdrain hydraulics is a perforated storm drain like that shown in Figure 4. This section may result in poorer structural section performance over time when compared to the use of dual subdrains. Additionally, the option shown in Figure 4 does not mitigate adverse subdrain hydraulics. Hence, the option without



subdrains shown in Figure 5 may also need to be considered at this site. The optional section shown in Figure 5 may be subject to periodic flooding of the section with an accompanied reduction in strength, as well as being more subject to frost differential movement of the road in areas where the groundwater rises above the insulation layer. Additional maintenance costs should be anticipated where subdrains or perforated storm drains cannot be used. However, we expect that road performance will be at least as good as the current uninsulated section because the frost susceptible soils in the existing road will be replaced by NFS sand and gravel.

7.2 Board Insulation

Board insulation used to insulate the road structural section should have a minimum compressive strength of 60 psi and maximum water absorption of 0.3 percent by volume in accordance with the current version of MASS. This insulation should have a minimum R-value of 9. A minimum of 18 inches of gravel fill should be placed over the insulation to protect it from being crushed by heavy wheel loads during construction. This fill layer also reduces the potential for differential icing between insulated and uninsulated pavements.

To reduce potential rolling of the curb caused by frost heave, board insulation should extend a minimum of 3 feet beyond the back of the curb or 1 foot beyond the back of the sidewalk. Past experience has shown this works well in most applications. However, in the past, MOA has reduced the width of board insulation to extend no more than 1 foot behind the back of curb when budget or right-of-way constraints exist. This approach increases the risk of the curb heaving up and rotating “curb rolling”. In general, the potential for curb rolling decreases as the distance the insulation is extended behind the back of the curb is increased.

Special consideration should be given to transitions between insulated and uninsulated road structural sections. These areas include transitions at the beginning and ending of the project, intersections with cross streets, and residential driveway entrances. The insulation should extend out from the roadway section 8 to 12 feet and the thickness reduced in these areas in order to minimize potential for differential heave. The insulation can be tapered from an R-value of 9 to an R-value of 4.5 in the transition zone. Grades and cross-slopes should be maintained within the excavations and fill embankments such that the base and subbase can drain.

7.3 Geotextiles

The road design should include a geotextile at the base of the structural fill section, as shown in Figures 3 through 5. The use of a geotextile fabric should prevent migration of fines and promote lateral drainage at the base of the structural section.

To preserve the integrity of the structural sections over the frost susceptible subgrade, we recommend that a non-woven geotextile (MASS Class 2, Type A) is placed on top of the excavated subgrade soils prior



to placement of classified fill and insulation, if used. The geotextile should also be extended up the sides of excavations.

General practice is to install the geotextile transverse to the road centerline. Placing the fabric longitudinally may result in large overlaps because fabric widths may not coincide well with the width of subgrade to be covered. Joints should be overlapped in accordance to the manufacturer's recommendation for compact subgrades. If soft or loose subgrades are encountered along the alignment, sewing of the joints may be preferred.

Additionally, consideration could be given to the use of a water-wicking geotextile, such as TenCate Mirafi H2Ri. Through special provisions, a water-wicking geotextile can be used in place of the geotextile recommended above, and under the right conditions, may help move water from the road section to subdrains. However, in areas where the groundwater is within the structural section, the water-wicking geotextile may not perform as intended.

7.4 Subdrains

If utilized, the subdrains should be designed per MASS Detail # 55-3. The surface of the excavated subgrade should be sloped a minimum of 2 percent toward the subdrain to promote drainage to the edge drainage system. The subdrains may be terminated into the drainage system manholes or other suitable outfall. Flows from the subdrains should be considered in design of the drainage system to accommodate for the added volume of water and potential icing issues.

7.5 Site Preparation

All subgrade exposed at the bottoms of excavations should be scarified, moisture conditioned, and compacted to 95 percent of the modified Proctor density (AASHTO T180).

7.6 Reuse of Material

The majority of material encountered in the upper 5 feet along the roads are considered frost susceptible. This material does not meet the specification for MOA Type II or Type II-A fill. It is recommended these soils are not reused in the new pavement section.

7.7 Excavation Dewatering

It is our understanding that storm drain utility upgrades are planned as part of the project. During drilling, groundwater was observed in all boreholes except one, Borehole BH-01. In general, groundwater was observed at depths ranging from 3.7 feet to 7.5 feet bgs while drilling. However, approximately two weeks after the completion of drilling, groundwater levels had increased in the boreholes with PVC standpipes to depths ranging from approximately 2.9 feet to 5.9 feet bgs.



Groundwater depth varies seasonally, and can be impacted by rainfall and local drainage upgradient from the project site and from surrounding properties. Based on the findings from our geotechnical exploration, groundwater may be encountered in excavations that extend deeper than 3 feet; therefore, provisions for dewatering should be incorporated into the specifications in the event that it is required during construction.

Additionally, it is unknown what influence the creek has on the groundwater table within the road section. When excavating near the creek, the contractor should have provisions to manage any excess groundwater encountered in the excavations.

7.8 Utility Excavations

The near surface soils at this site are granular and classified as Type C soils in relation to the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1926 Occupational Safety and Health Standards – Excavations (Subpart P). The OSHA standard limits open trenches in the anticipated type of soils to a maximum allowable slope inclination of 1.5 horizontal to 1 vertical (1.5H:1V) if a shoring system or trench box is not used. The contractor should be responsible for all slope maintenance and monitoring during excavations.

7.9 Utility Bedding and Backfill

The satisfactory performance of the flexible pipe is highly dependent upon the quality of soil under and along the sides of the pipe. Bedding and backfill material, placement, and compaction should generally conform to the requirements of the pipe manufacturer, governing utility, and the current MASS. The condition of the trench subgrade should be verified to assure all loose, frozen, or organic soil is removed from beneath the bedding materials. Granular soils were generally encountered during our investigation and are considered suitable for reuse as backfill for the utilities, provided that proper compaction and moisture conditioning can be achieved.

7.10 Potential for Contaminated Soils

Based on the measurement of volatile organics in the headspace of samples discussed in Section 6.2.1, there is a potential that petroleum hydrocarbons or other constituents may be encountered in excavations. The extent and magnitude of potentially contaminated soils is unknown at this time. If contaminated soil or groundwater is encountered in excavations or during dewatering, there could be project delays and unexpected costs. However, these additional costs can be mitigated by including provisions for handling and disposal of contaminated soil and groundwater in the specifications.



8.0 USE OF REPORT

This report has been prepared exclusively for the use of CRW in their design of the proposed road improvements along Image Drive and Reflection Drive in Anchorage, Alaska. If there are significant changes in the nature, design, or location of the facilities, we should be notified so that we may review our conclusions and recommendations in light of the proposed changes and provide a written modification or verification of the changes.

Variations are likely in subsurface conditions between explorations and also with time. Therefore, inspection and testing by a qualified geotechnical engineer should be included during construction to provide corrective recommendations adapted to the conditions revealed during the work. A contingency for unanticipated conditions should be included in the construction budget and schedule in the event corrective measures are necessary based on conditions revealed in the excavations.

This work program followed the standard of care expected of professionals undertaking similar work in the State of Alaska under similar conditions. No warranty expressed or implied is made.



9.0 CLOSING

Thank you for the opportunity to assist with this project. If you have comments or questions, please contact one of the undersigned at (907) 344-6001.

GOLDER ASSOCIATES INC.

DRAFT, NO SIGNATURES

Brenton B. Savikko, PE
Senior Project Engineer

John D. Thornley, PE
Senior Geotechnical Engineer

Mark R. Musial, PE
Principal and Geotechnical-Permafrost Practice/Program Leader

BBS/MRM/JDT/cjc/mlp



10.0 REFERENCES

Braley, W.A., Connor, B., 1989, BERG2 Micro-Computer Estimation of Freeze and Thaw Depths and Thaw Consolidation, Prepared for State of Alaska, Department of Transportation and Public Facilities, Statewide Research.

Combellick, R.A., 1999, *Simplified geologic map and cross sections of central and east Anchorage, Alaska*: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 1999-1, 13 p.

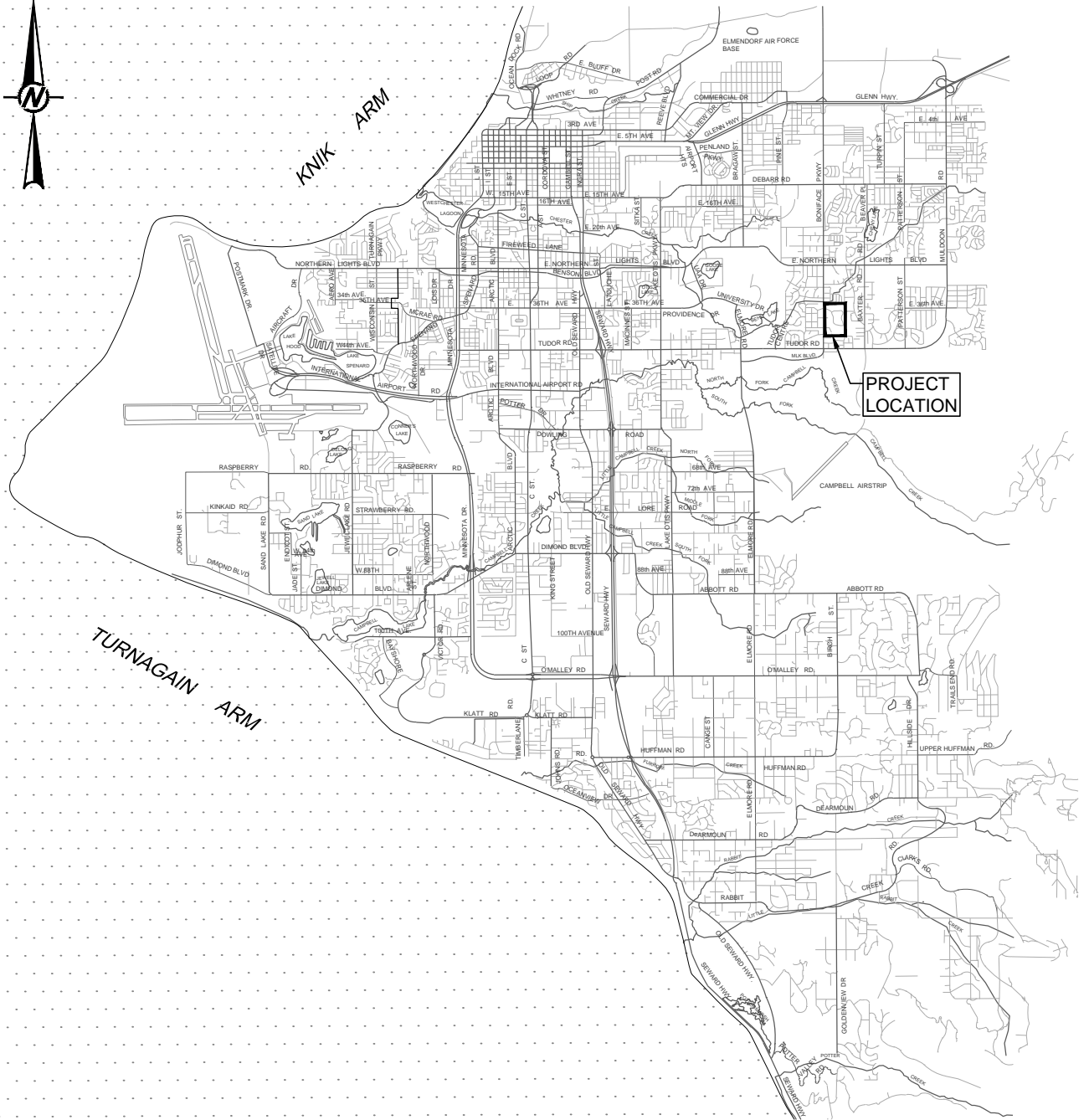
Municipality of Anchorage (MOA) Project Management & Engineering (PM&E) Department. 2007. *Design Criteria Manual (DCM), Chapter 1, Streets*.

Municipality of Anchorage (MOA) Project Management & Engineering Department. 2015. *Municipality of Anchorage Standard Specifications (MASS)*.

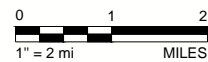
Various Construction As-Built Sheets, 1984 to 1986.

FIGURES

DRAFT



DRAFT



CLIENT
CRW ENGINEERING GROUP, LLC

CONSULTANT



YYYY-MM-DD 2016-06-17

DESIGNED -

PREPARED APG

REVIEWED BBS

APPROVED -

PROJECT
IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

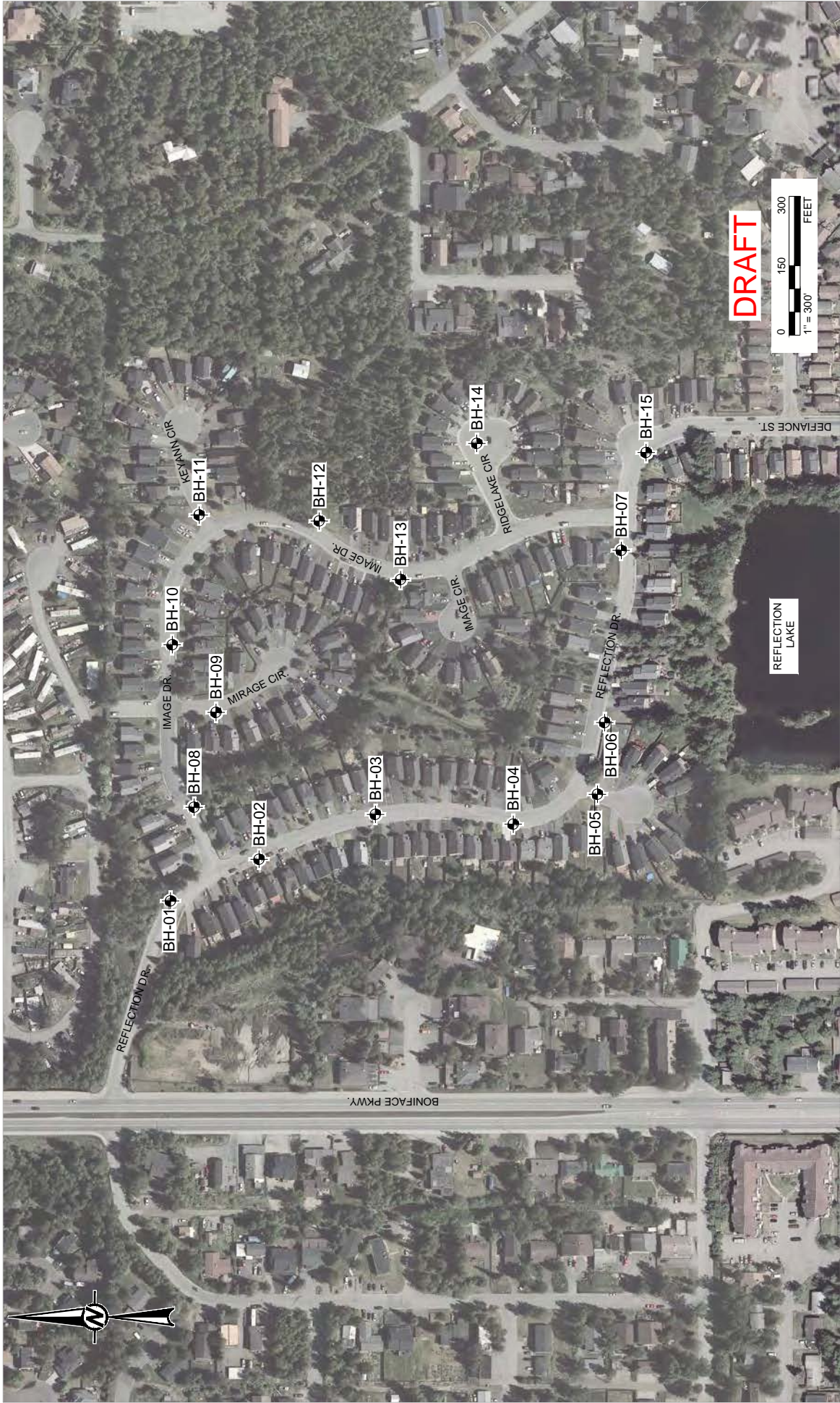
TITLE
☐ CITY MAP

PROJECT NO.
1523636

CONTROL
..

REV.
A

FIGURE
1



LE END

BH-01

BOREHOLE LOCATION AND NAME

CLIENT

CRW ENGINEERING GROUP, LLC

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

REFERENCE(S)

1. ORTHOIMAGERY ACQUIRED IN JULY 2015 BY THE ANCHORAGE LIDAR AND IMAGERY PROJECT AND WAS DISTRIBUTED BY ALASKA DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS (DGGS) ONLINE MAP.

TITLE

OREHOLE LOCATION MAP

CONSULTANT

2016-06-17

DESIGNED

APG

PREPARED

BBS

REVIEWED

-

APPROVED

-

PROJECT NO.

1523636

CONTROL

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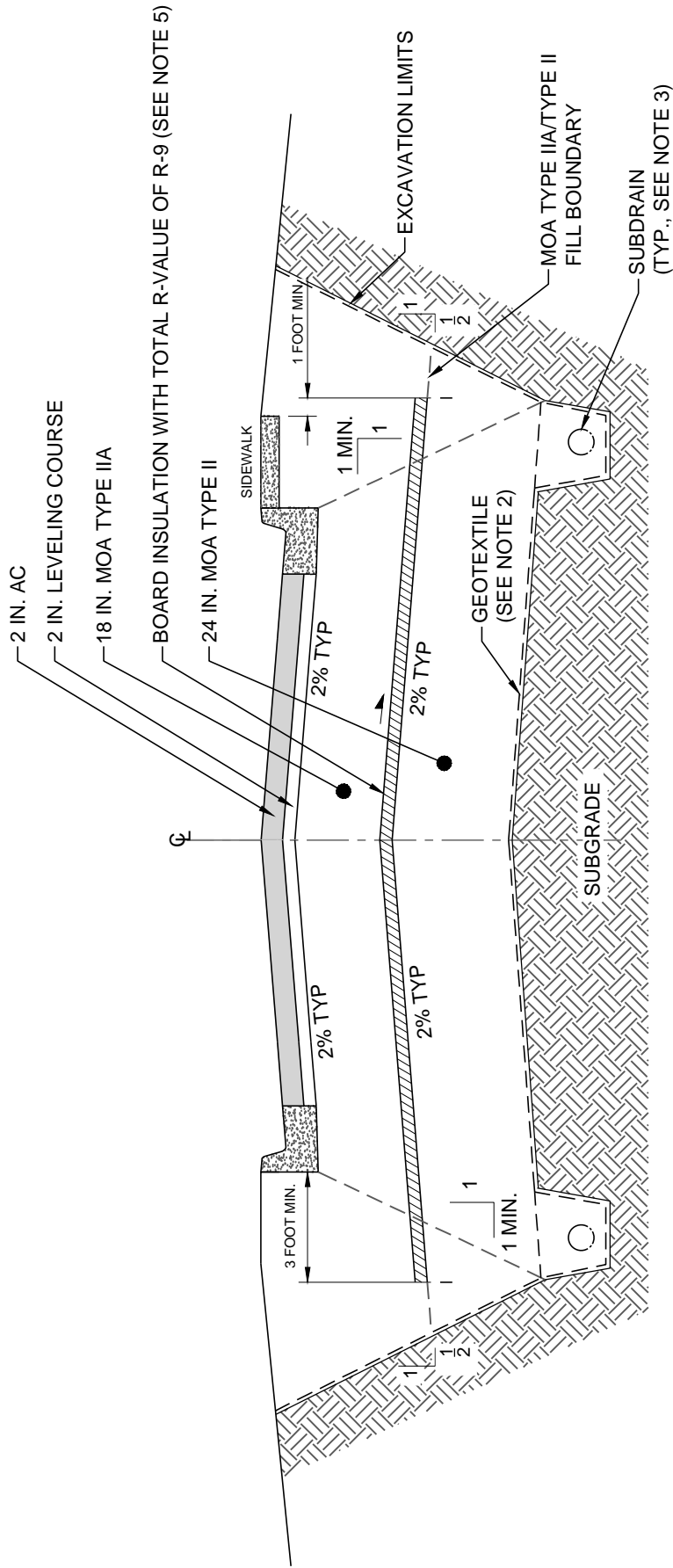
REV.

A

FIGURE

2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



NOT TO SCALE

NOTE(S)

1. ALL MEASUREMENTS SHOWN ARE MINIMUM VALUES.
2. GEOTEXTILE SHALL MEET MOA M.A.S.S. SECTION 20.25 CLASS 2, TYPE A, NON-WOVEN FABRIC WHEN SPECIFIED.
3. INSTALL SUBDRAINS PER M.A.S.S. DETAIL 55-3.
4. EXTEND INSULATION A MINIMUM OF 3 FEET BEYOND THE BACK OF CURB WHEN NO SIDEWALK IS PRESENT.
5. INSULATION MIN. 60 PSI, ABSORPTION 0.30% MAX. BY VOLUME PER M.A.S.S.

NOT FOR CONSTRUCTION
DRAFT

CLIENT
CRW ENGINEERING GROUP, LLC

PROJECT
IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

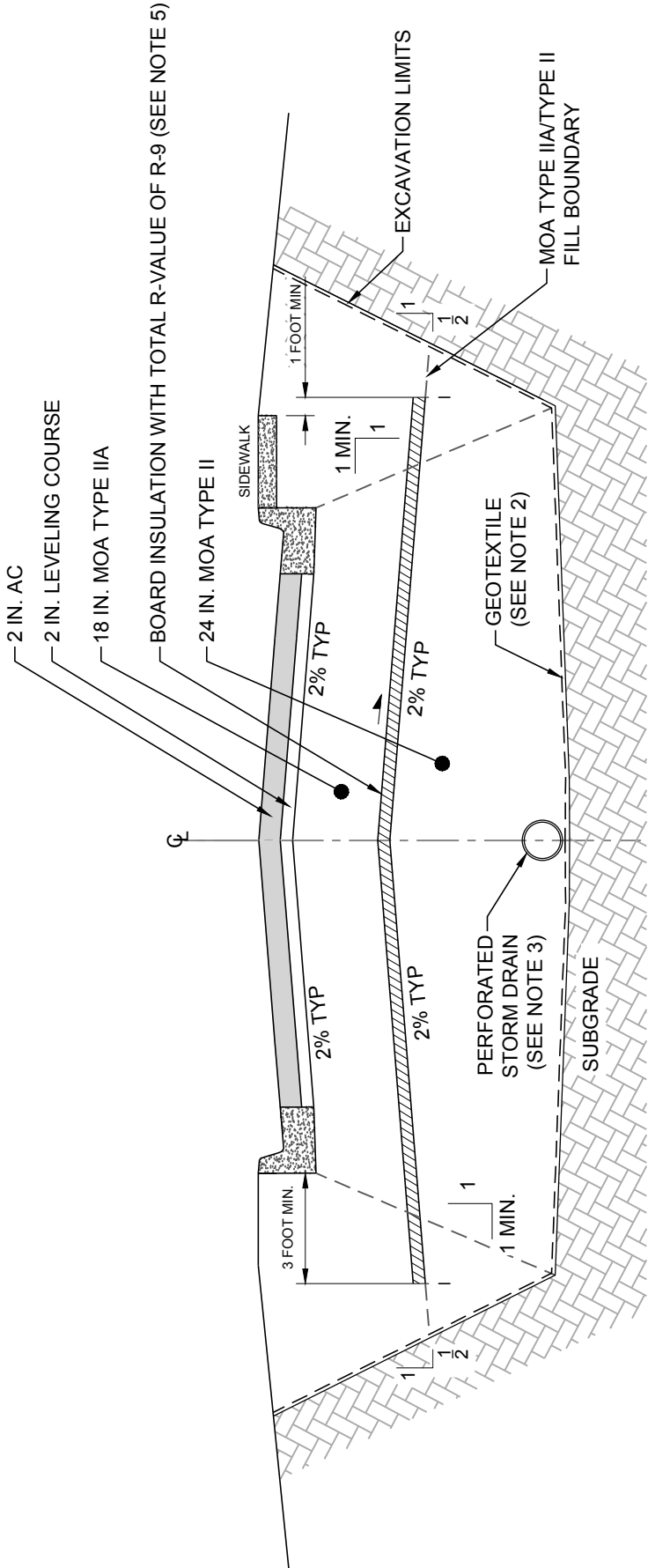
CONSULTANT	YYYY-MM-DD	2016-08-12
DESIGNED	APG	
PREPARED	BBS	
REVIEWED	BBS	
APPROVED	-	

TITLE

TYPICAL INSULATED SECTION WITH SUBDRAINS

PROJECT NO. 1523636
CONTROL A
REV. A
FIGURE 3





NOT TO SCALE

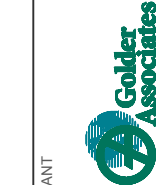
NOTE(S)

1. ALL MEASUREMENTS SHOWN ARE MINIMUM VALUES.
2. GEOTEXTILE SHALL MEET MOA M.A.S.S. SECTION 20.25 CLASS 2, TYPE A, NON-WOVEN FABRIC WHEN SPECIFIED.
3. VERTICAL AND HORIZONTAL LOCATION OF STORM DRAIN MAY VARY.
4. EXTEND INSULATION A MINIMUM OF 3 FEET BEYOND THE BACK OF CURB WHEN NO SIDEWALK IS PRESENT.
5. INSULATION MIN. 60 PSI, ABSORPTION 0.30% MAX. BY VOLUME PER M.A.S.S.

NOT FOR CONSTRUCTION
DRAFT

CLIENT
CRW ENGINEERING GROUP, LLC

PROJECT
IMAGE-REFLECTION DR ROAD UPGRADES

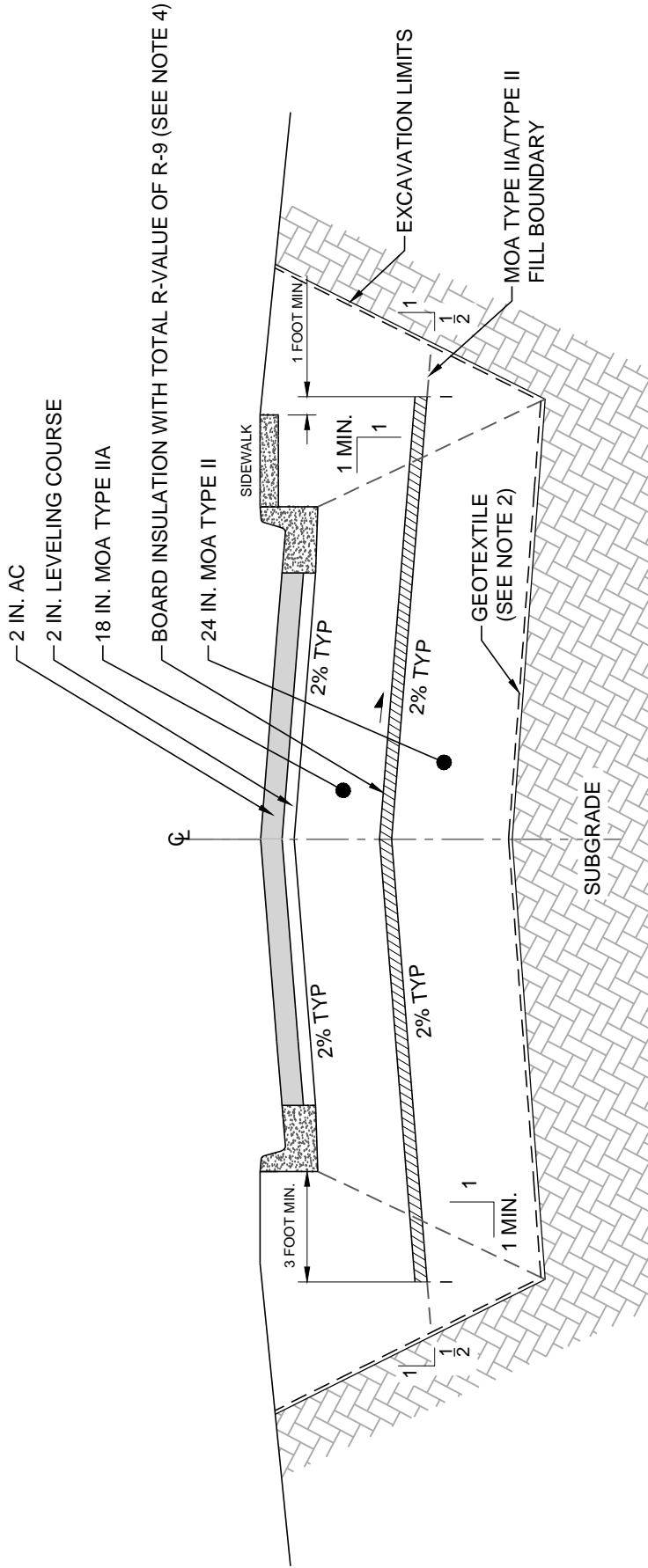


CONSULTANT	YYYY-MM-DD	2016-08-15
DESIGNED	APG	
PREPARED	BBS	
REVIEWED	BBS	
APPROVED	-	

ANCHORAGE, ALASKA

TITLE
TYPICAL INSULATION SECTION WITH PERFORATED STORM DRAIN

PROJECT NO.	CONTROL	REV.	FIGURE
1523636	C		4



NOT TO SCALE

NOTE(S)

1. ALL MEASUREMENTS SHOWN ARE MINIMUM VALUES.
2. GEOTEXTILE SHALL MEET MOA M.A.S.S. SECTION 20.25 CLASS 2, TYPE A, NON-WOVEN FABRIC WHEN SPECIFIED.
3. EXTEND INSULATION A MINIMUM OF 3 FEET BEYOND THE BACK OF CURB WHEN NO SIDEWALK IS PRESENT.
4. INSULATION MIN. 60 PSI, ABSORPTION 0.30% MAX. BY VOLUME PER M.A.S.S.

NOT FOR CONSTRUCTION
DRAFT

CLIENT
CRW ENGINEERING GROUP, LLC

PROJECT
IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

CONSULTANT	
YYYY-MM-DD	2016-08-11
DESIGNED	APG
PREPARED	BBS
REVIEWED	-
APPROVED	-

TITLE
TYPICAL INSULATION SECTION





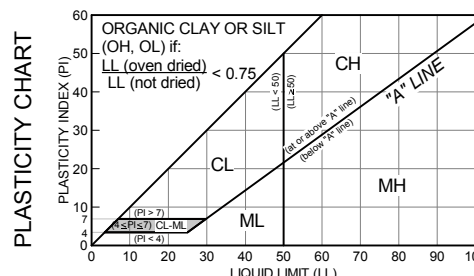




PROJECT NO.	CONTROL	REV.	FIGURE
1523636	A		5



**APPENDIX A
BOREHOLE LOGS**

DRAFT

UNIFIED SOIL CLASSIFICATION (adapted from ASTM D2487)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES AND GROUP SYMBOLS USING LABORATORY TESTS			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND			
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	$C_u \geq 4$ AND $1 \leq C_c \leq 3$	GW	WELL-GRADED GRAVEL		If soil contains $\geq 15\%$ sand, add "with sand"	
			$C_u < 4$ AND/OR [$C_c < 1$ OR $C_c > 3$]	GP	POORLY GRADED GRAVEL			
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH	GM	SILTY GRAVEL			
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL			
	SANDS $\geq 50\%$ OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	$C_u \geq 6$ AND $1 \leq C_c \leq 3$	SW	WELL-GRADED SAND		If soil contains $\geq 15\%$ gravel, add "with gravel"	
			$C_u < 6$ AND/OR [$C_c < 1$ OR $C_c > 3$]	SP	POORLY GRADED SAND			
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR MH	SM	SILTY SAND			
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND			
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT <50		CL	LEAN CLAY		If soil contains coarse-grained soil from 15% to 29%, add "with sand" or "with gravel" for whichever type is prominent, or for $\geq 30\%$, add "sandy" or "gravelly"		
	SILTS AND CLAYS LIQUID LIMIT ≥ 50		ML	SILT				
			OL	ORGANIC CLAY OR SILT				
			CH	FAT CLAY				
			MH	ELASTIC SILT				
			OH	ORGANIC CLAY OR SILT				
	HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR	PT			PEAT	

NOTES:

$$C_u = \frac{D_{60}}{D_{10}} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

Gravels or sands with 5% to 12% fines require dual symbols (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC) and add "with clay" or "with silt" to group name. If fines classify as CL-ML for GM or SM, use dual symbol GC-GM or SC-SM. $D_{(X\%)}$ is soil particle diameter where X% is % finer. *Optional Abbreviations:* Lower case "s" after USCS group symbol denotes either "sandy" or "with sand" while "g" denotes either "gravelly" or "with gravel"

RELATIVE DENSITY / CONSISTENCY ESTIMATE USING STANDARD PENETRATION TEST (SPT) VALUES (adapted from Terzaghi and Peck 1967 and NAVFAC DM 7.1)

COHESIONLESS SOILS ^(a)		COHESIVE SOILS ^(b)		UNCONFINED COMPRESSIVE STRENGTH (TSF) ^(d)
RELATIVE DENSITY	$(N_1)_{60}$ (blows/ft) ^(c)	CONSISTENCY	$(N_1)_{60}$ (blows/ft) ^(c)	
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
COMPACT	10 - 30	FIRM	4 - 8	0.50 - 1.0
(MEDIUM DENSE)		STIFF	8 - 15	1.0 - 2.0
DENSE	30 - 50	VERY STIFF	15 - 30	2.0 - 4.0
VERY DENSE	OVER 50	HARD	OVER 30	OVER 4.0

- (a) Soils consisting of gravel, sand, and silt, either separately or in combination possessing no characteristics of plasticity, and exhibiting drained behavior.
- (b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
- (c) Refer to ASTM D1586 for a definition of N value. $(N_1)_{60}$ is the N value corrected for hammer energy and overburden pressure, and is detailed in ASTM D6066. N values may be affected by a number of factors including: material size, sampler size, hammer weight and type, depth, drilling method, and borehole disturbance. **N values are only an approximate guide for cohesive soil and do not apply to frozen soil.**
- (d) Undrained shear strength, $s_u = 1/2$ unconfined compression strength, U_c . Note that Torvane (TV) measures s_u and pocket penetrometer (PP) measures U_c .

CRITERIA FOR DESCRIBING MOISTURE CONDITION (adapted from ASTM D2488)

DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	GREATER THAN 12 in.
COBBLES	12 in. to 3 in.
GRAVEL	3 in. to #4 Sieve (4.76 mm)
COARSE GRAVEL	3 in. to 3/4 in.
FINE GRAVEL	3/4 in. to #4 (4.76 mm)
SAND	#4 (4.76 mm) to #200 (0.074 mm)
COARSE SAND	#4 (4.76 mm) to #10 (2.0 mm)
MEDIUM SAND	#10 (2.0 mm) to #40 (0.42 mm)
FINE SAND	#40 (0.42 mm) to #200 (0.074 mm)
SILT & CLAY (FINES)	SMALLER THAN #200 (0.074 mm)

SAMPLER ABBREVIATIONS

SS SPT Sampler (2 in. OD, 140 lb hammer)	C Core (Diamond Bit)
HD Heavy Duty Split Spoon (3 in. OD, 340 lb hammer)	TW Thin Wall (Shelby Tube)
-BL Brass Liners used in Split Spoon	TP Thin Wall Piston Sampler
R Refusal when driving Split Spoon	MS Modified Shelby
CA Continuous Core (Soil in Hollow-Stem Auger)	MC Geoprobe Macro-Core
GS Grab Sample from Surface / Testpit	RC Air Rotary Cuttings
AC Auger Charge	AW Auger Wash
	AG Auger Cuttings

DESCRIPTIVE TERMINOLOGY FOR PERCENTAGES (ASTM D2488)

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0 - 5%
FEW	5 - 10%
LITTLE	10 - 25%
SOME	30 - 45%
MOSTLY	50 - 100%

LABORATORY TEST AND NOTES ABBREVIATIONS / SYMBOLS

Con Consolidation	PID Photoionization Detector	TXCD Triaxial, Consolidated Drained
Dd Dry Density	PM Modified Proctor (D1557)	TXCU Triaxial, Consolidated Undrained
K Thermal Conductivity	PP Pocket Penetrometer (Field)	TXUU Triaxial, Unconsolidated Undrained
MA Sieve and Hydrometer	PTLD Point Load	W_L Liquid Limit (LL)
NP Non-plastic	SA Sieve Analysis	W_P Plastic Limit (PL)
OLI Organic Loss	SpG Specific Gravity	Ω Soil Resistivity (Res.)
P200 Passing #200 Sieve (D1140)	TC Thaw Consolidation/Strain	▼ Water Level
pH Soil pH	TV Torvane (Field)	▽ Water Level While Drilling
PI Plasticity Index (D4318)		

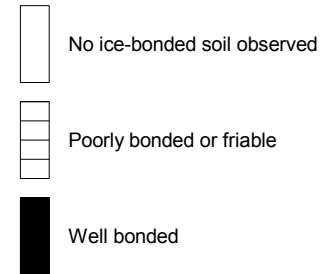
SOIL CLASSIFICATION / LEGEND

Figure A-1

FROZEN SOIL CLASSIFICATION (ASTM D4083)

1. DESCRIBE SOIL INDEPENDENT OF FROZEN STATE	CLASSIFY SOIL BY THE UNIFIED SOIL CLASSIFICATION SYSTEM			
2. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF FROZEN SOIL	MAJOR GROUP		SUBGROUP	
	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION
	Segregated ice not visible by eye	N	Poorly bonded or friable	Nf
			Well bonded	No excess ice Nbn
				Excess ice Nbe
	Segregated ice visible by eye (ice less than 25 mm thick)	V	Individual ice crystals or inclusions	Vx
			Ice coatings on particles	Vc
			Random or irregularly oriented ice formations	Vr
			Stratified or distinctly oriented ice formations	Vs
			Uniformly distributed ice	Vu
3. MODIFY SOIL DESCRIPTION BY DESCRIPTION OF SUBSTANTIAL ICE STRATA	Ice greater than 25 mm thick	ICE	Ice with soil inclusions	ICE+soil type
			Ice without soil inclusions	ICE

ICE BONDING SYMBOLS



DEFINITIONS

Candled Ice is ice which has rotted or otherwise formed into long columnar crystals, very loosely bonded together.

Clear Ice is transparent and contains only a moderate number of air bubbles.

Cloudy Ice is translucent, but essentially sound and non-pervious

Friable denotes a condition in which material is easily broken up under light to moderate pressure.

Granular Ice is composed of coarse, more or less equidimensional, ice crystals weakly bonded together.

Ice Coatings on particles are discernible layers of ice found on or below the larger soil particles in a frozen soil mass. They are sometimes associated with hoarfrost crystals, which have grown into voids produced by the freezing action.

Ice Crystal is a very small individual ice particle visible in the face of a soil mass. Crystals may be present alone or in a combination with other ice formations.

Ice Inclusions are individual ice masses visible in the face of a soil mass. Inclusions may be present alone or in a combination with other ice formations.

Ice Lenses are lenticular ice formations in soil occurring essentially parallel to each other, generally normal to the direction of heat loss and commonly in repeated layers.

Ice Segregation is the growth of ice as distinct lenses, layers, veins and masses in soils, commonly but not always oriented normal to direction of heat loss.

Massive Ice is a large mass of ice, typically nearly pure and relatively homogeneous.

Poorly-bonded signifies that the soil particles are weakly held together by the ice and that the frozen soil consequently has poor resistance to chipping or breaking.

Porous Ice contains numerous voids, usually interconnected and usually resulting from melting at air bubbles or along crystal interfaces from presence of salt or other materials in the water, or from the freezing of saturated snow. Though porous, the mass retains its structural unity.

Thaw-Stable frozen soils do not, on thawing, show loss of strength below normal, long-time thawed values nor produce detrimental settlement.

Thaw-Unstable frozen soils show on thawing, significant loss of strength below normal, long-time thawed values and/or significant settlement, as a direct result of the melting of the excess ice in the soil.

Well-Bonded signifies that the soil particles are strongly held together by the ice and that the frozen soil possesses relatively high resistance to chipping or breaking.

FROST DESIGN SOIL CLASSIFICATION ⁽¹⁾

FROST GROUP ⁽²⁾	GENERAL SOIL TYPE	% FINER THAN 0.02 mm BY WEIGHT	TYPICAL USCS SOIL CLASS
NFS ⁽³⁾ [MOA NFS]	(a) Gravels Crushed stone Crushed rock	0 to 1.5	GW, GP
	(b) Sands	0 to 3	SW, SP
PFS ⁽⁴⁾ [MOA NFS] [MOA F2]	(a) Gravels Crushed stone Crushed rock	1.5 to 3	GW, GP
	(b) Sands	3 to 10	SW, SP
S1 [MOA F1]	Gravelly soils	3 to 6	GW, GP GW-GM, GP-GM, GW-GC, GP-GC
S2 [MOA F2]	Sandy soils	3 to 6	SW, SP SW-SM, SP-SM, SW-SC, SP-SC
F1 [MOA F1]	Gravelly soils	6 to 10	GM, GC, GM-GC, GW-GM, GP-GM, GW-GC, GP-GC
F2 [MOA F2]	(a) Gravelly soils	10 to 20	GW, GP GW-GM, GP-GM, GW-GC, GP-GC
	(b) Sands	6 to 15	SM, SW-SM, SP-SM, SC, SW-SC, SP-SC, SM-SC
F3 [MOA F3]	(a) Gravelly soils	Over 20	GM, GC, GM-GC
	(b) Sands, except very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI>12	--	CL, CH
F4 [MOA F4]	(a) Silts	--	ML, MH, ML-CL
	(b) Very fine silty sands	Over 15	SM, SC, SM-SC
	(c) Clays, PI<12	--	CL, ML-CL
	(d) Varved clays or other fine-grained banded sediments	--	CL or CH layered with ML, MH, ML-CL, SM, SC, or SM-SC

(1) From U.S. Army Corps of Engineers (USACE), EM 1110-3-138, "Pavement Criteria for Seasonal Frost Conditions," April 1984

(2) USACE frost groups directly correspond to frost groups listed in Municipality of Anchorage (MOA) design criteria manual (DCM), 2007; except as noted.

(3) Non-frost susceptible

(4) Possibly frost susceptible, requires lab test for void ratio to determine frost design soil classification. Gravel with void ratio > 0.25 would be NFS; Gravel with void ratio < 0.25 would be S1; Sands with void ratio > 0.30 would be NFS; Sands with void ratio < 0.30 would be S2 or F2

RECORD OF BOREHOLE BH-01

SHEET 1 of 2

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 127.5 ft
COORDS: 61.18770° N 149.77652° W

LOCATION: Anchorage, AK		EQUIPMENT: CME-75, Truck Mount		COORDS: 61.18779 N 149.7632 W										
DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT		NOTES TESTS WATER LEVELS	
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ WATER CONTENT (PERCENT)		
												W _p		W _L
0	Hollow Stem Auger	VEGETATION: Road												PID = 0.2 ppm
0.0 - 0.2		Asphalt; well bonded				0.2								
0.2 - 10.0		Frozen to 5 feet, compact to dense below, dry, brown, well-graded SAND with silt and gravel; medium to coarse-grained sand, some gravel up to 1.5 inch diameter, few silt, well bonded (SW-SM, F2) [FILL]					1	GS						
							2	HD	27-28-30	58	18/18			PID = 0.3 ppm, Gravel = 44%, Sand = 46%, Fines = 10%, MA
5				SW-SM			3	HD	47-20-16	36	18/18			PID = 0.7 ppm
							4	HD	47-12-12	24	18/18			PID = 0.2 ppm
10		10.0 - 15.0 Compact, dry, yellowish brown, SILTY GRAVEL with sand; gravel up to 2.5 inch diameter, some medium-grained sand, little silt (GM)				10.0	5	HD	27-20-22	42	18/18		PID = 0.2 ppm, Gravel = 39%, Sand = 37%, Fines = 24%	
				GM										
15		15.0 - 26.5 Firm, moist, brown, SILT with sand; little medium to coarse-grained sand, trace to little gravel up to 1 inch diameter, Layers of increased sand and gravel content up to approximately 0.5 inch to 1 inch thick (ML)				15.0	6	HD	5-6-7	13	18/18		PID = 0.2 ppm	
				ML										
20		Log continued on next page												

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-3

RECORD OF BOREHOLE BH-01

SHEET 2 of 2

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 127.5 ft
COORDS: 61.18770° N 149.77652° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS				
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	10 20 30 40					
						DEPTH (ft)						SALINITY (ppt) Δ					
												WATER CONTENT (PERCENT)					
												W _p 10 20 30 40 W _L					
20	Hollow Stem Auger	15.0 - 26.5 Firm, moist, brown, SILT with sand; little medium to coarse-grained sand, trace to little gravel up to 1 inch diameter, Layers of increased sand and gravel content up to approximately 0.5 inch to 1 inch thick (ML) (Continued)		ML			7	HD	6-5-6	11	18 18		PID = 0.4 ppm				
25							8	HD	8-12-22	34	18 18		PID = 0.2 ppm				
		Borehole completed at 26.5 ft.															
		Note: 1) No groundwater observed while drilling. 2) Borehole backfilled with cuttings. 3) Asphalt cold patch installed at ground surface.															
30																	
35																	
40																	

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-3

RECORD OF BOREHOLE BH-02

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 64.053 ft
COORDS: 61.18713° N 149.77522° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES						UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS				
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	10	20		30	40		
						DEPTH (ft)						WATER CONTENT (PERCENT) W _p ——— W _L						
0	Hollow Stem Auger	0.0 - 0.3 Frozen, Asphalt; well bonded	■	SP-SM		0.3	1	GS									PID = 1.1 ppm	
0.3 - 2.5 Frozen, light brown, poorly graded SAND with silt and gravel; some gravel up to 1 inch diameter, few silt, well bonded (SP-SM) [FILL]																		
2.5 - 5.0 Frozen to 4 feet, loose below, wet, brown, well-graded GRAVEL with silt and sand; gravel up to 1.5 inch diameter, some medium to coarse-grained sand, few silt, well bonded visible ice as colorless inclusions (GW-GM, Vx)		■	GW-GM		2.5	2	HD	10-16-9	25	18/18						PID = 0.5 ppm, Gravel = 52%, Sand = 38%, Fines = 10%, SA 3.4 ft 4/5/2016 4 ft 3/22/2016; WD		
5			5.0 - 15.0 Loose, wet, brown, poorly graded SAND with silt and gravel; medium to coarse-grained sand, few to little gravel up to 1 inch diameter, few silt (SP-SM)	■	SP-SM		5.0	3	HD	4-4-2	6	18/18						PID = 0.7 ppm
10			■	SP-SM			4	HD	3-2-5	7	6/18						PID = 2.0 ppm	
15			■	SP-SM			5	HD	5-6-5	11	6/18						PID = 0.3 ppm	
20		15.0 - 16.5 Firm, wet, gray, sandy SILT; medium to coarse-grained sand, few gravel up to 0.5 inch diameter, little silt (SM)	■	SM		15.0	6	HD	12-10-10	20	12/18						PID = 0.5 ppm	
		Borehole completed at 16.5 ft.																
		Notes: 1) Groundwater observed at 4 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 3.4 feet on 4/5/2016. 4) Borehole backfilled with cuttings.																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-4

RECORD OF BOREHOLE BH-03

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 64.053 ft
COORDS: 61.18644° N 149.77465° W

LOCATION: Anchorage, AK		EQUIPMENT: CME-75, Truck Mount		COORDS: 61.16044° N 149.17405° W															
DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES				UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS							
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)		SALINITY (ppt) Δ WATER CONTENT (PERCENT)						
													W _p	W _L					
0	Hollow Stem Auger	VEGETATION: Road															PID = 0.5 ppm, Gravel = 44%, Sand = 43%, Fines = 13%		
0.0 - 0.3		Frozen, Asphalt; well bonded				0.3	1	GS											
0.3 - 7.0		Frozen, light brown, SILTY GRAVEL with sand; some medium to coarse-grained sand, gravel up to 1.5 inch diameter, little silt, cobbles present below 5 feet, well bonded with no excess ice (GM, Nbn, F1) [FILL]		GM														PID = 2.0 ppm, MA	
							2	HD	25-20-13	33	18/18							4.4 ft 4/5/2016	
																		5 ft 3/22/2016; WD	
							3	HD	9-10-7	17	18/18								PID = 1.3 ppm
5		7.0 - 15.5	Compact, wet, grayish brown, SILTY SAND with gravel; fine to coarse-grained sand, little gravel up to 0.5 inch diameter, little silt (SM)			7.0	4	HD	10-12-14	26	18/18							PID = 0.3 ppm, Gravel = 28%, Sand = 40%, Fines = 32%	
10							5	HD	12-16-22	38	18/18							PID = 0.3 ppm	
15		15.5 - 16.5	Firm, moist, gray, sandy SILT with gravel; little sand, little gravel up to 1 inch diameter, low plasticity (ML)		ML	15.5	6A	HD	8		6/6							PID = 0.5 ppm	
							6B	HD	5-6		12/12							PID = 0.5 ppm	
		Borehole completed at 16.5 ft.																	
		Notes: 1) Groundwater observed at 5 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 4.4 feet on 4/5/2016. 4) Borehole backfilled with cuttings.																	
20																			

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-5

RECORD OF BOREHOLE BH-04

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 64.293 ft
COORDS: 61.18564° N 149.77475° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	10 20 30 40			
						DEPTH (ft)						WATER CONTENT (PERCENT) W _p W _L			
0	Hollow Stem Auger	VEGETATION: Road													
		0.0 - 0.2 Frozen, Asphalt; well bonded				0.2	1	GS							PID = 0.3 ppm
		0.2 - 2.5 Frozen, dry, brown, poorly graded SAND with silt and gravel; fine to medium-grained sand, some gravel up to 0.5 inch diameter, few silt, well bonded (SP-SM) [FILL]		SP-SM											
		2.5 - 7.5 Frozen to 4 feet, compact below, gray, SILTY GRAVEL; gravel up to 1.5 inch diameter, some fine to coarse-grained sand, few silt, well bonded with no excess ice (SM, Nbn)		SM		2.5	2	HD	25-27-23	50	18/18				PID = 0.3 ppm, Gravel = 32%, Sand = 40%, Fines = 28%, SA 3.9 ft 4/5/2016
5							3	HD	8-7-9	16	18/18				PID = 0.4 ppm 5.25 ft 3/22/2016; WD
		7.5 - 15.0 Compact, dry, gray, poorly graded GRAVEL with silt and sand; gravel up to 2 inch diameter, little fine to medium-grained sand, few silt (GP-GM)		GP-GM		7.5	4	HD	8-9-11	20	18/18				PID = 0.4 ppm
10							5	HD	7-17-11	28	18/18				PID = 0.5 ppm
15		15.0 - 16.5 Dense, dry, gray, SILTY GRAVEL with sand; some sand, little to some silt (GM)		GM		15.0	6	HD	19-18-14	32	18/18				PID = 2.8 ppm
		Borehole completed at 16.5 ft.													
		Notes: 1) Groundwater observed at 5.3 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 3.9 feet on 4/5/2016. 4) Borehole backfilled with cuttings.													
20															

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-6




RECORD OF BOREHOLE BH-05

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 65.976 ft
COORDS: 61.18513° N 149.77440° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■			NOTES TESTS WATER LEVELS				
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ						
						DEPTH (ft)						WATER CONTENT (PERCENT)						
		VEGETATION: Road										W _p	W	W _L				
0	Hollow Stem Auger	0.0 - 0.2 Frozen, Asphalt; well bonded		SM		0.2	1	GS				○				PID = 0.4 ppm, Gravel = 41%, Sand = 43%, Fines = 16%, MA		
0.2 - 2.5 Frozen, moist, brown, SILTY SAND with gravel; some gravel up to 1.5 inch diameter, little silt, well bonded (SM, F2) [FILL]																		
2.5 - 7.5 Frozen to 4 feet, compact below, wet, brown, poorly graded GRAVEL with silt and sand; gravel up to 2.5 inch diameter, some sand, few silt, well bonded (GP-GM)			GP-GM		2.5	2	HD	15-10-11	21	18/18	○	■			PID = 1.7 ppm 3 ft 4/5/2016			
								3	HD	6-13-15	28	18/18	○	■			4.5 ft 3/22/2016; WD PID = 0.3 ppm	
5		7.5 - 16.5 Compact to dense, moist, gray, SILTY SAND with gravel; little gravel up to 1 inch diameter, some silt, cobbles present (SM)		SM		7.5	4	HD	17-13-13	26	18/18	○	■			PID = 0.9 ppm, Gravel = 18%, Sand = 45%, Fines = 37%, SA		
10							5	HD	14-20-17	37	18/18	○	■			PID = 0.4 ppm		
15							6	HD	20-12-15	27	18/18	○	■			PID = 0.7 ppm		
		Borehole completed at 16.5 ft.																
		Notes: 1) Groundwater observed at 4.5 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 3 feet on 4/5/2016. 4) Borehole backfilled with cuttings.																
20																		

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-7

RECORD OF BOREHOLE BH-06

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 63.813 ft
COORDS: 61.18505° N 149.77357° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES						UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ				
						DEPTH (ft)						WATER CONTENT (PERCENT)				
												W _p	W _L			
0		SNOW DEPTH: 1" VEGETATION: Grass														
0	Hollow Stem Auger	0.0 - 5.0 Frozen, moist to wet, brown, SILTY SAND with gravel; some gravel up to 1 inch diameter, medium to coarse-grained sand, trace silt, organic odor in samples, well bonded (SM)		SM			1	GS							PID = 0.6 ppm, Gravel = 35%, Sand = 49%, Fines = 16%	
															PID = 0.3 ppm	
		2				HD	10-17-29	46	18/18							
5		5.0 - 15.0 Loose to dense, wet, brown, poorly graded GRAVEL with silt and sand; gravel up to 2.5 inch diameter, little to some medium to coarse-grained sand, few silt, trace organics as rootlets (GP-GM)		GP-GM	5.0		3	HD	16-19-15	34	12/18				PID = 0.5 ppm 5.75 ft 3/22/2016; WD	
																PID = 0.2 ppm
		4				HD	7-7-6	13	18/18							
10		5				HD	4-5-5	10	18/18							PID = 0.2 ppm
15	15.0 - 16.5 Compact, wet, dark gray, poorly graded SAND with silt; fine to medium-grained sand, few silt (SP-SM)		SP-SM	15.0		6	HD	11-10-13	23	18/18				PID = 0.2 ppm		
		Borehole completed at 16.5 ft.														
		Notes: 1) Groundwater observed at 5.8 feet while drilling (WD). 2) Borehole backfilled with cuttings.														
20																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-8

RECORD OF BOREHOLE BH-07

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/22/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 66.937 ft
COORDS: 61.18497° N 149.77138° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES						UNCORRECTED BLOWS / FT		NOTES TESTS WATER LEVELS		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ				
						DEPTH (ft)						WATER CONTENT (PERCENT)				
		VEGETATION: Road														
0	Hollow Stem Auger	0.0 - 0.2 Frozen, Asphalt; well bonded		SM		0.2	1	GS							PID = 0.2 ppm, Gravel = 32%, Sand = 51%, Fines = 17%, MA	
		0.2 - 2.5 Frozen, dry, brown, SILTY SAND with gravel; some gravel up to 1 inch diameter, little silt, well bonded (SM, F2) [FILL]														
		2.5 - 5.0 Frozen, dark grayish brown, poorly graded GRAVEL with silt and sand; gravel up to 1.5 inch diameter, some medium to coarse- grained sand, few silt, well bonded visible ice as white inclusions (GP-GM, Vx)	GP-GM		2.5	2	HD	22-30-28	58	18 18			PID = 0.2 ppm 3.6 ft 4/5/2016 3.7 ft 3/22/2016; WD			
5		5.0 - 6.0 Stiff, reddish brown, ORGANIC SILT with sand and gravel; little gravel up to 0.25 inch diameter, little fine to medium-grained sand, organics as fibrous peat/tree matter (OL)	OL		5.0	3A	HD	7-7	14	12 12			PID = 0.2 ppm, OLI = 11%			
		6.0 - 15.0 Compact, wet, dark gray to dark brown, poorly graded GRAVEL with silt and sand; gravel up to 2 inch diameter, some medium-grained sand, few silt, organics present as peat/tree matter (GP-GM)			GP-GM		6.0	3B	HD	6		6 6			PID = 0.2 ppm	
															PID = 0.2 ppm	
10								4	HD	5-6-6	12	18 18				
							5	HD	5-7-9	16	18 18			PID = 0.4 ppm		
15		15.0 - 16.5 Compact, wet, brown, poorly graded SAND with silt; medium-grained sand, few gravel up to 1/4 inch diameter, trace silt, trace organics (SP-SM)		SP-SM		15.0	6	HD	21-16-14	30	18 18			PID = 0.4 ppm		
		Borehole completed at 16.5 ft.														
		Notes: 1) Groundwater observed at 3.6 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 3.6 feet on 4/5/2016. 4) Borehole backfilled with cuttings.														
20																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-9

RECORD OF BOREHOLE BH-08

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 61.65 ft
COORDS: 61.18758° N 149.77457° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■			NOTES TESTS WATER LEVELS		
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ				
												WATER CONTENT (PERCENT)				
												W _p	W _L		W _u	
0		SNOW DEPTH: 0.5" VEGETATION: Grass													PID = 0.2 ppm	
	Hollow Stem Auger	0.0 - 2.5 Frozen, dark brown, SILTY SAND with gravel; some gravel up to 0.75 inch diameter, medium to coarse-grained sand, little silt, well bonded visible ice as white coatings on particles (SM, Vc)		SM			1	GS								
		2.5 - 5.0 Frozen, dark brown, poorly graded SAND with silt and gravel; some gravel up to 1.5 inch diameter, medium to coarse-grained sand, few silt, well bonded (SP-SM)		SP-SM	2.5		2	HD	43-22-13	35	18 18					PID = 8.7 ppm, Gravel = 43%, Sand = 46%, Fines = 11%, SA
5		5.0 - 7.5 Compact, dark brown, SILTY GRAVEL with sand; some sand, little to some silt (GM)		GM	5.0		3	HD	5-8-7	15	18 18					5 ft 3/23/2016; WD PID = 3.2 ppm
		7.5 - 15.0 Compact, wet, dark gray, poorly graded GRAVEL with silt and sand; gravel up to 1 inch diameter, some medium to coarse- grained sand, few silt (GP-GM)		GP-GM	7.5		4	HD	6-8-11	19	18 18					PID = 3.3 ppm
10								5	HD	13-10-12	22	18 18				
15		15.0 - 16.5 Compact, wet, dark gray, SILTY GRAVEL with sand; gravel up to 1 inch diameter, some medium-grained sand, little silt (GM)		GM	15.0		6	HD	19-19-18	37	18 18					PID = 0.6 ppm
		Borehole completed at 16.5 ft.														
		Notes: 1) Groundwater observed at 5 feet while drilling (WD). 2) Borehole backfilled with bentonite chips and hydrated in place.														
20																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-10

RECORD OF BOREHOLE BH-09

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 71.023 ft
COORDS: 61.18750° N 149.77328° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES						UNCORRECTED BLOWS / FT		NOTES TESTS WATER LEVELS
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ		
												WATER CONTENT (PERCENT)		
		VEGETATION: Road										W _p	W _L	

0	Hollow Stem Auger	0.0 - 0.2 Frozen, Asphalt; well bonded	SM		0.2	1	GS							PID = 0.1 ppm, Gravel = 40%, Sand = 46%, Fines = 14%, SA PID = 0.2 ppm 2.9 ft 4/5/2016 5 ft 3/23/2016; WD PID = 0.3 ppm, Gravel = 46%, Sand = 43%, Fines = 11% PID = 0.5 ppm PID = 0.3 ppm PID = 0.2 ppm
		0.2 - 5.0 Frozen, brown, SILTY SAND with gravel; some gravel up to 1 inch diameter, medium to coarse-grained sand, little silt, well bonded visible ice as clear coatings on particles (SM, Vc) [FILL]												
5		5.0 - 10.0 Loose, wet, dark gray, poorly graded GRAVEL with silt and sand; gravel up to 1 inch diameter, some medium to coarse-grained sand, few silt (GP-GM)	GP-GM		5.0	3	HD	6-6-6	12	18	18			
10		10.0 - 15.0 Loose, wet, gray, SILTY SAND; fine-grained sand, little sand, trace gravel up to 0.5 inch diameter (SM)	SM		10.0	5	HD	7-7-11	18	18	18			
15		15.0 - 16.5 Stiff, wet, dark gray, SILT; trace fine-grained sand (ML)	ML		15.0	6	HD	5-5-4	9	18	18			
		Borehole completed at 16.5 ft.												
		Notes: 1) Groundwater observed at 5 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 2.9 feet on 4/5/2016. 4) Borehole backfilled with cuttings.												
20														

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-11

RECORD OF BOREHOLE BH-10

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 67.658 ft
COORDS: 61.18761° N 149.77257° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS			
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ				
						DEPTH (ft)						W _p		W _L		
		VEGETATION: Road														
0	Hollow Stem Auger	0.0 - 0.2 Frozen, Asphalt; well bonded	■	SP		0.2	1	GS						PID = 0.2 ppm		
		0.2 - 5.0 Frozen, brown, poorly graded SAND with gravel; some gravel, well bonded with no excess ice (SP, Nbn) [FILL]														
5			5.0 - 7.5 Loose, wet, gray, SILTY GRAVEL with sand; gravel up to 1 inch diameter, some medium to coarse-grained sand, few to little silt (GM)		GM	5.0	3	HD	5-5-5	10	18/18			PID = 0.3 ppm		
		7.5 - 10.0 Compact, wet, dark gray, poorly graded SAND with silt and gravel; medium-grained sand, little gravel up to 1 inch diameter, few silt (SP-SM)		SP-SM	7.5	4	HD	11-7-8	15	18/18			PID = 0.3 ppm			
10		10.0 - 16.5 Compact, wet, dark gray, poorly graded SAND with silt; fine-grained sand, trace to few silt, none to trace gravel up to 0.5 inch diameter (SP-SM)		SP-SM	10.0	5	HD	6-6-8	14	18/18			PID = 0.5 ppm			
15		0.5 inch thick layer of SILT (ML) at 15 feet					6A	HD	5		6/6		PID = 1.7 ppm			
							6B	HD	10-16		12/12		PID = 0.3 ppm			
		Borehole completed at 16.5 ft.														
		Notes: 1) Groundwater observed at 5 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 3.8 feet on 4/5/2016. 4) Borehole backfilled with cuttings.														
20																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-12

RECORD OF BOREHOLE BH-11

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 66.216 ft
COORDS: 61.18750° N 149.77098° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS			
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	10 20 30 40				
						DEPTH (ft)						WATER CONTENT (PERCENT) W _p — W — W _L				
0	Hollow Stem Auger	0.0 - 0.3 Frozen, Asphalt; well bonded	■	SP-SM	[Hatched Box]	0.3	1	GS				○	PID = 0.2 ppm, Gravel = 27%, Sand = 65%, Fines = 8%, SA			
0.3 - 5.0 Frozen, brown, poorly graded SAND with silt and gravel; some gravel up to 1 inch diameter, few silt, well bonded with no excess ice (SP-SM, Nbn) [FILL]															PID = 0.3 ppm	
															3.5 ft 4/5/2016	
5		5.0 - 15.0 Compact, wet, grayish brown, poorly graded SAND with silt and gravel; medium to coarse-grained sand, some gravel up to 2 inch diameter, few silt, cobbles present (SP-SM)	SP-SM	[Dotted Box with Cobble]	5.0	3	HD	8-11-8	19	18/18	○	■	PID = 0.4 ppm, Gravel = 44%, Sand = 48%, Fines = 9%, SA			
															7 ft 3/23/2016; WD PID = 0.4 ppm	
10															PID = 1.2 ppm	
15		15.0 - 16.5 Dense, wet, gray, SILTY GRAVEL with sand; some sand, little to some silt (GM)	GM	[Dotted Box with Cobble]	15.0	6A	HD	17		6/6	○		PID = 2.6 ppm			
								6B	HD	20-37		12/12	○		PID = 0.3 ppm	
		Borehole completed at 16.5 ft.														
		Notes: 1) Groundwater observed at 7 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 3.5 feet on 4/5/2016. 4) Borehole backfilled with cuttings.														
20																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-13

RECORD OF BOREHOLE BH-12

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 67.177 ft
COORDS: 61.18680° N 149.77118° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES						UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS				
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV.	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	10	20		30	40		
						DEPTH (ft)						SALINITY (ppt) Δ WATER CONTENT (PERCENT) W _p ——— W ——— W _L						
0	Hollow Stem Auger	0.0 - 5.0 Frozen to 2.5 feet, compact below, dark brown, SILTY SAND with gravel and organics; medium to coarse-grained sand, some gravel up to 0.5 inch diameter, few silt, organics present as rootlets, well bonded with no excess ice (SM, Nbn)		SM			1	GS									PID = 0.2 ppm, Gravel = 30%, Sand = 56%, Fines = 14%	
																	PID = 0.2 ppm	
							2	HD	3-2-5	7	18/18							5 ft 3/23/2016; WD PID = 0.3 ppm
5		5.0 - 10.0 Loose to compact, wet, brown, poorly graded GRAVEL with silt and sand; gravel up to 1.5 inch diameter, some medium to coarse-grained sand, few silt, organics present as rootlets, cobbles present (GP-GM)		GP-GM		5.0	3	HD	8-8-9	17	18/18							PID = 0.3 ppm
							4	HD	10-15-12	27	18/18							
10		10.0 - 15.0 Compact, wet, grayish brown, poorly graded SAND with silt and gravel; medium to coarse-grained sand, little gravel up to 1 inch diameter, few silt (SP-SM)		SP-SM		10.0	5	HD	14-15-17	32	18/18						PID = 0.3 ppm	
15		15.0 - 16.5 Loose, wet, gray, poorly graded SAND with silt; medium to coarse-grained sand, few silt, few gravel up to 1 inch diameter (SP-SM)		SP-SM		15.0	6	HD	6-7-9	16	12/18						PID = 0.6 ppm	
		Borehole completed at 16.5 ft.																
		Notes: 1) Groundwater observed at 5 feet while drilling (WD). 2) Borehole backfilled with cuttings.																
20																		

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-14

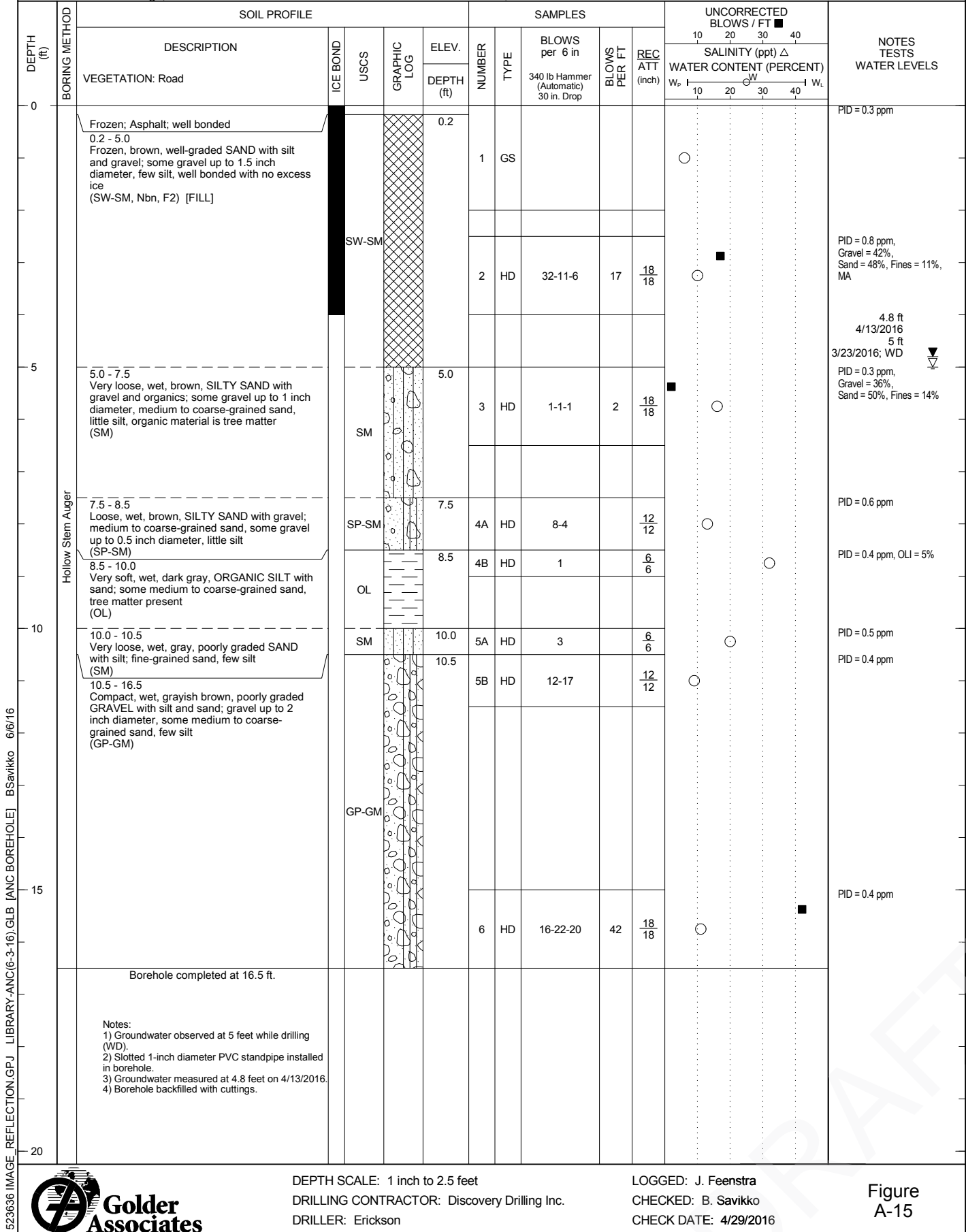
RECORD OF BOREHOLE BH-13

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 62.851 ft
COORDS: 61.18628° N 149.77181° W



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure A-15

RECORD OF BOREHOLE BH-14

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 63.092 ft
COORDS: 61.18582° N 149.77038° W

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES					UNCORRECTED BLOWS / FT ■		NOTES TESTS WATER LEVELS			
		DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 340 lb Hammer (Automatic) 30 in. Drop	BLOWS PER FT	REC ATT (inch)	SALINITY (ppt) Δ				
												WATER CONTENT (PERCENT)				
		VEGETATION: Road										W _p	W _L			
0	Hollow Stem Auger	0.0 - 0.2 Frozen, Asphalt; well bonded	■	SP-SM	[Cross-hatched pattern]	0.2	1	GS				○		PID = 1.2 ppm, Gravel = 43%, Sand = 47%, Fines = 10%, SA		
0.2 - 5.0 Frozen, brown, poorly graded SAND with silt and gravel; some gravel up to 1.5 inch diameter, few silt, well bonded with no excess ice (SP-SM, Nbn) [FILL]														PID = 0.5 ppm		
5		5.0 - 10.0 Loose to compact, brown, SILTY SAND with gravel; medium to coarse-grained sand, little gravel up to 1.5 inch diameter, little silt, with no excess ice (SM, Nbn)	■	SM	[Pattern with circles]	5.0	3	HD	14-10-5	15	18/18	○	■	PID = 0.4 ppm, Gravel = 27%, Sand = 59%, Fines = 14%, SA 5.9 ft 4/5/2016		
10		10.0 - 16.5 Loose, wet, grayish brown, poorly graded SAND; medium-grained sand, trace to few silt, thin layers of silt interbedded (SP)	■	SP	[Pattern with dots]	10.0	5	HD	8-8-9	17	18/18	○	■	PID = 0.6 ppm		
15							6	HD	7-8-19	27	18/18	○	■	PID = 0.9 ppm		
		Borehole completed at 16.5 ft.														
		Notes: 1) Groundwater observed at 7.5 feet while drilling (WD). 2) Slotted 1-inch diameter PVC standpipe installed in borehole. 3) Groundwater measured at 5.9 feet on 4/5/2016. 4) Borehole backfilled with cuttings.														
20																

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure
A-16

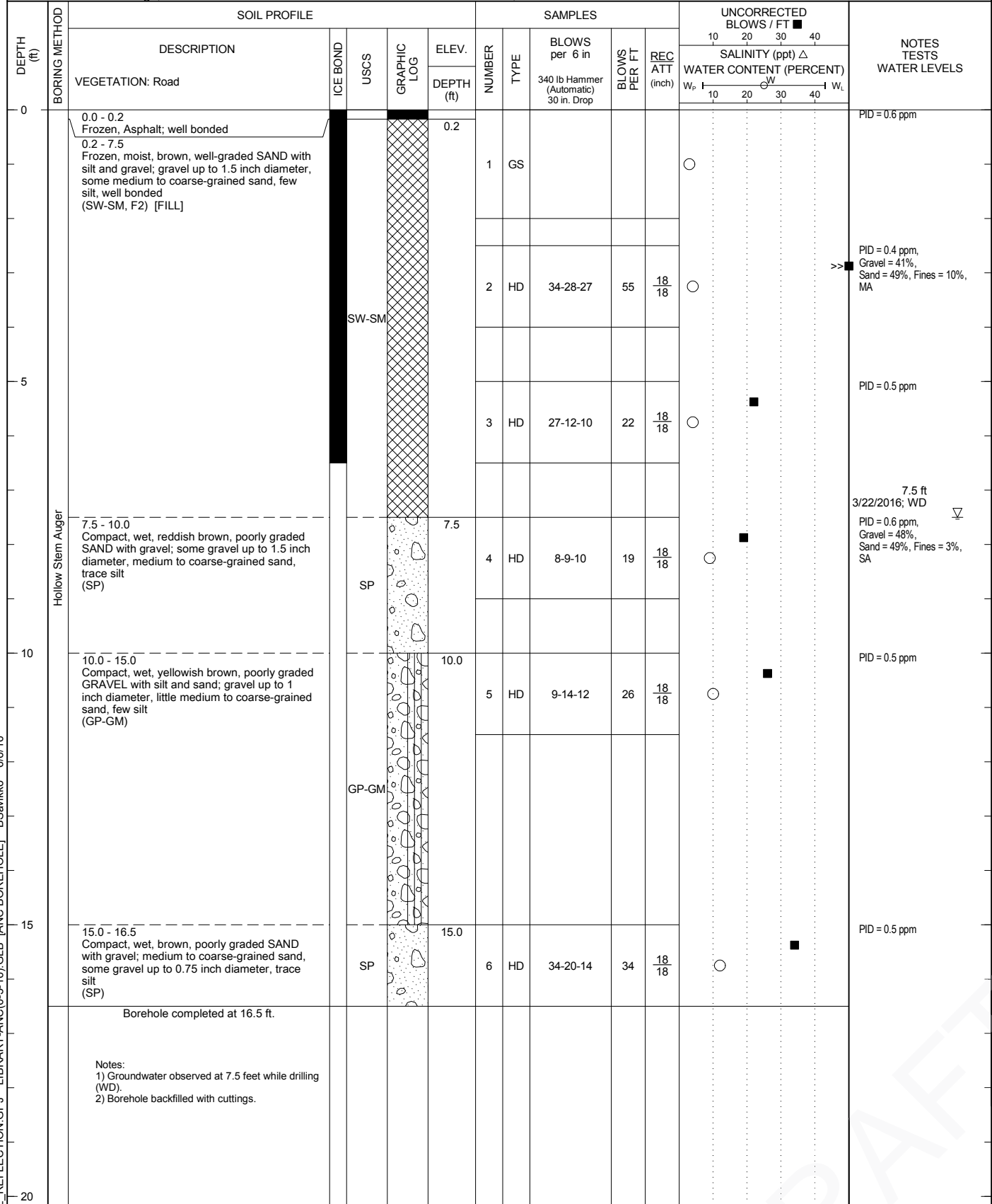
RECORD OF BOREHOLE BH-15

SHEET 1 of 1

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NUMBER: 1523636
LOCATION: Anchorage, AK

CLIENT: CRW Engineering Group, LLC
DRILLING DATE: 3/23/2016
EQUIPMENT: CME-75, Truck Mount

DATUM: WGS 84
ELEVATION: 62.611 ft
COORDS: 61.18477° N 149.77024° W



1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC BOREHOLE] BSavikko 6/6/16



DEPTH SCALE: 1 inch to 2.5 feet
DRILLING CONTRACTOR: Discovery Drilling Inc.
DRILLER: Erickson

LOGGED: J. Feenstra
CHECKED: B. Savikko
CHECK DATE: 4/29/2016

Figure A-17

APPENDIX B
LABORATORY DATA

DRAFT

TABLE B-1: SAMPLE SUMMARY

Client:	CRW Engineering Group, LLC	Project No.:	1523636
Project:	Image Drive / Reflection Drive Road Upgrades		
Location:	Anchorage, AK	Reviewed By:	M. Faulise
		Date:	4/20/2016

SAMPLING DATA							CLASSIFICATION AND INDEX TEST RESULTS									
SAMPLE LOCATION	SAMPLE NUMBER	DEPTH (ft)		RECOVERY (%)	SAMPLE TYPE	BLOWS PER FOOT	NATURAL MOISTURE CONTENT (%)	GRADATION (%)			ORGANIC CONTENT (%)	AMOUNT FINER THAN 0.02 mm (%)	FROST CLASSIFICATION	PID HEADSPACE (ppm)	DESCRIPTION (USCS)	TESTS / OTHER TESTS
		TOP	BOTTOM					GRAVEL	SAND	FINES (SILT & CLAY)						
BH-01	1	0.0	2.0	100	GS		5							0.2		
BH-01	2	2.5	4.0	100	HD	58	4	44	46	10		6	F2	0.3	SW-SM	MA
BH-01	3	5.0	6.5	100	HD	36	3							0.7		
BH-01	4	7.5	9.0	100	HD	24	3							0.2		
BH-01	5	10.0	11.5	100	HD	42	6	39	37	24				0.2	GM	
BH-01	6	15.0	16.5	100	HD	13	10							0.2		
BH-01	7	20.0	21.5	100	HD	11	15							0.4		
BH-01	8	25.0	26.5	100	HD	34	13							0.2		
BH-02	1	0.0	2.0	100	GS		4							1.1		
BH-02	2	2.5	4.0	100	HD	25	8	52	38	10				0.5	GW-GM	SA
BH-02	3	5.0	6.5	100	HD	6	7							0.7		
BH-02	4	7.5	9.0	33	HD	7	16							2		
BH-02	5	10.0	11.5	33	HD	11	14							0.3		
BH-02	6	15.0	16.5	67	HD	20	11							0.5		
BH-03	1	0.0	2.0	100	GS		3	44	43	13		9		0.5		
BH-03	2	2.5	4.0	100	HD	33	4						F1	2	GM	MA
BH-03	3	5.0	6.5	100	HD	17	7							1.3		
BH-03	4	7.5	9.0	100	HD	26	7	28	40	32				0.3	SM	
BH-03	5	10.0	11.5	100	HD	38	7							0.3		
BH-03	6A	15.0	15.5	100	HD		8							0.5		
BH-03	6B	15.5	16.5	100	HD		10							0.5		
BH-04	1	0.0	2.0	100	GS		2							0.3		
BH-04	2	2.5	4.0	100	HD	50	9	32	40	28				0.3	SM	SA
BH-04	3	5.0	6.5	100	HD	16	10							0.4		
BH-04	4	7.5	9.0	100	HD	20	7							0.4		
BH-04	5	10.0	11.5	100	HD	28	6							0.5		
BH-04	6	15.0	16.5	100	HD	32	7							2.8		
BH-05	1	0.0	2.0	100	GS		5	41	43	16		11	F2	0.4	SM	MA
BH-05	2	2.5	4.0	100	HD	21	4							1.7		
BH-05	3	5.0	6.5	100	HD	28	8							0.3		
BH-05	4	7.5	9.0	100	HD	26	9	18	45	37				0.9	SM	SA
BH-05	5	10.0	11.5	100	HD	37	6							0.4		

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC_SAMPLE_SUMMARY] BSavikko 6/6/16

TABLE B-1: SAMPLE SUMMARY

Client:	CRW Engineering Group, LLC	Project No.:	1523636
Project:	Image Drive / Reflection Drive Road Upgrades		
Location:	Anchorage, AK	Reviewed By:	M. Faulise
		Date:	4/20/2016

SAMPLING DATA							CLASSIFICATION AND INDEX TEST RESULTS									
SAMPLE LOCATION	SAMPLE NUMBER	DEPTH (ft)		RECOVERY (%)	SAMPLE TYPE	BLOWS PER FOOT	NATURAL MOISTURE CONTENT (%)	GRADATION (%)			ORGANIC CONTENT (%)	AMOUNT FINER THAN 0.02 mm (%)	FROST CLASSIFICATION	PID HEADSPACE (ppm)	DESCRIPTION (USCS)	TESTS / OTHER TESTS
		TOP	BOTTOM					GRAVEL	SAND	FINES (SILT & CLAY)						
BH-05	6	15.0	16.5	100	HD	27	5							0.7		
BH-06	1	0.0	2.0	100	GS		7	35	49	16				0.6	SM	
BH-06	2	2.5	4.0	100	HD	46	8							0.3		
BH-06	3	5.0	6.5	67	HD	34	9							0.5		
BH-06	4	7.5	9.0	100	HD	13	8							0.2		
BH-06	5	10.0	11.5	100	HD	10	10							0.2		
BH-06	6	15.0	16.5	100	HD	23	19							0.2		
BH-07	1	0.0	2.0	100	GS		4	32	51	17		12	F2	0.2	SM	MA
BH-07	2	2.5	4.0	100	HD	58	12							0.2		
BH-07	3a	5.0	6.0	100	HD	14	32				11			0.2		
BH-07	3b	6.0	6.5	100	HD		11							0.2		
BH-07	4	7.5	9.0	100	HD	12	11							0.2		
BH-07	5	10.0	11.5	100	HD	16	10							0.4		
BH-07	6	15.0	16.5	100	HD	30	14							0.4		
BH-08	1	0.0	2.0	100	GS		8							0.2		
BH-08	2	2.5	4.0	100	HD	35	13	43	46	11				8.7	SP-SM	SA
BH-08	3	5.0	6.5	100	HD	15	11							3.2		
BH-08	4	7.5	9.0	100	HD	19	11							3.3		
BH-08	5	10.0	11.5	100	HD	22								33.8		
BH-08	6	15.0	16.5	100	HD	37	7							0.6		
BH-09	1	0.0	2.0	100	GS		6	40	46	14				0.1	SM	SA
BH-09	2	2.5	4.0	100	HD	32	10							0.2		
BH-09	3	5.0	6.5	100	HD	12	10	46	43	11				0.3	GP-GM	
BH-09	4	7.5	9.0	100	HD	13	9							0.5		
BH-09	5	10.0	11.5	100	HD	18	21							0.3		
BH-09	6	15.0	16.5	100	HD	9	23							0.2		
BH-10	1	0.0	2.0	100	GS		3							0.2		
BH-10	2	2.5	4.0	100	HD	31	7							0.3		
BH-10	3	5.0	6.5	100	HD	10	7	45	42	12				0.3	GM	
BH-10	4	7.5	9.0	100	HD	15	13							0.5		
BH-10	5	10.0	11.5	100	HD	14	20							1.7		
BH-10	6A	15.0	15.5	100	HD		21							0.3		

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC_SAMPLE_SUMMARY] BSavikko 6/6/16

TABLE B-1: SAMPLE SUMMARY

Client:	CRW Engineering Group, LLC	Project No.:	1523636
Project:	Image Drive / Reflection Drive Road Upgrades		
Location:	Anchorage, AK	Reviewed By:	M. Faulise
		Date:	4/20/2016

SAMPLING DATA							CLASSIFICATION AND INDEX TEST RESULTS									
SAMPLE LOCATION	SAMPLE NUMBER	DEPTH (ft)		RECOVERY (%)	SAMPLE TYPE	BLOWS PER FOOT	NATURAL MOISTURE CONTENT (%)	GRADATION (%)			ORGANIC CONTENT (%)	AMOUNT FINER THAN 0.02 mm (%)	FROST CLASSIFICATION	PID HEADSPACE (ppm)	DESCRIPTION (USCS)	TESTS / OTHER TESTS
		TOP	BOTTOM					GRAVEL	SAND	FINES (SILT & CLAY)						
BH-10	6B	15.5	16.5	100	HD		18							0.3		
BH-11	1	0.0	2.0	100	GS		7	27	65	8				0.2	SP-SM	SA
BH-11	2	2.5	4.0	100	HD	48	11							0.3		
BH-11	3	5.0	6.5	100	HD	19	8	44	48	9				0.4	SP-SM	SA
BH-11	4	7.5	9.0	100	HD	8	7							0.4		
BH-11	5	10.0	11.5	100	HD	16	13							1.2		
BH-11	6A	15.0	15.5	100	HD		14							2.6		
BH-11	6B	15.5	16.5	100	HD		7							0.3		
BH-12	1	0.0	2.0	100	GS		54	30	56	14				0.2	SM	
BH-12	2	2.5	4.0	100	HD	7	38							0.2		
BH-12	3	5.0	6.5	100	HD	17	7							0.3		
BH-12	4	7.5	9.0	100	HD	27	11							0.3		
BH-12	5	10.0	11.5	100	HD	32	13							0.3		
BH-12	6	15.0	16.5	67	HD	16	15							0.6		
BH-13	1	0.0	2.0	100	GS		6							0.3		
BH-13	2	2.5	4.0	100	HD	17	10	42	48	11		5	F2	0.8	SW-SM	MA
BH-13	3	5.0	6.5	100	HD	2	16	36	50	14				0.3	SM	
BH-13	4A	7.5	8.5	100	HD		13							0.6		
BH-13	4B	8.5	9.0	100	HD		32				5			0.4		
BH-13	5A	10.0	10.5	100	HD		20							0.5		
BH-13	5B	10.5	11.5	100	HD		9							0.4		
BH-13	6	15.0	16.5	100	HD	42	11							0.4		
BH-14	1	0.0	2.0	100	GS		4	43	47	10				1.2	SP-SM	SA
BH-14	2	2.5	4.0	100	HD	46	6							0.5		
BH-14	3	5.0	6.5	100	HD	15	9	27	59	14				0.4	SM	SA
BH-14	4	7.5	9.0	100	HD	11	10							0.8		
BH-14	5	10.0	11.5	100	HD	17	23							0.6		
BH-14	6	15.0	16.5	100	HD	27	17							0.9		
BH-15	1	0.0	2.0	100	GS		3							0.6		
BH-15	2	2.5	4.0	100	HD	55	4	41	49	10		5	F2	0.4	SW-SM	MA
BH-15	3	5.0	6.5	100	HD	22	4							0.5		
BH-15	4	7.5	9.0	100	HD	19	9	48	49	3				0.6	SP	SA

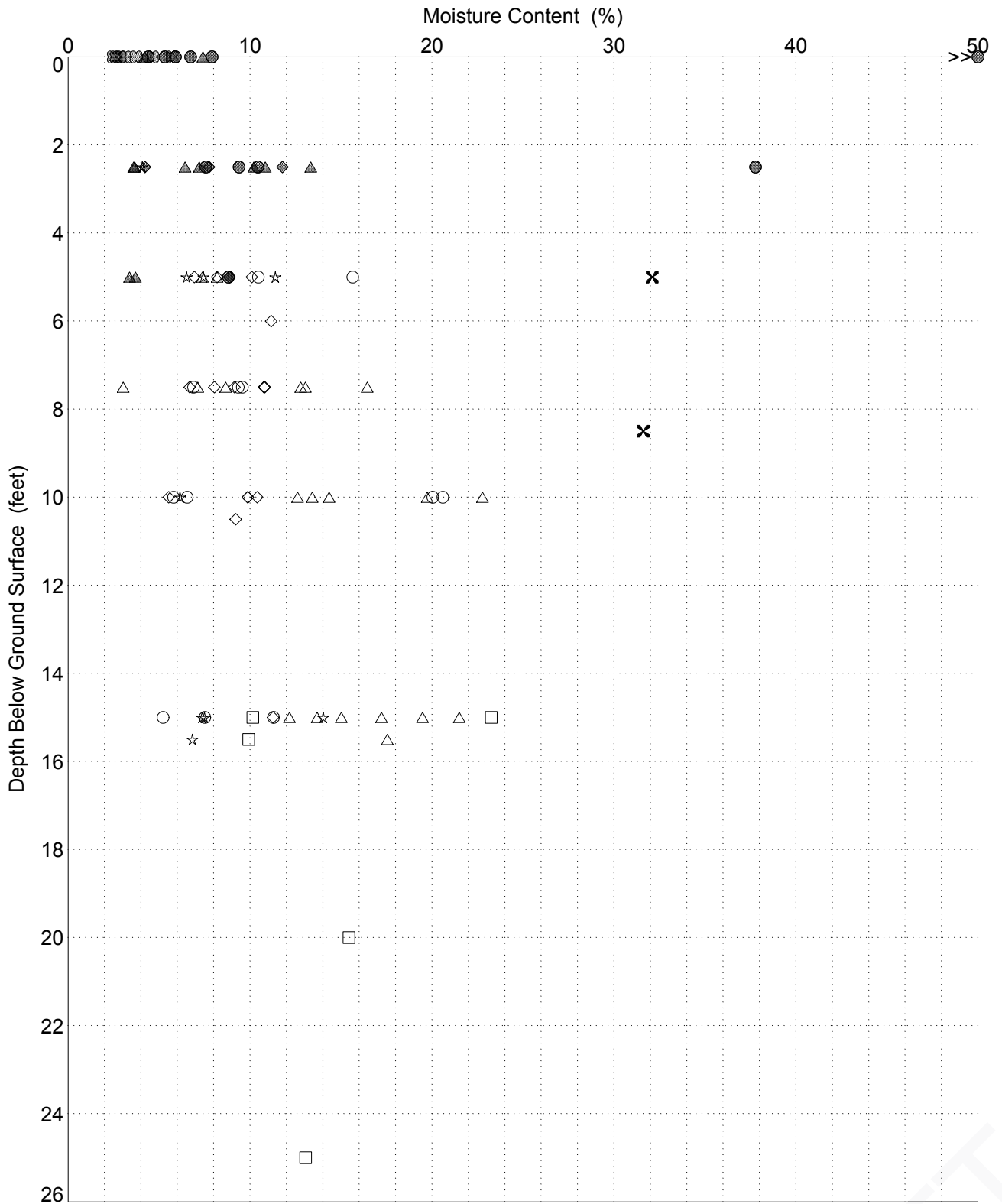
1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC_SAMPLE_SUMMARY] BSavikko 6/6/16

TABLE B-1: SAMPLE SUMMARY

Client:	CRW Engineering Group, LLC	Project No.:	1523636
Project:	Image Drive / Reflection Drive Road Upgrades		
Location:	Anchorage, AK	Reviewed By:	M. Faulise
		Date:	4/20/2016

SAMPLING DATA							CLASSIFICATION AND INDEX TEST RESULTS									
SAMPLE LOCATION	SAMPLE NUMBER	DEPTH (ft)		RECOVERY (%)	SAMPLE TYPE	BLOWS PER FOOT	NATURAL MOISTURE CONTENT (%)	GRADATION (%)			ORGANIC CONTENT (%)	AMOUNT FINER THAN 0.02 mm (%)	FROST CLASSIFICATION	PID HEADSPACE (ppm)	DESCRIPTION (USCS)	TESTS / OTHER TESTS
		TOP	BOTTOM					GRAVEL	SAND	FINES (SILT & CLAY)						
BH-15	5	10.0	11.5	100	HD	26	10							0.5		
BH-15	6	15.0	16.5	100	HD	34	12							0.5		

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC_SAMPLE_SUMMARY] BSavikko 6/6/16



CLIENT
CRW ENGINEERING GROUP, LLC

PROJECT
IMAGE DRIVE / REFLECTION DRIVE ROAD UPGRADES

ANCHORAGE, AK

TITLE
MOISTURE CONTENT VS. DEPTH

CONSULTANT



YYYY-MM-DD 2016-06-06

PREPARED BBS

DESIGN N/A

REVIEW BBS

APPROVED

PROJECT No.
1523636

CONTROL

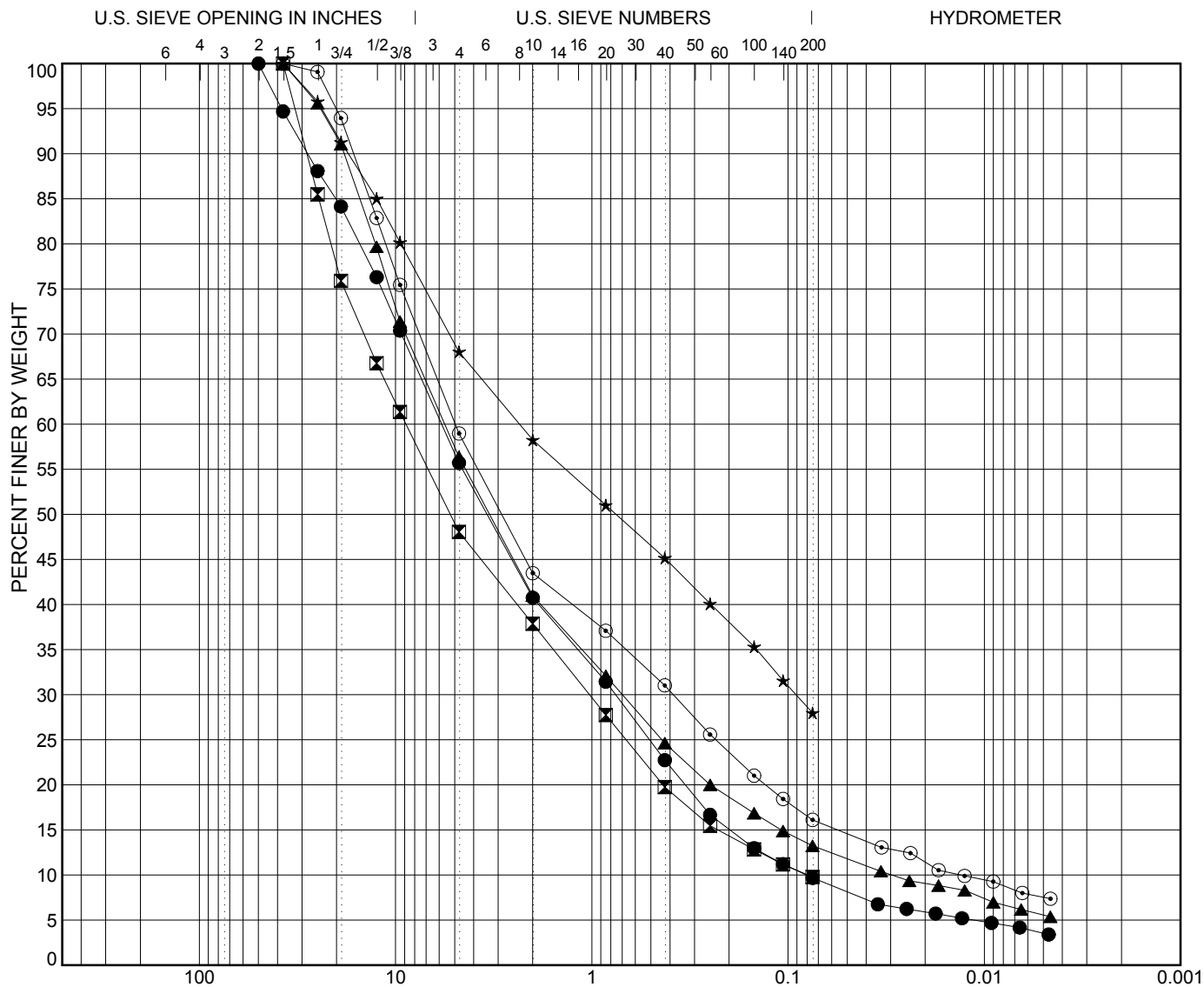
Rev.

FIGURE
B-1

FIGURE B-2: SUMMARY OF PARTICLE SIZE DISTRIBUTION RESULTS

Reference(s)
ASTM D422
ASTM D6913

Client:	CRW Engineering Group, LLC	Project No.:	1523636
Project:	Image Drive / Reflection Drive Road Upgrades	QA/QC By:	K. Sorensen
Location:	Anchorage, AK	Reviewed By:	M. Faulise
		Date:	4/15/2016
		Date:	4/20/2016



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

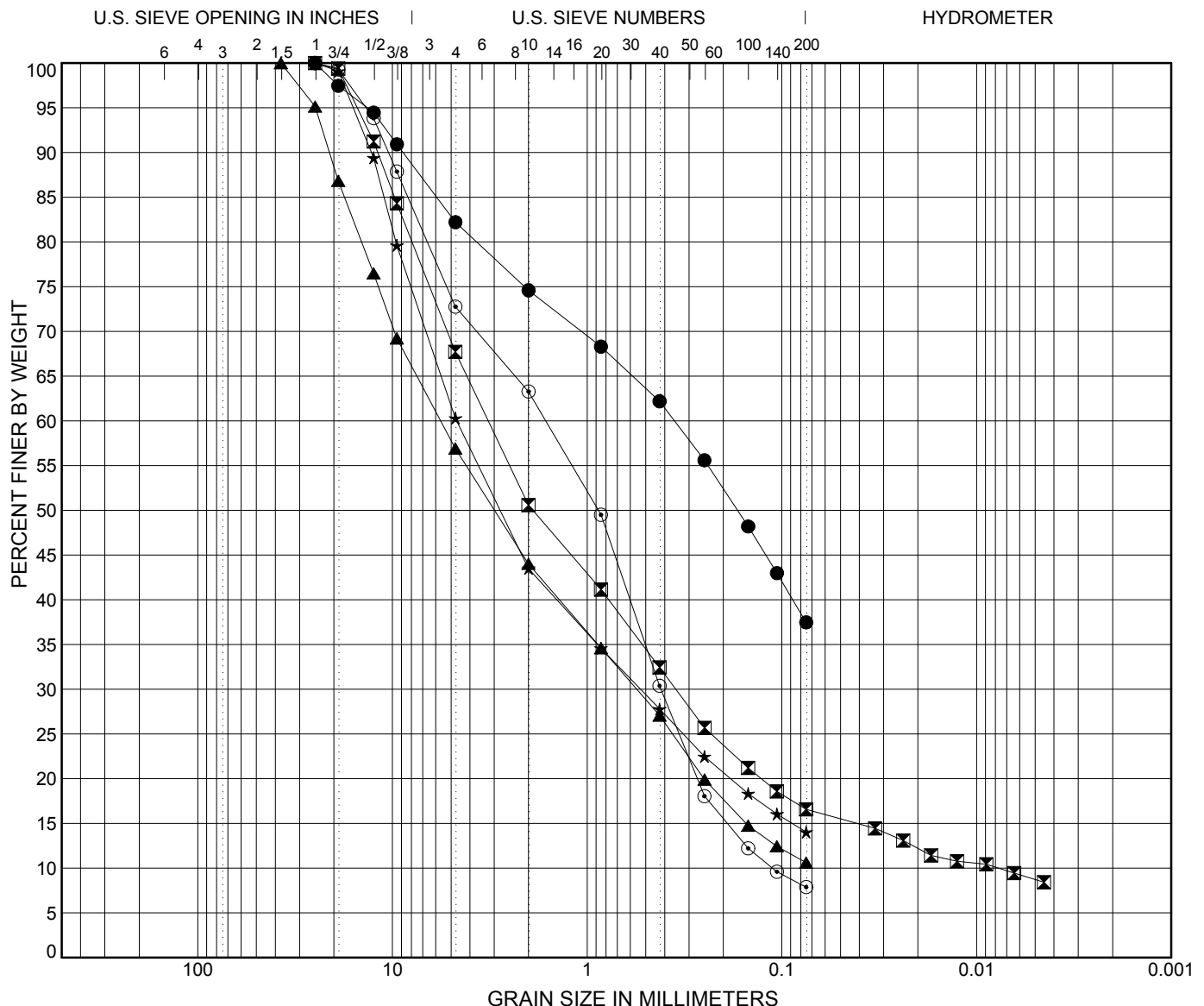
	Sample Location	Sample Number	Depth (ft)	USCS Classification	Cc	Cu	% Gravel	% Sand	% Fines	% < 0.02 mm
●	BH-01	2	2.5	well-graded sand with silt and gravel (SW-SM)	1.2	72.2	44	46	10	6
⊠	BH-02	2	2.5	well-graded gravel with silt and sand (GW-GM)	1.5	111.7	52	38	10	
▲	BH-03	1	0.0	silty gravel with sand (GM)	3.0	190.1	44	43	13	9
★	BH-04	2	2.5	silty sand with gravel (SM)	-	-	32	40	28	
⊙	BH-05	1	0.0	silty sand with gravel (SM)	2.3	374.5	41	43	16	11

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC LAB GRAIN SIZE] BSavikko 6/6/16

FIGURE B-3: SUMMARY OF PARTICLE SIZE DISTRIBUTION RESULTS

Reference(s)
ASTM D422
ASTM D6913

Client:	CRW Engineering Group, LLC	Project No.:	1523636		
Project:	Image Drive / Reflection Drive Road Upgrades	QA/QC By:	K. Sorensen	Date:	4/15/2016
Location:	Anchorage, AK	Reviewed By:	M. Faulise	Date:	4/20/2016



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

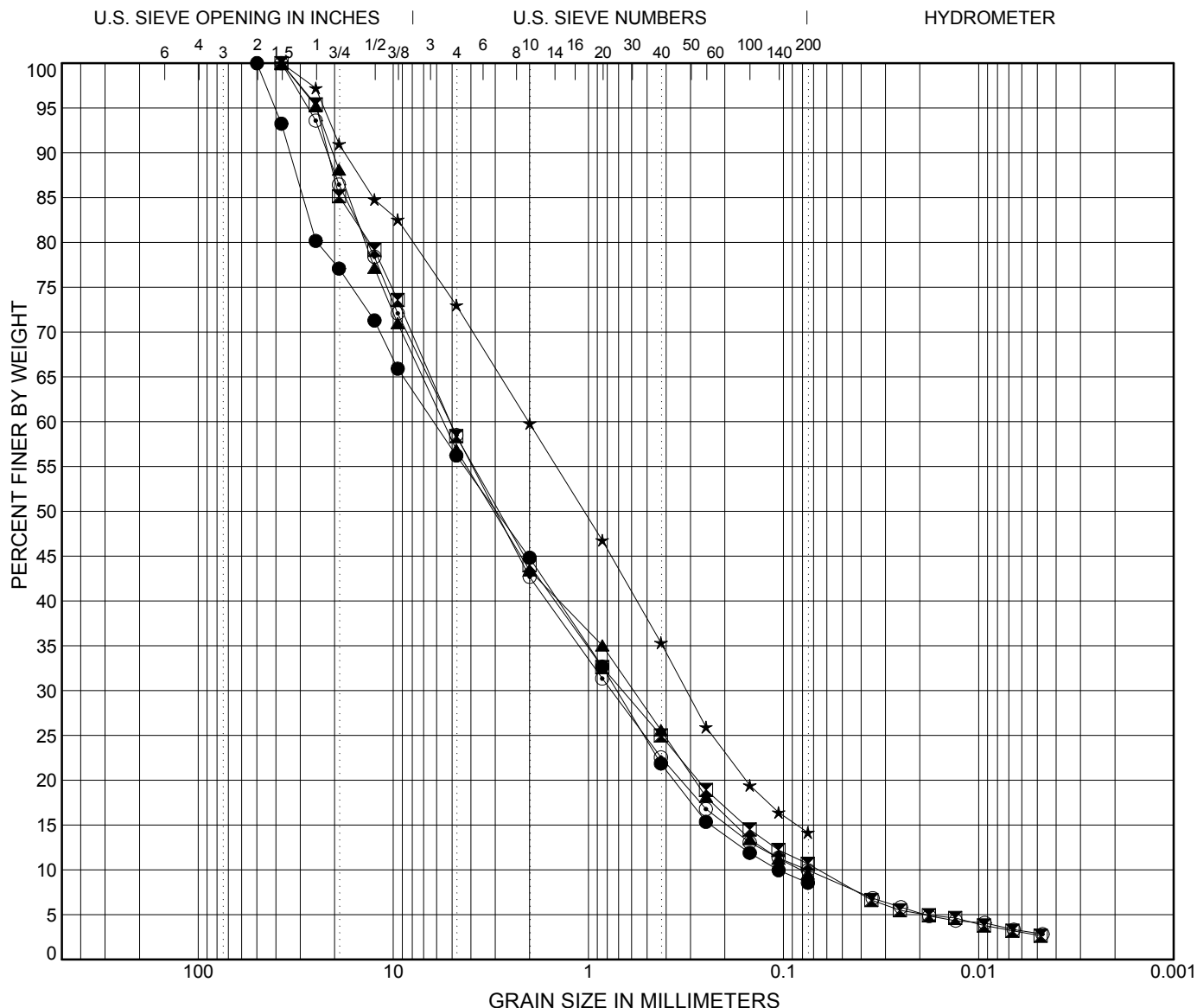
	Sample Location	Sample Number	Depth (ft)	USCS Classification	Cc	Cu	% Gravel	% Sand	% Fines	% < 0.02 mm
●	BH-05	4	7.5	silty sand with gravel (SM)	-	-	18	45	37	
■	BH-07	1	0.0	silty sand with gravel (SM)	5.0	417.0	32	51	17	12
▲	BH-08	2	2.5	poorly graded sand with silt and gravel (SP-SM)	0.8	84.8	43	46	11	
★	BH-09	1	0.0	silty sand with gravel (SM)	-	-	40	46	14	
○	BH-11	1	0.0	poorly graded sand with silt and gravel (SP-SM)	1.0	14.6	27	65	8	

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC LAB GRAIN SIZE] BSavikko 6/6/16

FIGURE B-4: SUMMARY OF PARTICLE SIZE DISTRIBUTION RESULTS

Reference(s)
ASTM D422
ASTM D6913

Client: CRW Engineering Group, LLC	Project No.: 1523636
Project: Image Drive / Reflection Drive Road Upgrades	QA/QC By: K. Sorensen Date: 4/15/2016
Location: Anchorage, AK	Reviewed By: M. Faulise Date: 4/20/2016



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

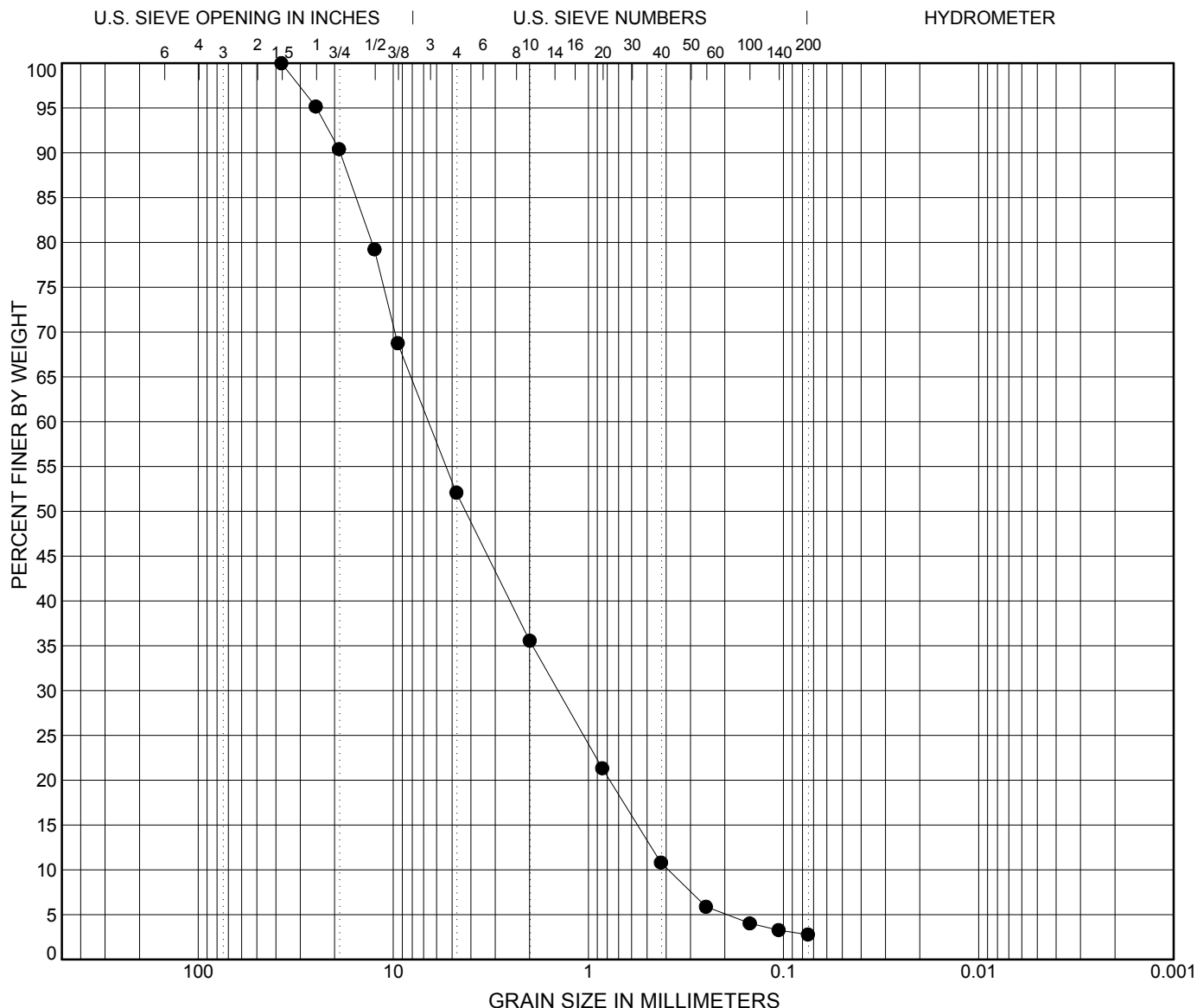
	Sample Location	Sample Number	Depth (ft)	USCS Classification	Cc	Cu	% Gravel	% Sand	% Fines	% < 0.02 mm
●	BH-11	3	5.0	poorly graded sand with silt and gravel (SP-SM)	0.8	58.3	44	48	9	
⊠	BH-13	2	2.5	well-graded sand with silt and gravel (SW-SM)	1.3	77.1	42	48	11	5
▲	BH-14	1	0.0	poorly graded sand with silt and gravel (SP-SM)	0.8	67.8	43	47	10	
★	BH-14	3	5.0	silty sand with gravel (SM)	-	-	27	59	14	
⊙	BH-15	2	2.5	well-graded sand with silt and gravel (SW-SM)	1.5	67.7	41	49	10	5

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC LAB GRAIN SIZE] BSavikko 6/6/16

FIGURE B-5: SUMMARY OF PARTICLE SIZE DISTRIBUTION RESULTS

Reference(s)
ASTM D422
ASTM D6913

Client:	CRW Engineering Group, LLC	Project No.:	1523636	
Project:	Image Drive / Reflection Drive Road Upgrades	QA/QC By:	K. Sorensen	Date: 4/15/2016
Location:	Anchorage, AK	Reviewed By:	M. Faulise	Date: 4/20/2016



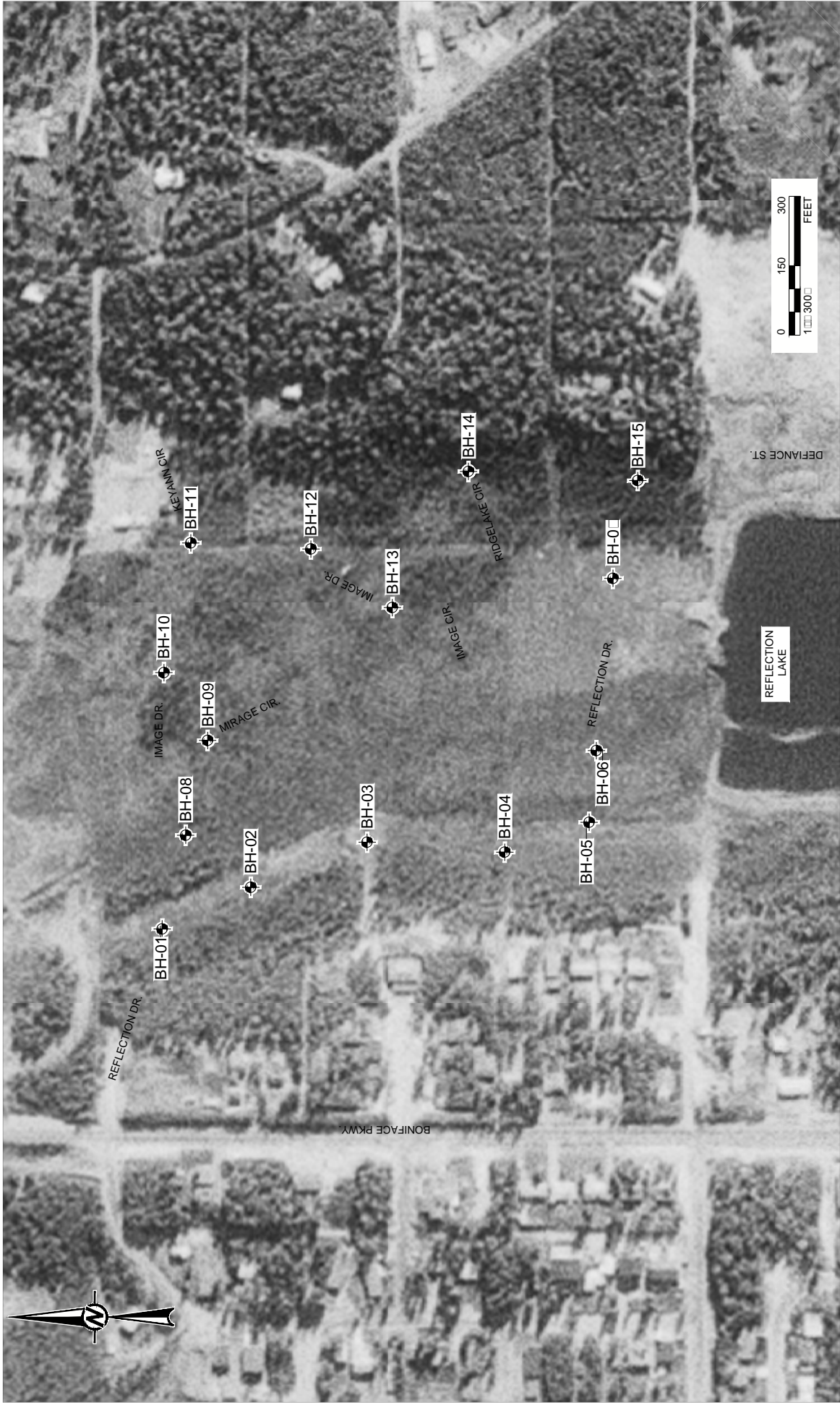
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Sample Number	Depth (ft)	USCS Classification	Cc	Cu	% Gravel	% Sand	% Fines	% < 0.02 mm
●	BH-15	4	7.5	poorly graded sand with gravel (SP)	0.8	17.0	48	49	3	

1523636 IMAGE_REFLECTION.GPJ LIBRARY-ANC(6-3-16).GLB [ANC LAB GRAIN SIZE] BSavikko 6/6/16

APPENDIX C
HISTORIC PHOTOGRAPHY

DRAFT



LE END

BH-01

BOREHOLE LOCATION AND NAME

REFERENCE(S)

1. HISTORICAL IMAGE DATED 19-3-06-29 AND DISTRIBUTED BY U.S.G.S.

CLIENT

CRW ENGINEERING GROUP, LLC

CONSULTANT

2016-06-10

DESIGNED

APG

PREPARED

BBS

REVIEWED

-

APPROVED

-

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

TITLE

HISTORICAL AERIAL IMAGE

PROJECT NO.

1523636

CONTROL

A

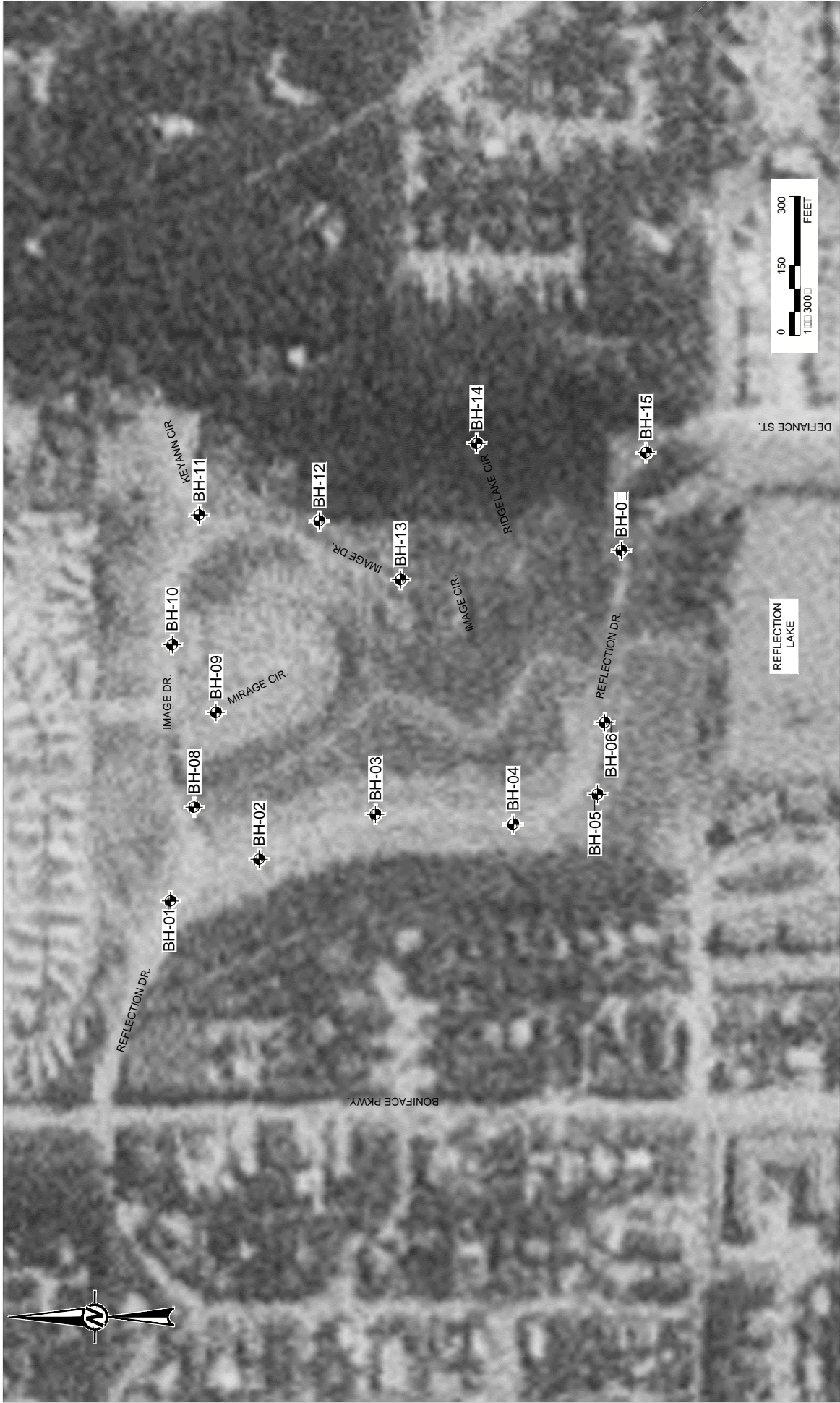
REV.

A

FIGURE

C-1

DRAFT



LE END

BH-01

BOREHOLE LOCATION AND NAME

REFERENCE(S)

1. HISTORICAL IMAGE DATED 1985-08-2 AND DISTRIBUTED BY U.S.G.S.

CLIENT

CRW ENGINEERING GROUP, LLC

CONSULTANT

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

TITLE

HISTORICAL AERIAL IMAGE

DESIGNED

2016-06-10

PREPARED

APG

REVIEWED

BBS

APPROVED

PROJECT NO.

1523636

CONTROL

A

REV.

FIGURE

C-2

DRAFT

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



LE/END

BH-01

BOREHOLE LOCATION AND NAME

CLIENT

CRW ENGINEERING GROUP, LLC

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

REFERENCE(S)

1. HISTORICAL IMAGE DATED 1988-08-15 AND DISTRIBUTED BY U.S.G.S.

CONSULTANT

CRW ENGINEERING GROUP, LLC

DESIGNED

2016-06-10

PREPARED

APG

REVIEWED

BBS

APPROVED

TITLE

HISTORICAL AERIAL IMAGE

PROJECT NO.

1523636

CONTROL

A

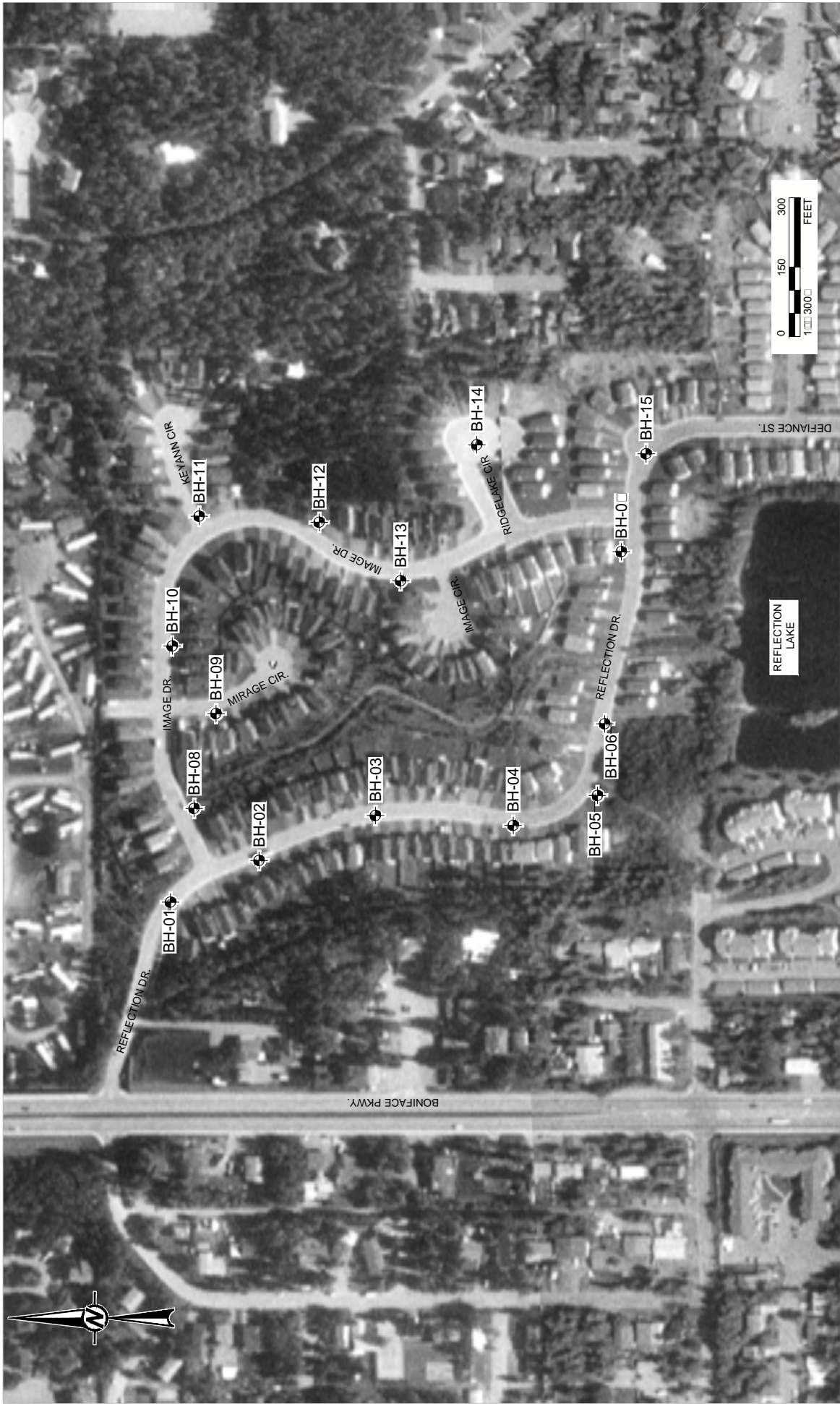
REV.

FIGURE

C-3

DRAFT

Golder Associates



LE END

BH-01

BOREHOLE LOCATION AND NAME

CLIENT

CRW ENGINEERING GROUP, LLC

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

REFERENCE(S)

1. HISTORICAL DIGITAL ORTHO UAD (DO) IMAGE DATED 1996 AND DISTRIBUTED BY U.S.G.S.

CONSULTANT

2016-06-10

DESIGNED

APG

PREPARED

BBS

REVIEWED

APPROVED

TITLE

HISTORICAL AERIAL IMAGE

PROJECT NO.

1523636

CONTROL

A

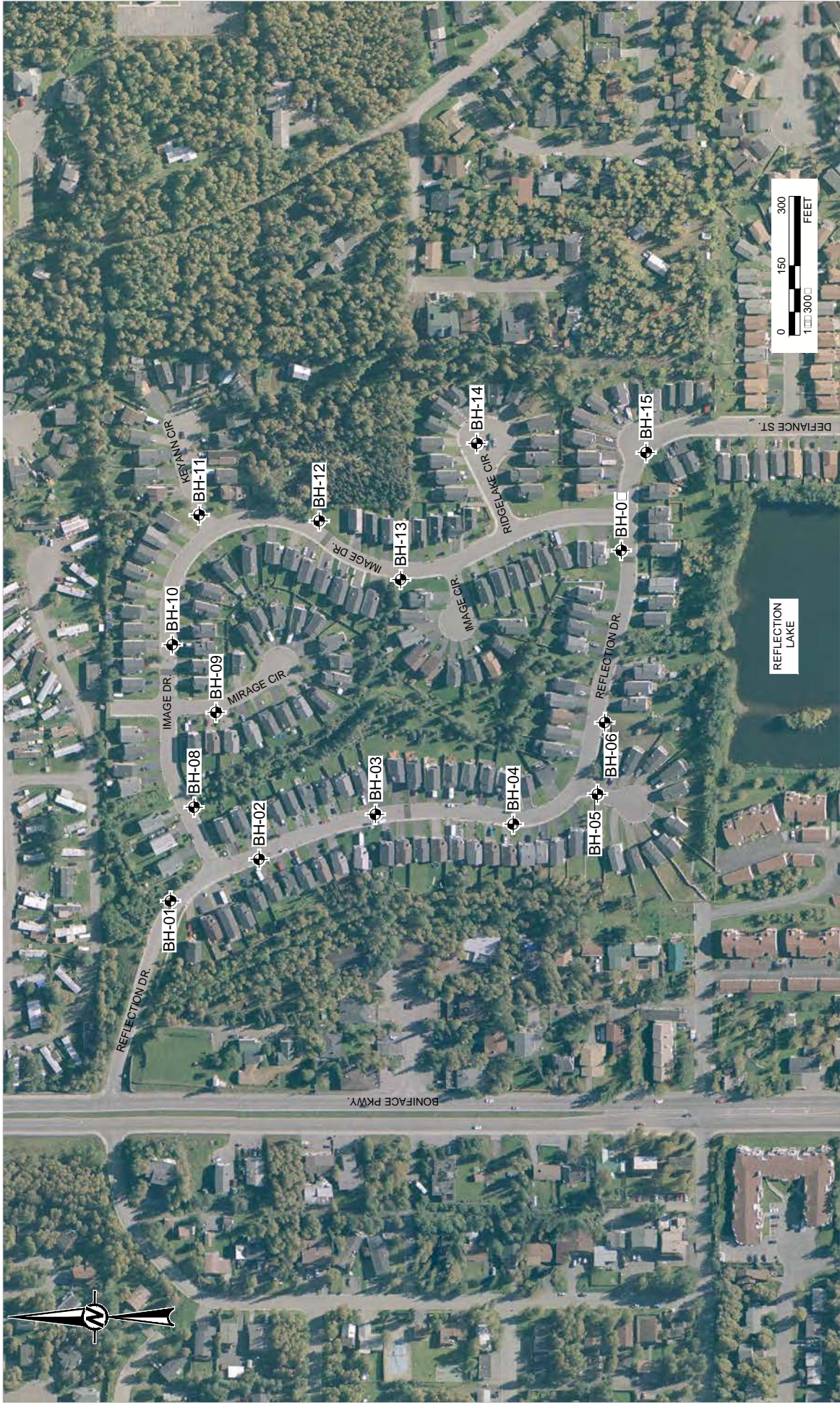
REV.

C-4

FIGURE

C-4

Goldier Associates



LE END

BH-01

BOREHOLE LOCATION AND NAME

CLIENT

CRW ENGINEERING GROUP, LLC

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

REFERENCE(S)

1. ORTHOIMAGE DATED JULY 2002 ACQUIRED AND DISTRIBUTED BY U.S.G.S.

CONSULTANT

2016-06-10

DESIGNED

APG

PREPARED

BBS

REVIEWED

APPROVED

TITLE

HISTORICAL AERIAL IMAGE

PROJECT NO.

1523636

REV.

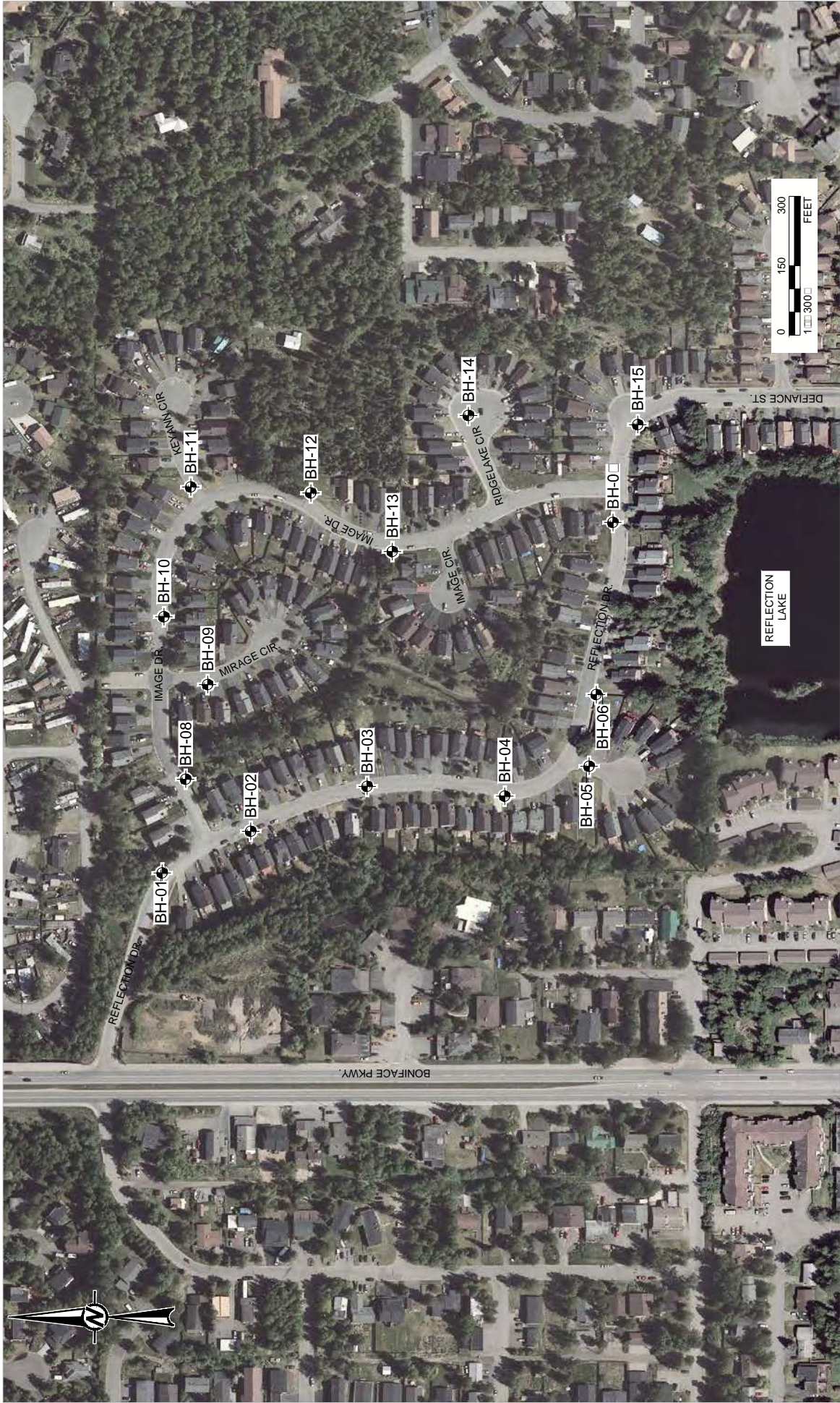
A

CONTROL

FIGURE

C-5

CRW ENGINEERING GROUP, LLC



LE END

BH-01

BOREHOLE LOCATION AND NAME

CLIENT

CRW ENGINEERING GROUP, LLC

PROJECT

IMAGE-REFLECTION DR ROAD UPGRADES

ANCHORAGE, ALASKA

REFERENCE(S)

1. ORTHOIMAGE DATED JULY 2015 PROVIDED BY ANCHORAGE LIDAR AND IMAGERY PROJECT AND DISTRIBUTED BY ALASKA DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS (DGGS).

CONSULTANT

2016-06-10

DESIGNED

PREPARED

REVIEWED

APPROVED

APG

BBS

TITLE

HISTORICAL AERIAL IMAGE

PROJECT NO.

1523636

REV.

A

CONTROL

FIGURE

C-6

Golder Associates

**APPENDIX D
SITE PHOTOGRAPHS**

DRAFT

**Project Title: Image/Reflection Drive Road Upgrades****PHOTO 1**

Typical pavement conditions along the project area, Photo taken at Borehole BH-03.

**PHOTO 2**

Typical pavement and sidewalk conditions along project area. Photo taken near Borehole BH-02.





PHOTO 3

Cracking along road center line near Borehole BH-11.



PHOTO 4

Typical pavement and sidewalk conditions along project area. Photo taken near Borehole BH-10.



APPENDIX E
SGS LABORATORY TEST RESULTS

DRAFT

Laboratory Report of Analysis

To: Golder Associates Inc.
2121 Abbott Road, #100
Anchorage, AK 99507
(907)865-2524

Report Number: **1161603**

Client Project: **Image/Reflection Drive**

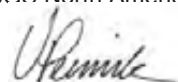
Dear Brenton Savikko,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Victoria at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.



SGS North America Inc.
Environmental Services – Alaska Division
Project Manager

Victoria Pennick

2016.04.21

11:37:04 -08'00'

Victoria Pennick
Project Manager
Victoria.Pennick@sgs.com

Date

Print Date: 04/20/2016 1:13:54PM

Case Narrative

SGS Client: **Golder Associates Inc.**
SGS Project: **1161603**
Project Name/Site: **Image/Reflection Drive**
Project Contact: **Brenton Savikko**

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

Print Date: 04/20/2016 1:13:55PM

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

Sample Summary

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Collected</u>	<u>Received</u>	<u>Matrix</u>
BH-8 #5	1161603001	04/06/2016	04/06/2016	Soil/Solid (dry weight)

<u>Method</u>	<u>Method Description</u>
AK101	AK101/8021 Combo. (S)
SW8021B	AK101/8021 Combo. (S)
AK102	Diesel/Residual Range Organics
AK103	Diesel/Residual Range Organics
SM21 2540G	Percent Solids SM2540G

Print Date: 04/20/2016 1:13:57PM

Detectable Results Summary

Client Sample ID: **BH-8 #5**

Lab Sample ID: 1161603001

Semivolatile Organic Fuels

Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	37.5	mg/Kg
Residual Range Organics	38.6	mg/Kg
Gasoline Range Organics	1.44J	mg/Kg
o-Xylene	26.8J	ug/Kg

Print Date: 04/20/2016 1:13:58PM

SGS North America Inc.

200 West Potter Drive, Anchorage, AK 99518
 t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Results of BH-8 #5

Client Sample ID: **BH-8 #5**
 Client Project ID: **Image/Reflection Drive**
 Lab Sample ID: 1161603001
 Lab Project ID: 1161603

Collection Date: 04/06/16 12:00
 Received Date: 04/06/16 15:35
 Matrix: Soil/Solid (dry weight)
 Solids (%):89.0
 Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	37.5	22.1	6.86	mg/Kg	1		04/12/16 13:56
Surrogates							
5a Androstane (surr)	101	50-150		%	1		04/12/16 13:56

Batch Information

Analytical Batch: XFC12329
 Analytical Method: AK102
 Analyst: CJSW
 Analytical Date/Time: 04/12/16 13:56
 Container ID: 1161603001-A

Prep Batch: XXX35139
 Prep Method: SW3550C
 Prep Date/Time: 04/11/16 09:03
 Prep Initial Wt./Vol.: 30.466 g
 Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	38.6	22.1	6.86	mg/Kg	1		04/12/16 13:56
Surrogates							
n-Triacontane-d62 (surr)	97.2	50-150		%	1		04/12/16 13:56

Batch Information

Analytical Batch: XFC12329
 Analytical Method: AK103
 Analyst: CJSW
 Analytical Date/Time: 04/12/16 13:56
 Container ID: 1161603001-A

Prep Batch: XXX35139
 Prep Method: SW3550C
 Prep Date/Time: 04/11/16 09:03
 Prep Initial Wt./Vol.: 30.466 g
 Prep Extract Vol: 1 mL

Results of BH-8 #5

Client Sample ID: **BH-8 #5**
 Client Project ID: **Image/Reflection Drive**
 Lab Sample ID: 1161603001
 Lab Project ID: 1161603

Collection Date: 04/06/16 12:00
 Received Date: 04/06/16 15:35
 Matrix: Soil/Solid (dry weight)
 Solids (%):89.0
 Location:

Results by Volatile Fuels

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Gasoline Range Organics	1.44 J	3.35	1.01	mg/Kg	1		04/15/16 04:51

Surrogates

4-Bromofluorobenzene (surr)	96	50-150		%	1		04/15/16 04:51
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Batch Information

Analytical Batch: VFC12962
 Analytical Method: AK101
 Analyst: S.P
 Analytical Date/Time: 04/15/16 04:51
 Container ID: 1161603001-B

Prep Batch: VXX28685
 Prep Method: SW5035A
 Prep Date/Time: 04/06/16 12:00
 Prep Initial Wt./Vol.: 51.295 g
 Prep Extract Vol: 30.6335 mL

Parameter	Result Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Benzene	8.40 U	16.8	5.37	ug/Kg	1		04/15/16 04:51
Ethylbenzene	16.8 U	33.5	10.5	ug/Kg	1		04/15/16 04:51
o-Xylene	26.8 J	33.5	10.5	ug/Kg	1		04/15/16 04:51
P & M -Xylene	33.5 U	67.1	20.1	ug/Kg	1		04/15/16 04:51
Toluene	16.8 U	33.5	10.5	ug/Kg	1		04/15/16 04:51

Surrogates

1,4-Difluorobenzene (surr)	95.7	72-119		%	1		04/15/16 04:51
----------------------------	------	--------	--	---	---	--	----------------

Batch Information

Analytical Batch: VFC12962
 Analytical Method: SW8021B
 Analyst: S.P
 Analytical Date/Time: 04/15/16 04:51
 Container ID: 1161603001-B

Prep Batch: VXX28685
 Prep Method: SW5035A
 Prep Date/Time: 04/06/16 12:00
 Prep Initial Wt./Vol.: 51.295 g
 Prep Extract Vol: 30.6335 mL



Method Blank

Blank ID: MB for HBN 1731160 [SPT/9866]

Blank Lab ID: 1318918

QC for Samples:

1161603001

Matrix: Soil/Solid (dry weight)

Results by SM21 2540G

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Total Solids	100			%

Batch Information

Analytical Batch: SPT9866

Analytical Method: SM21 2540G

Instrument:

Analyst: K.W

Analytical Date/Time: 4/7/2016 7:53:00PM

Print Date: 04/20/2016 1:14:00PM

SGS North America Inc.

200 West Potter Drive Anchorage, AK 95518

† 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Duplicate Sample Summary

Original Sample ID: 1161579002

Duplicate Sample ID: 1318919

QC for Samples:

1161603001

Analysis Date: 04/07/2016 19:53

Matrix: Soil/Solid (dry weight)

Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	81.8	82.5	%	0.83	(< 15)

Batch Information

Analytical Batch: SPT9866

Analytical Method: SM21 2540G

Instrument:

Analyst: K.W

Print Date: 04/20/2016 1:14:02PM

Method Blank

Blank ID: MB for HBN 1731617 [VXX/28685]
Blank Lab ID: 1319812

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	1.25U	2.50	0.750	mg/Kg
Surrogates				
4-Bromofluorobenzene (surr)	76.4	50-150		%

Batch Information

Analytical Batch: VFC12962
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/14/2016 7:38:00PM

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:03PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [VXX28685]
 Blank Spike Lab ID: 1319815
 Date Analyzed: 04/14/2016 20:54

Spike Duplicate ID: LCSD for HBN 1161603
 [VXX28685]
 Spike Duplicate Lab ID: 1319816
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by AK101

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	12.5	13.5	108	12.5	14.3	114	(60-120)	5.30	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	1.25	85	85	1.25	88.4	88	(50-150)	3.90	

Batch Information

Analytical Batch: **VFC12962**
 Analytical Method: **AK101**
 Instrument: **Agilent 7890A PID/FID**
 Analyst: **S.P**

Prep Batch: **VXX28685**
 Prep Method: **SW5035A**
 Prep Date/Time: **04/14/2016 08:00**
 Spike Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL
 Dupe Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:05PM

Matrix Spike Summary

Original Sample ID: 1161564001
MS Sample ID: 1319817 MS
MSD Sample ID: 1319818 MSD

QC for Samples: 1161603001

Analysis Date: 04/15/2016 1:21
Analysis Date: 04/15/2016 1:41
Analysis Date: 04/15/2016 2:00
Matrix: Soil/Solid (dry weight)

Results by AK101

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	2.09U	9.46	9.31	98	9.46	9.54	101	60-120	2.50	(< 20)
Surrogates										
4-Bromofluorobenzene (surr)		0.946	0.780	82	0.946	0.799	85	50-150	2.50	

Batch Information

Analytical Batch: VFC12962
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/15/2016 1:41:00AM

Prep Batch: VXX28685
Prep Method: AK101 Extraction (S)
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 68.69g
Prep Extract Vol: 25.00mL

Print Date: 04/20/2016 1:14:06PM

Method Blank

Blank ID: MB for HBN 1731617 [VXX/28685]
Blank Lab ID: 1319812

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	6.25U	12.5	4.00	ug/Kg
Ethylbenzene	12.5U	25.0	7.80	ug/Kg
o-Xylene	12.5U	25.0	7.80	ug/Kg
P & M -Xylene	25.0U	50.0	15.0	ug/Kg
Toluene	12.5U	25.0	7.80	ug/Kg
Surrogates				
1,4-Difluorobenzene (surr)	96.1	72-119		%

Batch Information

Analytical Batch: VFC12962
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/14/2016 7:38:00PM

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:07PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [VXX28685]
 Blank Spike Lab ID: 1319813
 Date Analyzed: 04/14/2016 19:57

Spike Duplicate ID: LCSD for HBN 1161603 [VXX28685]
 Spike Duplicate Lab ID: 1319814
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by SW8021B

Parameter	Blank Spike (ug/Kg)			Spike Duplicate (ug/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	1250	1320	106	1250	1350	108	(75-125)	2.30	(< 20)
Ethylbenzene	1250	1330	107	1250	1370	109	(75-125)	2.40	(< 20)
o-Xylene	1250	1330	106	1250	1370	110	(75-125)	3.20	(< 20)
P & M -Xylene	2500	2700	108	2500	2760	111	(80-125)	2.30	(< 20)
Toluene	1250	1480	118	1250	1510	121	(70-125)	2.00	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	1250	97.6	98	1250	97.8	98	(72-119)	0.14	

Batch Information

Analytical Batch: VFC12962
 Analytical Method: SW8021B
 Instrument: Agilent 7890A PID/FID
 Analyst: S.P

Prep Batch: VXX28685
 Prep Method: SW5035A
 Prep Date/Time: 04/14/2016 08:00
 Spike Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL
 Dupe Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:09PM

Matrix Spike Summary

Original Sample ID: 1161564001
MS Sample ID: 1319817 MS
MSD Sample ID: 1319818 MSD

Analysis Date: 04/15/2016 1:21
Analysis Date: 04/15/2016 1:41
Analysis Date: 04/15/2016 2:00
Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by SW8021B

Parameter	Sample	Matrix Spike (ug/Kg)			Spike Duplicate (ug/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	10.4U	946	1003	106	946	1016	107	75-125	1.20	(< 20)
Ethylbenzene	20.9U	946	982	104	946	1002	106	75-125	1.90	(< 20)
o-Xylene	20.9U	946	967	102	946	988	104	75-125	2.10	(< 20)
P & M -Xylene	41.7U	1892	1944	103	1892	1985	105	80-125	2.30	(< 20)
Toluene	20.9U	946	990	105	946	1006	106	70-125	1.60	(< 20)

Surrogates

1,4-Difluorobenzene (surr)	946	941	100	946	923	98	72-119	1.90
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Batch Information

Analytical Batch: VFC12962
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/15/2016 1:41:00AM

Prep Batch: VXX28685
Prep Method: AK101 Extraction (S)
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 68.69g
Prep Extract Vol: 25.00mL

Print Date: 04/20/2016 1:14:10PM

Method Blank

Blank ID: MB for HBN 1731261 [XXX/35139]
Blank Lab ID: 1319120

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by AK102

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Diesel Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
5a Androstane (surr)	97.9	60-120		%

Batch Information

Analytical Batch: XFC12329
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CJSW
Analytical Date/Time: 4/12/2016 1:17:00PM

Prep Batch: XXX35139
Prep Method: SW3550C
Prep Date/Time: 4/11/2016 9:03:02AM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

Print Date: 04/20/2016 1:14:11PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [VVV3X1328
Blank Spike La5 ID: 13121] 1
Date 9nalt Aey: 0zdl] q 016 13:] 4

Spike D/ pliuat ID: LCSD for HBN 1161603
[VVV3X1328
Spike D/ pliuat La5 ID: 13121]]
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KC for SaP pleR 1161603001

c eR lbR5t AK102

	Blank Spike xP wd/wh			Spike D/ pliuat xP wd/wh					
<u>) araP eter</u>	<u>Spike</u>	<u>c eR lb</u>	<u>c eu xmh</u>	<u>Spike</u>	<u>c eR lb</u>	<u>c eu xmh</u>	<u>CL</u>	<u>c) D xmh</u>	<u>c) D CL</u>
DieRel c anwe Qr waniuR	164	141	103	164	12-	112	x4XG] X h	1z.60	xO] 0 h
Surrogates									
Xa 9nyroRane xR rrh	3.33	10z	10z	3.33	116	116	x60G] 0 h	11.30	

Batch Information

9nalt bual Babug: **XFC12329**
9nalt bual s elgoy: **AK102**
InR/ Penb **Agilent 7890B R**
9nalt Rb **CJSW**

) rep Babug: **XXX35139**
) rep s elgoy: **SW3550C**
) rep Date d iP e: **04/11/2016 09:03**
Spike InibT bdWbl.: 164 P wd/wh EMraubWbl: 1 P L
D/ pe InibT bdWbl.: 164 P wd/wh EMraubWbl: 1 P L

) rinbDate: 0zdl] q 016 1:1z:1]) s

Method Blank

Blank ID: MB for HBN 1731261 [XXX/35139]
Blank Lab ID: 1319120

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by AK103

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Residual Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
nA riacontaneAt62 (surr)	100	60A20		%

Batch Information

Fanalytical Batch: X8C12329
Fanalytical Method: FK103
Instrument: Fgilent 7J90B R
Fnalyst: CVST
Fanalytical Date/- ime: 4/12/2016 1:17:00PM

Prep Batch: XXX35139
Prep Method: ST 3550C
Prep Date/- ime: 4/11/2016 9:03:02FM
Prep Initial T t./Vol.: 30 g
Prep Extract Vol: 1 mL

Print Date: 04/20/2016 1:14:13PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [VVV3X1328
Blank Spike La5 ID: 13121] 1
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[VVV3X1328
Spike D/ pliuat La5 ID: 13121]]
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KC for SaP pleR 1161603001

ceR lR5t AK102

	Blank Spike xP wd/wh			Spike D/ pliuat xP wd/wh					
<u>) araP eter</u>	<u>Spike</u>	<u>c eR/ lb</u>	<u>c eu xmh</u>	<u>Spike</u>	<u>c eR/ lb</u>	<u>c eu xmh</u>	<u>CL</u>	<u>c) D xmh</u>	<u>c) D CL</u>
c eRy/ al c anwe Qr waniur	164	1X6	2z	164	14X	10X	x60G] 0 h	11.60	xO] 0 h
Surrogates									
nG riauontaneG6] xR rrh	3.33	<<	<<	3.33	22.X	100	x60G] 0 h	1] .30	

Batch Information

9nalt bual Babug: **XFC13239**
9nalt bual s elgoy: **AK102**
InR/ Penb **Agilent 7890B R**
9nalt Rb **CJSW**

) rep Babug: **XXX25129**
) rep s elgoy: **SW2550C**
) rep Date d iPe: **04/11/3016 09:02**
Spike InibT bdWbl.: 164 P wd/wh EMraubWbl: 1 P L
D/ pe InibT bdWbl.: 164 P wd/wh EMraubWbl: 1 P L

) rinbDate: 0zdl] q 016 1:1z:1z) s



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CLIENT: GOLDER ASSOCIATES PHONE NO: 907-865-2524 CONTACT: Brenton Savikko										PROJECT: Image/Reflection Drive NAME: Image/Reflection Drive E-MAIL: bsavikko@golder.com QUOTE #: 1523636 P.O. #: 1523636										PRESERVATIVE Type C = COMP O = GRAB M = Multi I = Incremental S = Soils										REMARKS/ LOC ID										Data Deliverable Requirements: Level 2 + EDD + Chromatogram																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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1161603



SAMPLE RECEIPT FORM

Review Criteria:	Yes	N/A	No	Comments/Action Taken:
Were custody seals intact? Note # & location, if applicable. COC accompanied samples?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>Exemption permitted if sampler hand carries/delivers.</i>
Temperature blank compliant* (i.e., 0-6°C after CF)? If >6°C, were samples collected <8 hours ago? If <0°C, were all sample containers ice free?	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<i>Exemption permitted if chilled & collected <8 hrs ago.</i>
Cooler ID: ¹ _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ If samples are received <u>without</u> a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank <u>nor</u> cooler temp can be obtained, note "ambient" or "chilled."				<i>Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.</i>
Delivery method (specify all that apply): <input checked="" type="checkbox"/> Client (hand carried) <input type="checkbox"/> USPS <input type="checkbox"/> Lynden <input type="checkbox"/> AK Air <input type="checkbox"/> Alert Courier <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> RAVN <input type="checkbox"/> C&D Delivery <input type="checkbox"/> Carlie <input type="checkbox"/> Pen Air <input type="checkbox"/> Warp Speed <input type="checkbox"/> Other: _____ → For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Yes	N/A	No	
Were samples received within hold time? Do samples match COC* (i.e., sample IDs, dates/times collected)? Were analyses requested unambiguous?	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<i>Note: Refer to form F-083 "Sample Guide" for hold times. Note: If times differ <1hr, record details and login per COC.</i>
Were samples in good condition (no leaks/cracks/breakage)? Packing material used (specify all that apply): <input checked="" type="checkbox"/> Bubble Wrap <input type="checkbox"/> Separate plastic bags <input type="checkbox"/> Vermiculite <input type="checkbox"/> Other:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were proper containers (type/mass/volume/preservative*) used? Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples? Were all VOA vials free of headspace (i.e., bubbles ≤6 mm)? Were all soil VOAs field extracted with MeOH+BFB?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <i>Exemption permitted for metals (e.g., 200.8/6020A).</i> Samples were sub-sampled and extracted by lab upon receipt
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was pH verified and compliant ? If pH was adjusted, were bottles flagged (i.e., stickers)?	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	
For special handling (e.g., "MI" soils, foreign soils, lab filter for dissolved..., lab extract for volatiles, Ref Lab, limited volume), were bottles/paperwork flagged (e.g., sticker)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
For RUSH/SHORT Hold Time , were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
For SITE-SPECIFIC QC , e.g. BMS/BMSD/BDUP, were containers / paperwork flagged accordingly?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	SRF Completed by: CRD PM notified:
Was PEER REVIEW of sample numbering/labeling completed ?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Peer Reviewed by:
Additional notes (if applicable):				
<i>Note to Client: Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.</i>				

Sample Containers and Preservatives

<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>	<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>
1161603001-A	No Preservative Required	OK			
1161603001-B	Methanol field pres. 4 C	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.

BU - The container was received with headspace greater than 6mm.

DM- The container was received damaged.

FR- The container was received frozen and not usable for Bacteria or BOD analyses.

PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

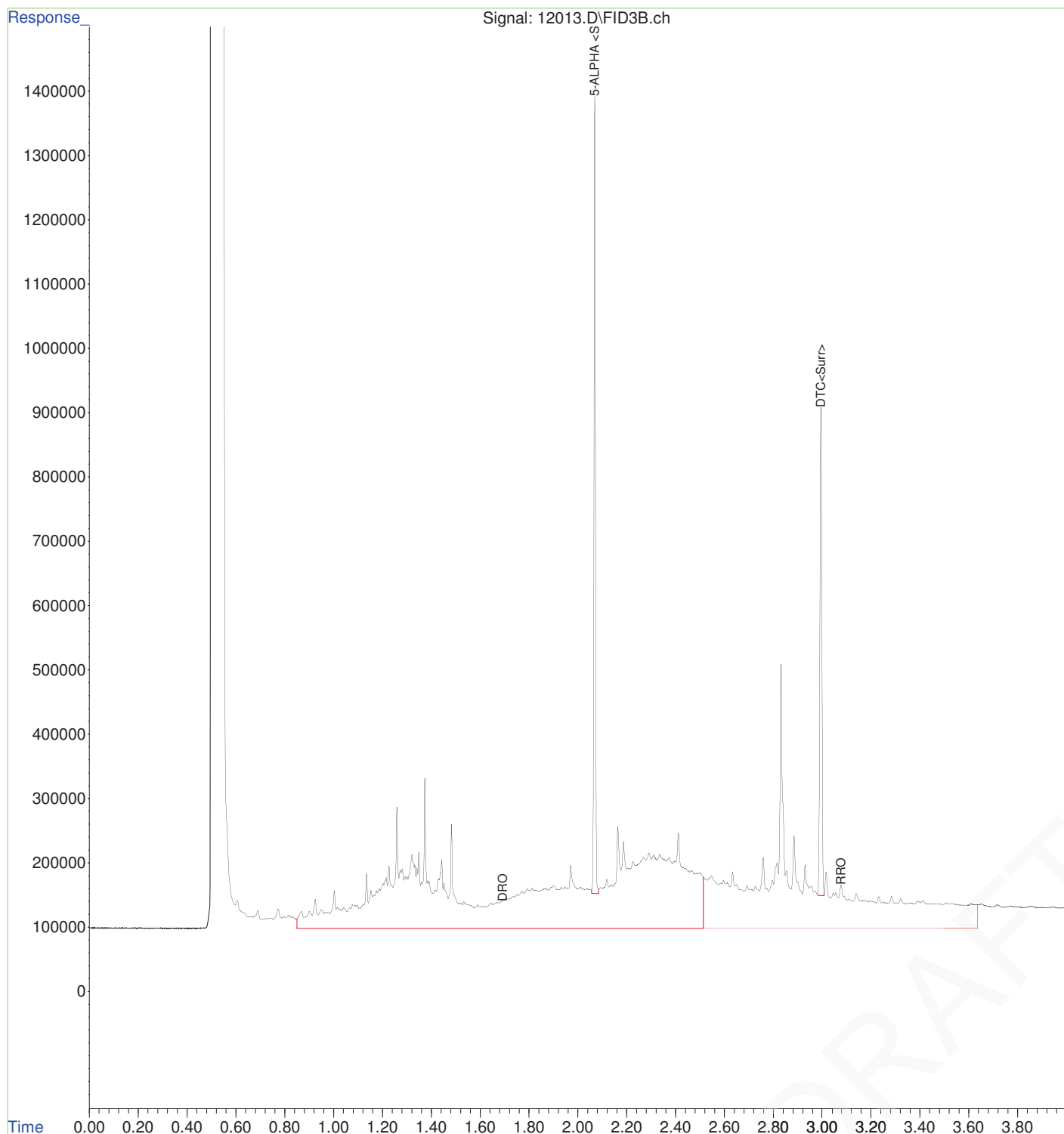
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

CHROMATOGRAMS

Data Path : Z:\04\SF\DATA\041216\
Data File : 12013.D
Signal(s) : FID3B.ch
Acq On : 12 Apr 2016 1:56 pm
Operator : CJSW
Sample : 1161603001
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Apr 13 11:59:20 2016
Quant Method : Z:\04\SF\METHOD\SFR2016-0407A.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Fri Apr 08 09:05:55 2016
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

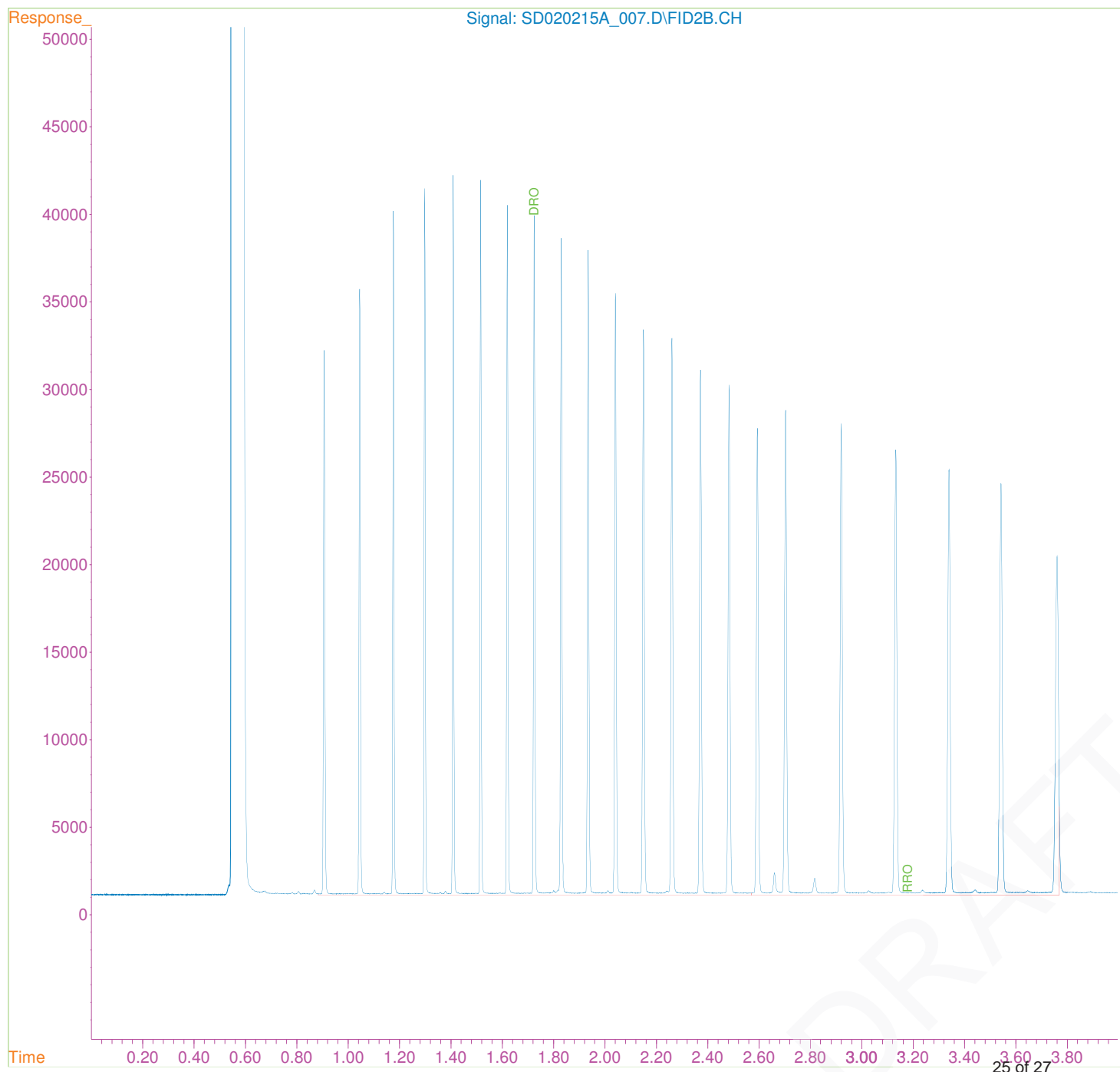


Data Path : Z:\01\SD\DATA\020215A\
Data File : SD020215A_007.D
Signal(s) : FID2B.CH
Acq On : 02 Feb 2015 1:01 pm
Operator : NLL
Sample : NAS
Misc :
ALS Vial : 2 Sample Multiplier: 1

Normal Alkane Standards

Integration File: autoint1.e
Quant Time: Feb 02 13:21:38 2015
Quant Method : Z:\01\SD\METHOD\SDR2015-0130C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Mon Feb 02 09:35:16 2015
Response via : Initial Calibration
Integrator: ChemStation 6890 Scale Mode: Small noise peaks clipped

Volume Inj. :
Signal Phase :
Signal Info :

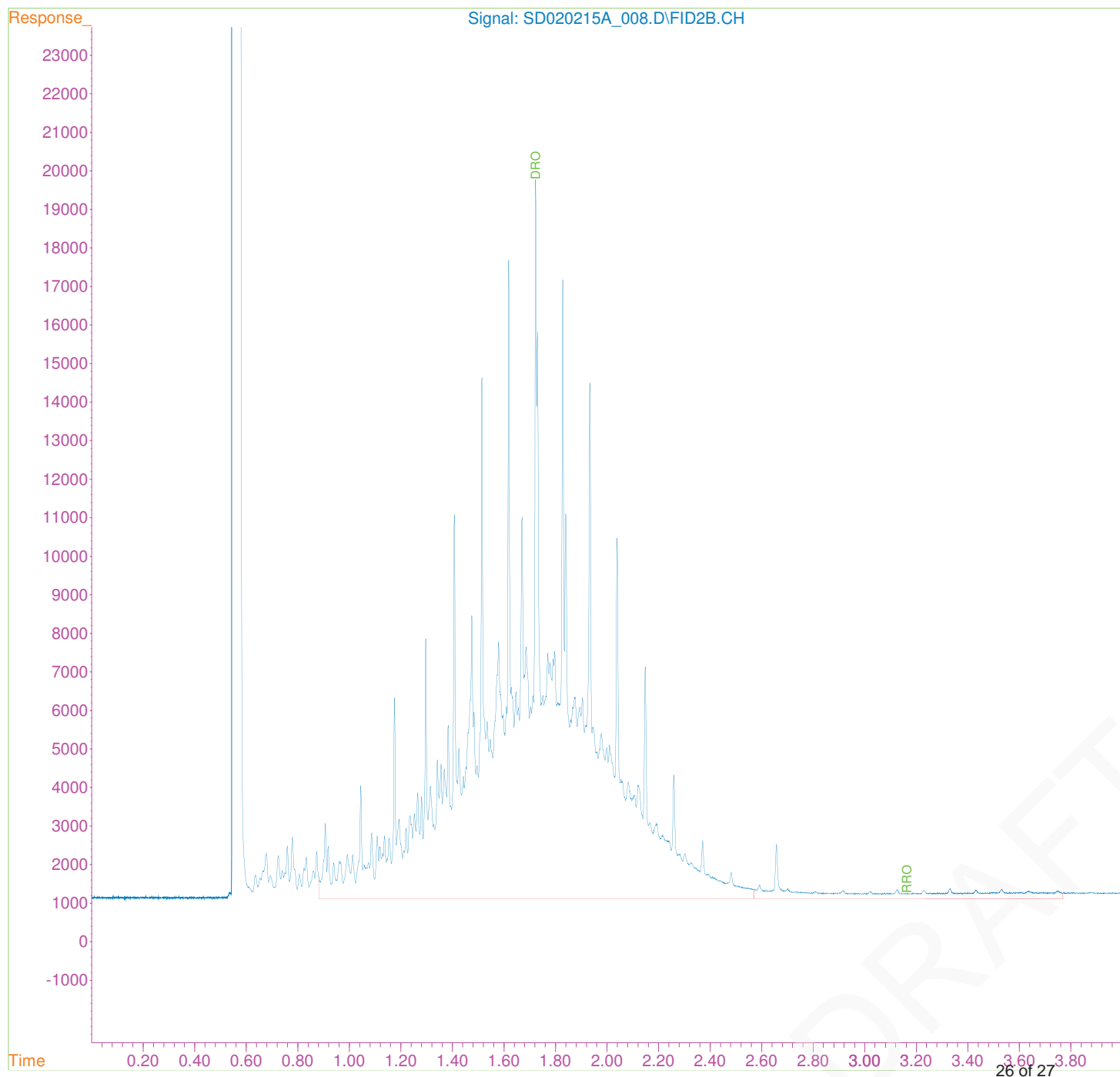


Data Path : Z:\01\SD\DATA\020215A\
Data File : SD020215A_008.D
Signal(s) : FID2B.CH
Acq On : 02 Feb 2015 1:11 pm
Operator : NLL
Sample : CCVB
Misc :
ALS Vial : 3 Sample Multiplier: 1

Diesel Range Organics
Diesel standard

Integration File: autoint1.e
Quant Time: Feb 02 13:23:42 2015
Quant Method : Z:\01\SD\METHOD\SDR2015-0130C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Mon Feb 02 09:35:16 2015
Response via : Initial Calibration
Integrator: ChemStation 6890 Scale Mode: Small noise peaks clipped

Volume Inj. :
Signal Phase :
Signal Info :

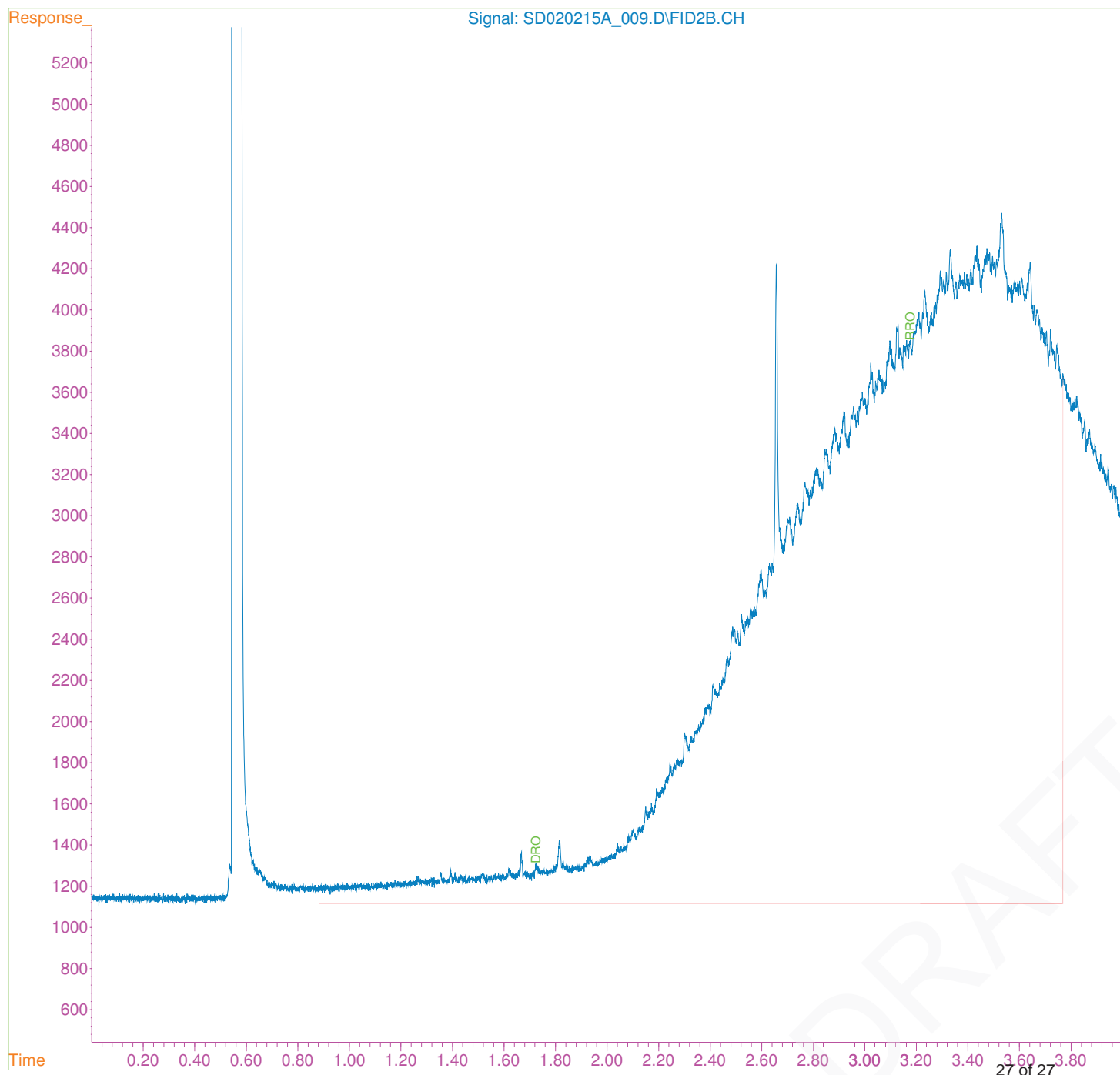


Data Path : Z:\01\SD\DATA\020215A\
Data File : SD020215A_009.D
Signal(s) : FID2B.CH
Acq On : 02 Feb 2015 1:21 pm
Operator : NLL
Sample : CCVR
Misc :
ALS Vial : 4 Sample Multiplier: 1

Residual Range Organics
"Lube Oil" standard

Integration File: autoint1.e
Quant Time: Feb 02 13:28:20 2015
Quant Method : Z:\01\SD\METHOD\SDR2015-0130C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Mon Feb 02 09:35:16 2015
Response via : Initial Calibration
Integrator: ChemStation 6890 Scale Mode: Small noise peaks clipped

Volume Inj. :
Signal Phase :
Signal Info :



Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Inc.
2121 Abbott Road, Suite 100
Anchorage, AK 99507 USA
Tel: (907) 344-6001
Fax: (907) 344-6011



Engineering Earth's Development, Preserving Earth's Integrity

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Table 1: Summary of Groundwater Measurements

Borehole Number	Borehole Depth (feet)	While Drilling⁽¹⁾ Groundwater Depth (feet)	4/5/2016 Groundwater Depth (feet)	7/15/2016 Groundwater Depth (feet)	10/18/2016 Groundwater Depth (feet)
BH-01	26.5	Not Observed	No PVC installed	No PVC installed	No PVC installed
BH-02	16.5	4	3.4	4.0	3.9
BH-03	16.5	5	4.4	5.5	4.5
BH-04	16.5	5.3	3.9	4.3	4.2
BH-05	16.5	4.5	3.0	3.7	3.2
BH-06	16.5	5.8	No PVC installed	No PVC installed	No PVC installed
BH-07	16.5	3.7	3.6	3.7	3.9
BH-08	16.5	5	No PVC installed	No PVC installed	No PVC installed
BH-09	16.5	5	2.9	3.1	3.0
BH-10	16.5	5	3.8	3.5	3.3
BH-11	16.5	7	3.5	3.6	3.5
BH-12	16.5	5	No PVC installed	No PVC installed	No PVC installed
BH-13	16.5	5	4.8 ⁽²⁾	4.8	4.8
BH-14	16.5	7.5	5.9	6.0	6.2
BH-15	16.5	7.5	No PVC installed	No PVC installed	No PVC installed

Notes:

- 1) Water level depth observations were collected while drilling.
- 2) Measured on 4/13/2016 due to access constraints on 4/5/2016.

Chemical Data Report

Appendix M



REPORT

CHEMICAL DATA REPORT IMAGE DRIVE / REFLECTION DRIVE AREA ROAD UPGRADE

Anchorage, Alaska

(MOA PM&E Project No. 14-50)

Submitted To: Mr. Bill Johnson, PE
CRW Engineering Group, LLC
3940 Arctic Blvd., Suite 300
Anchorage, AK 99503

Submitted By: Golder Associates Inc.
2121 Abbott Road, Suite 100
Anchorage, AK 99507 USA

Distribution:
3 Copies – CRW Engineering Group, LLC
2 Copies – Golder Associates Inc.

December 8, 2016

1523636.01





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1.0 INTRODUCTION

Golder Associates Inc. (Golder) is pleased to present this chemical data report as part of an environmental assessment to support design of the planned reconstruction of the Image Drive/Reflection Drive area in Anchorage, Alaska (Figure 1).

This report was prepared per our proposal dated May 12, 2016 and the authorization as Amendment Number Three for Environmental Assessment (10133, Task 9050) to our Agreement for Professional Services (CRW Project No. 10133.00). This work is a continuation of Amendment Number Two, which included preparing a Sampling and Analysis Plan (SAP) for this work (Golder 2016a), which was reviewed and approved by CRW and the Municipality of Anchorage (MOA).

1.1 Project Description and Background

The planned reconstruction of the Image Drive/Reflection Drive area will include the reconstruction of approximately 4,500 feet of road, curb and gutter, and subdrains, and replacement of the existing failing storm drains. In support of this project, Golder completed the geotechnical investigation field work in March 2016 that included collecting soil samples at the geotechnical borehole locations shown in Figure 1. The soil samples were field screened for the presence of volatile organic compounds by measuring the concentration of volatile organic compounds in the headspace of the sample containers using a photoionization detector (PID) (Golder 2016b).

A soil sample collected from Borehole BH-08 at the depth interval of 10 to 11.5 feet below ground surface (bgs) had a PID reading above 20 ppm and a slight petroleum hydrocarbon odor. Borehole BH-08 is located on the south edge of Image Drive about 15 to 20 feet west of a small creek (Figure 2). Because of the field screening results, the soil sample (BH-08 #5) was submitted to the SGS North America, Inc. Environmental Services (SGS) laboratory in Anchorage, Alaska and analyzed for Gasoline Range Organics (GRO), Diesel Range Organics (DRO), Residual Range Organics and Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX).

The results of the analyses are summarized in Table 1, and the complete laboratory report is attached in Appendix C. The DRO and RRO detections in the sample are likely due to weathered diesel fuel, as can be seen by inspection of the sample chromatogram attached at the end of Appendix C. Reference chromatograms for diesel fuel (heating oil) and lubrication oil are also attached at the end of Appendix C for comparison.

1.2 Purpose, Objective, and Scope

Although the DRO and RRO concentrations in the sample from Borehole BH-8 were below potential Alaska Department of Environmental Conservation (ADEC) cleanup levels, there was the potential that the planned



excavations during construction could encounter soil above cleanup levels. Therefore, the investigation described in this report was conducted in the vicinity of Borehole BH-8 for the purpose of further investigating the potential presence of hydrocarbons in the subsurface.

The objective of the work described in this report was to determine the presence, if any, of constituents identified during the geotechnical investigation in Borehole BH-08, and potentially identifying the source or migration pathway of petroleum hydrocarbons in the vicinity of Borehole BH-08.

The scope of work for this project is detailed in in a Sampling and Analysis Plan (SAP) prepared by Golder that outlined reasoning for sample collection location and depth selection, sample handling procedures, and data quality assurance and quality control requirements for the chemical testing (Golder 2016a).



2.0 FIELD INVESTIGATION METHODS

The field investigation, soil and groundwater sampling, and analytical laboratory testing was performed as outlined in the SAP (Golder 2016a), and is summarized in the following sections. Photographs taken during the investigation are presented in Appendix B. There were no significant changes or deviations from the SAP for this project.

2.1 Direct-Push Boreholes

The subsurface exploration activity was performed on September 8, 2016, when 5 boreholes (DP-1 through DP-5) were advanced at locations shown in Figure 2 by direct push methods to a target depth of 15 feet bgs. Prior to commencing drilling activities, conflicts with underground utilities were cleared through the statewide utility clearance process. Drilling services were provided by GeoTek Alaska, Inc. of Anchorage, Alaska using a Geoprobe 6610DT drill rig equipped with Macro-Core MC5 soil sampling tooling. Mr. Christopher Valentine, a Golder professional engineer who is a “qualified environmental professional” as defined in Alaska regulations 18 AAC 75 and 18 AAC 78, maintained a log of samples and subsurface conditions and collected soil samples from the Macro-Core 1.25-inch diameter disposable liner. Soils were visually classified in the field according to the Unified Soils Classification System (ASTM D 2488), which is summarized in Figure A-1 of Appendix A. Work was performed according the SAP using the methods summarized in the following sections.

2.2 Field Screening

Soil samples were collected at varying intervals of each borehole and were field screened. The soil samples were inspected for evidence of petroleum hydrocarbons (i.e., sheen, odor, and staining) and a portion of the soil was collected from the geoprobe sampler liner and was placed in a sealed plastic bag to test the headspace for volatile organic vapors using a PID in accordance with the methods detailed in the SAP and the ADEC Field Sampling Guidance, dated May 2016.

The PID was equipped with a 10.6-electronvolt (eV) lamp, and was calibrated prior to use with 100 parts per million (ppm) isobutylene calibration gas. The sample portion collected for headspace testing with the PID was placed in a sealed plastic bags and the samples were allowed to equilibrate to a temperature above 40 degrees Fahrenheit (°F) for at least 15 minutes. The samples were then agitated prior to measuring the concentration of volatile organics in the headspace using the PID. The PID readings of headspace for the soil samples are presented in the borehole logs in Appendix A.

2.3 Laboratory Sample Collection and Analyses

Soil and groundwater samples were selected and collected according the scope detailed in the SAP, and were submitted to SGS, a State of Alaska certified laboratory, to be analyzed for GRO, DRO, RRO, and BTEX using AK101, AK102, AK103, and SW 8021B testing methods respectively.



2.3.1 Soil Samples

Two soil samples were selected from each borehole for analytical testing, as detailed in the SAP. The soil samples were selected from zones with the highest potential for contamination, one sample was collected from the zone above the groundwater table, and because field screening did not observe any high PID reading and/or interval with other evidence of contamination, the second sample was collected at the depth of the existing sanitary sewer or storm line nearest to the borehole. As-built drawings for the sanitary sewer line and storm water line were used to estimate the depth.

2.3.2 Groundwater Samples

Groundwater samples were collected using a temporary well screen point (i.e. Geoprobe SP16 Groundwater Sampler), a variable-speed peristaltic pump, and disposable tubing at each sampling location. Visible signs of contamination (i.e., oil sheen, free product, incidental odors) were not observed in the groundwater. After purging and developing the well point, the water was pumped directly into sampling jars provided by the laboratory using a low flow-rate to avoid agitation of the water.

2.3.3 Quality Control Samples

2.3.3.1 Field Duplicates

A total of 5 soil and groundwater samples were collected for this project, and to meet the field duplicate target rate of 10 percent (one field duplicate per 10 samples), one soil and one groundwater field duplicate sample was collected to measure the precision of the sampling and analytical processes. The field duplicate samples were collected simultaneously from the same sample interval using identical methods. Each duplicate was submitted as a blind sample to the laboratory, meaning it was labeled with a sample number different from that of the sample being duplicated. The sample number for the duplicate was recorded in the field borehole log, and DP-2C was a field duplicate of DP-2A.

2.3.3.2 MS/MSD

Matrix spike (MS) and matrix spike duplicate (MSD) samples were used for evaluating potential matrix effects in soil samples. Additional sample volume was collected for the sample designated for MS/MSD analysis, DP-5B, with a note on the chain of custody form indicating that it is a MS/MSD sample. MS/MSD analyses were performed at a minimum frequency of five percent, per analyte, and per extraction batch.

2.3.3.3 Trip Blanks

Trip blanks for soil and water accompanied the collected samples back to the laboratory, and were analyzed for volatile compounds. The trip blanks were prepared by and supplied by the laboratory, and were analyzed to evaluate potential cross-contamination during the sample shipping and analysis process.



3.0 RESULTS

3.1 General Subsurface Conditions

Subsurface conditions observed during the environmental field investigation on September 8, 2016 were primarily silty sands and gravels, and were generally consistent with conditions observed during the geotechnical field investigation performed in May 2016, with is detailed in the Geotechnical Investigation Report (Golder 2016a).

Groundwater was observed in the boreholes advanced at the site. The average depth to groundwater at time of drilling was approximately 5 feet bgs and ranged from 4 to 10 feet bgs.

3.2 Field Screening Results

No soil staining, petroleum odors, or sheen was observed during the field investigation on September 8, 2016. The PID readings of soil sample headspace were all non-detect (0.0 ppm), and are presented in the borehole logs in Appendix A.

3.3 Analytical Results

As summarized in Tables 1 and 2, the analytical results for the collected soil and groundwater samples were below ADEC Method 2 cleanup levels. The laboratory report with chromatographs are provided in Appendix D with the ADEC Laboratory Data Review Checklist, and results are summarized in Table 1.

3.3.1 Soil Analytical Results

The DRO and RRO detections in the soil sample DP-2A and field duplicate DP-2C (from Borehole DP-2) were below potential cleanup levels, and are likely due to unknown heavy organic compounds bleeding into the DRO and RRO range, as can be seen by inspection of the sample chromatograms that are attached at the end of Appendix D. Reference chromatograms for diesel fuel (heating oil) and lubrication oil are also attached at the end of Appendix C for comparison. No odor, sheen, or indication of petroleum contamination was observed during field screening of that sample, but results like those obtained may be due to lubrication oil contamination or naturally occurring organics (i.e. peat) intermixed with the soil. The detection chromatograms from Borehole DP-2 are different from the chromatogram of the sample collected from Borehole BH-08 (Appendix C), which is closer to a weathered diesel fuel signature, and suggests the detections are likely from unrelated sources.

3.3.2 Groundwater Analytical Results

All groundwater analytical results at the site were below the laboratory limit of quantitation (LOQ), and were also below groundwater cleanup levels. Groundwater analytical results are summarized in Table 2, and the analytical laboratory report is provided in Appendix D.



3.3.3 Quality Assurance

The relative percent difference (RPD) for the sample concentration and corresponding duplicate concentration is used as a measure of precision. The RPDs for soil and water sample analyses is recommended to be below 50 percent and 30 percent, respectively. RPD is defined as:

$$\text{RPD (\%)} = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where: R_1 = Sample Concentration
 R_2 = Field Duplicate Concentration

RPD results for Soil Samples DP-2A and DP-2C were greater than 50 percent (as shown in Table 3) and did not meet the recommended goals. This is likely because the soil sample contained gravel, so there was insufficient mixing/homogenization of the sample before jarring; however, this should not affect data quality. RPD results for Groundwater Samples DP-1 and DP-6 were less than the recommended goal of 30 percent (Table 3).



4.0 CONCLUSIONS

The field screening observations did not indicate evidence of soil staining, petroleum odors, or groundwater sheen, and all PID readings of volatile organic vapors in sample headspace were non-detect.

All analytical laboratory results of GRO, DRO, RRO, and BTEX for the collected soil and groundwater samples, which includes the previously collected sample from the geotechnical Borehole BH-08, were either not detected above the LOQ, or were below potential cleanup levels as summarized in Tables 1 and 2.

As detailed in Section 3.3.1, the chromatograms from the DRO and RRO detections in Borehole DP-2 were different from the chromatogram of the sample collected from Borehole BH-08 (Appendix C), which suggests the detections are likely from unrelated sources.

In addition, the possible weathered diesel fuel contamination observed in Borehole BH-08 likely does not extend far past the BH-08 location, as Borehole DP-1 was located less than 10 feet away from BH-08.



5.0 LIMITATIONS AND USE OF REPORT

This report has been prepared exclusively for the use of CRW and MOA in their design of the proposed road improvements along Image Drive and Reflection Drive in Anchorage, Alaska. This report is not meant to represent a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, please note that regulatory statutes and the interpretation of regulatory statutes are subject to change over time and should be discussed with legal counsel.

The work program followed the standard of care expected of professionals undertaking similar work in the State of Alaska under similar conditions. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this report. Where data supplied by the client or other external sources (including without limitation, other consultants, laboratories, public databases) have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Golder for incomplete or inaccurate data supplied by others.

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6.0 CLOSING

We appreciate the opportunity to provide this report. Please contact us at 907-344-6001 if you have questions or comments.

GOLDER ASSOCIATES INC.

Christopher A. Valentine, PE
Qualified Environmental Professional

Mark R. Musial, PE
Principal and Geotechnical-Permafrost
Practice/Program Leader

CAV/MRM/mlp



7.0 REFERENCES

Golder Associates Inc. (Golder) 2016a, "Geotechnical Investigation – Image Drive / Reflection Drive Area Road Upgrade, Image Drive and Reflection Drive, Anchorage, Alaska, (MOA PM&E Project No. 14-50)," August 15, 2016, Golder Project Number 1523636

Golder Associates Inc. (Golder) 2016b, "Sampling and Analysis Plan for Environmental Assessment Services, Image Drive / Reflection Drive Area Road Reconstruction, Anchorage, Alaska" June 16, 2016, Golder Project Number 1523636.01

TABLES

Table 1: Soil Sample GRO, DRO, RRO, and BTEX Laboratory Results Summary

Borehole Number	Sample Number	Sample Depth Interval (feet bgs)	Date Collected	Analytical Lab Sample ID	Parameter and Units					
					Gasoline Range Organics (GRO) (mg/kg)	Diesel Range Organics (DRO) (mg/kg)	Residual Range Organics (RRO) (mg/kg)	Benzene (ug/kg)	Toluene (ug/kg)	Ethylbenzene (ug/kg)
BH-8	BH-8 #5	10 - 12	4/6/2016	1161603001	1.44 J	37.5	38.6	ND(8.40)	ND(16.8)	ND(16.8)
DP-1	DP-1A	4 - 4.5	9/8/2016	1165330001	ND(1.2)	ND(11.1)	25.9	ND(6)	ND(12)	ND(12)
DP-1	DP-1B	7 - 7.5	9/8/2016	1165330002	0.741 J	ND(11.8)	9.86 J	ND(5.6)	ND(11.2)	ND(11.2)
DP-2	DP-2A	3 - 3.5	9/8/2016	1165330003	ND(1.43)	56.0 J	511	ND(7.15)	ND(14.3)	ND(14.3)
DP-2	DP-2C (DP-2A Field Duplicate)	3 - 3.5	9/8/2016	1165330004	ND(1.4)	130	1810	ND(7)	ND(14)	ND(14)
DP-2	DP-2B	6.5 - 7	9/8/2016	1165330005	ND(0.975)	7.45 J	12.1 J	ND(4.875)	ND(9.75)	ND(9.75)
DP-3	DP-3B	9 - 9.5	9/8/2016	1165330007	0.678 J	15.2 J	85.3	ND(5.35)	ND(10.7)	ND(10.7)
DP-3	DP-3C	11 - 11.5	9/8/2016	1165330006	0.598 J	ND(10.75)	6.89 J	ND(3.955)	ND(7.9)	ND(7.9)
DP-4	DP-4A	3.5 - 4	9/8/2016	1165330008	0.538 J	16.1 J	37.7	ND(3.84)	ND(7.7)	ND(7.7)
DP-4	DP-4B	10.5 - 11	9/8/2016	1165330009	0.904 J	10.7 J	17.3 J	ND(6.6)	ND(13.2)	ND(13.2)
DP-5	DP-5A	4 - 4.5	9/8/2016	1165330010	0.680 J	13.2 J	42.1	ND(5.3)	ND(10.55)	ND(10.55)
DP-5	DP-5B	9 - 9.5	9/8/2016	1165330011	ND(1.08)	9.55 J	42.6	ND(5.4)	ND(10.8)	ND(10.8)
Potential Soil Cleanup Level ⁽¹⁾					300	250	11000	25	6500	6900
Trip Blank					0.787 J	--	--	ND(6.25)	ND(12.45)	ND(12.45)
										63000
										ND(24.9)

Notes:

Bold concentration indicate significant detections, no concentrations exceed potential cleanup level

mg/kg = concentration in milligrams per kilogram

ug/kg = concentration in micrograms per kilogram

ND(10) - Not detected at concentrations above the Method Detection Limit (MDL) shown in parenthesis

J - Estimated value, detected at concentration greater than the MDL but below the limit of quantitation (LOQ)

⁽¹⁾ Table B1, Method Two, Under 40-inch Zone, Migration to Groundwater Cleanup Level ⁽¹⁾18AAC75, Oil and Other Hazardous Substances Pollution Control," Revised May 8, 2016.

Analytical Laboratory Methods:

GRO by AK101

DRO by AK102

RRO by AK103

BTEX by 8021B

Table 2: Groundwater Sample GRO, DRO, RRO, and BTEX Laboratory Results Summary

Borehole Number	Sample Number	Date Collected	Analytical Lab Sample ID	Parameter and Units							
				Gasoline Range Organics (GRO) (mg/L)	Diesel Range Organics (DRO) (mg/L)	Residual Range Organics (RRO) (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	o-Xylene (ug/L)	P & M-Xylene (ug/L)
DP-1	DP-1	9/8/2016	1165330013	ND(0.05)	0.229 J	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
DP-1	DP-6 (DP-1 Field Duplicate)	9/8/2016	1165330014	ND(0.05)	0.212 J	ND(0.2405)	ND(0.25)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
DP-2	DP-2	9/8/2016	1165330015	ND(0.05)	0.187 J	ND(0.252)	ND(0.25)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
DP-3	DP-3	9/8/2016	1165330016	ND(0.05)	0.240 J	ND(0.265)	ND(0.25)	0.510 J	ND(0.5)	ND(0.5)	ND(1)
DP-4	DP-4	9/8/2016	1165330017	ND(0.05)	0.322 J	0.250 J	ND(0.25)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
DP-5	DP-5	9/8/2016	1165330018	ND(0.05)	ND(0.3)	ND(0.25)	ND(0.25)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)
Potential Groundwater Cleanup Level ⁽¹⁾				2.2	1.5	1.1	5	1000	700	10000	
Trip Blank		9/8/2016	1165330012	ND(0.05)	--	--	ND(0.25)	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)

Notes:

mg/L = concentration in milligrams per liter

ug/L = concentration in micrograms per liter

ND(10) - Not detected at concentrations above the Method Detection Limit (MDL) shown in parenthesis

J - Estimated value, detected at concentration greater than the MDL but below the limit of quantitation (LOQ)

⁽¹⁾ Table C. Groundwater Cleanup Levels "18AAC75, Oil and Other Hazardous Substances Pollution Control," Revised May 8, 2016.Analytical Laboratory Methods:

GRO by AK101

DRO by AK102

RRO by AK103

BTEX by 8021B

Table 3: Relative Percent Difference

	Soil Sample		Groundwater Sample			
	Sample DP-2A [1165330003] Results (mg/kg)	Sample DP-2C (DP- 2A Field Duplicate) [1165330004] Results (mg/kg)	Relative Percent Difference	Sample DP-1 [1165330013] Results (ug/l)	Sample DP-6 (DP-1 Field Duplicate) [1165330014] Results (ug/l)	Relative Percent Difference
Petroleum Hydrocarbons						
Gasoline Range Organics (GRO)	ND(1.43)	ND(1.4)	--	ND(0.05)	ND(0.05)	--
Diesel Range Organics (DRO)	56.0 J	130	80%	0.229 J	0.212 J	8%
Residual Range Organics (RRO)	511	1810	112%	ND(0.25)	ND(0.2405)	--
BTEX						
Benzene	ND(7.15)	ND(7)	--	ND(0.25)	ND(0.25)	--
Toluene	ND(14.3)	ND(14)	--	ND(0.5)	ND(0.5)	--
Ethylbenzene	ND(14.3)	ND(14)	--	ND(0.5)	ND(0.5)	--
o-Xylene	ND(14.3)	ND(14)	--	ND(0.5)	ND(0.5)	--
P & M -Xylene	ND(28.65)	ND(28)	--	ND(1)	ND(1)	--

Notes:

mg/L = concentration in milligrams per liter

ug/L = concentration in micrograms per liter

ND(10) - Not detected at concentrations above the Method Detection Limit (MDL) shown in parenthesis

J - Estimated value, detected at concentration greater than the MDL but below the limit of quantitation (LOQ)

Relative percent difference is the difference between two values divided by the mean of the two values.

FIGURES



FIGURE
1



PROJECT		ENVIRONMENTAL ASSESSMENT, IMAGE REFLECTION DRIVE	
ANCHORAGE, ALASKA		TITLE	
1523636.01		OREHOLE LOCATION MAP	
PROJECT NO.		CONTROL	
REV.		A	
FIGURE		2	
CLIENT		CRW ENGINEERING GROUP, LLC	
CONSULTANT		2016-12-08	
DESIGNED		APG	
PREPARED		CAV	
REVIEWED		MRM	
APPROVED			
REFERENCE(S)		1. ORTHOIMAGERY ACQUIRED IN JULY 2015 BY THE ANCHORAGE LIDAR AND IMAGERY PROJECT AND WAS DISTRIBUTED BY ALASKA DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS (DGGS) ONLINE MAP. 2. BORING LOCATIONS PROVIDED BY CRW ENGINEERING GROUP, LLC ON OCTOBER 3 2016.	

APPENDIX A
BOREHOLE LOGS

UNIFIED SOIL CLASSIFICATION (adapted from ASTM D2487)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES AND GROUP SYMBOLS USING LABORATORY TESTS			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND			
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	$C_u \geq 4$ AND $1 \leq C_c \leq 3$	GW	WELL-GRADED GRAVEL		If soil contains ≥15% sand, add "with sand"	
			$C_u < 4$ AND/OR [$C_c < 1$ OR $C_c > 3$]	GP	POORLY GRADED GRAVEL			
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR MH	GM	SILTY GRAVEL			
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL			
	SANDS ≥50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	$C_u \geq 6$ AND $1 \leq C_c \leq 3$	SW	WELL-GRADED SAND		If soil contains ≥15% gravel, add "with gravel"	
			$C_u < 6$ AND/OR [$C_c < 1$ OR $C_c > 3$]	SP	POORLY GRADED SAND			
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR MH	SM	SILTY SAND			
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND			
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT <50		CL	LEAN CLAY		If soil contains coarse-grained soil from 15% to 29%, add "with sand" or "with gravel" for whichever type is prominent, or for ≥ 30%, add "sandy" or "gravelly"		
	SILTS AND CLAYS LIQUID LIMIT ≥50		ML	SILT				
			OL	ORGANIC CLAY OR SILT				
			CH	FAT CLAY				
			MH	ELASTIC SILT				
			OH	ORGANIC CLAY OR SILT				
			HIGHLY ORGANIC SOILS				PT	PEAT

NOTES:

$$C_u = \frac{D_{60}}{D_{10}} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

Gravels or sands with 5% to 12% fines require dual symbols (GW-GM, GW-GC, GP-GM, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC) and add "with clay" or "with silt" to group name. If fines classify as CL-ML for GM or SM, use dual symbol GC-GM or SC-SM. The coefficient of uniformity, C_u , and coefficient of curvature, C_c , equations are given above where $D_{X\%}$ is soil particle diameter where X% is % finer. **Optional Abbreviations:** Lower case "s" after USCS group symbol denotes either "sandy" or "with sand" while "g" denotes either "gravelly" or "with gravel"

CRITERIA FOR DESCRIBING MOISTURE CONDITION (adapted from ASTM D2488)

DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

COMPONENT DEFINITIONS BY GRADATION

COMPONENT	SIZE RANGE
BOULDERS	GREATER THAN 12 in.
COBBLES	12 in. to 3 in.
GRAVEL	3 in. to #4 Sieve (4.76 mm)
COARSE GRAVEL	3 in. to 3/4 in.
FINE GRAVEL	3/4 in. to #4 (4.76 mm)
SAND	#4 (4.76 mm) to #200 (0.074 mm)
COARSE SAND	#4 (4.76 mm) to #10 (2.0 mm)
MEDIUM SAND	#10 (2.0 mm) to #40 (0.42 mm)
FINE SAND	#40 (0.42 mm) to #200 (0.074 mm)
SILT & CLAY (FINES)	SMALLER THAN #200 (0.074 mm)

DESCRIPTIVE TERMINOLOGY FOR PERCENTAGES (ASTM D2488)

DESCRIPTIVE TERMS	RANGE OF PROPORTION
TRACE	0 - 5%
FEW	5 - 10%
LITTLE	10 - 25%
SOME	30 - 45%
MOSTLY	50 - 100%

LABORATORY TEST AND NOTES ABBREVIATIONS / SYMBOLS

Con Consolidation	PID Photoionization Detector	TXCD Triaxial, Consolidated Drained
Dd Dry Density	PM Modified Proctor (D1557)	TXCU Triaxial, Consolidated Undrained
K Thermal Conductivity	PP Pocket Penetrometer (Field)	TXUU Triaxial, Unconsolidated Undrained
MA Sieve and Hydrometer	PTLD Point Load	W_L Liquid Limit (LL)
NP Non-plastic	SA Sieve Analysis	W_P Plastic Limit (PL)
OLI Organic Loss	SpG Specific Gravity	Ω Soil Resistivity (Res.)
P200 Passing #200 Sieve (D1140)	TC Thaw Consolidation/Strain	▼ Water Level
pH Soil pH	TV Torvane (Field)	▽ Water Level at time of drilling
PI Plasticity Index (D4318)		

RELATIVE DENSITY / CONSISTENCY ESTIMATE USING STANDARD PENETRATION TEST (SPT) VALUES (adapted from Terzaghi and Peck 1967 and NAVFAC DM 7.1)

COHESIONLESS SOILS ^(a)		COHESIVE SOILS ^(b)		UNCONFINED COMPRESSIVE STRENGTH (TSF) ^(d)
RELATIVE DENSITY	(N ₁) ₆₀ (blows/ft) ^(c)	CONSISTENCY	(N ₁) ₆₀ (blows/ft) ^(c)	
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.50
COMPACT	10 - 30	FIRM	4 - 8	0.50 - 1.0
(MEDIUM DENSE)		STIFF	8 - 15	1.0 - 2.0
DENSE	30 - 50	VERY STIFF	15 - 30	2.0 - 4.0
VERY DENSE	OVER 50	HARD	OVER 30	OVER 4.0

(a) Soils consisting of gravel, sand, and silt, either separately or in combination possessing no characteristics of plasticity, and exhibiting drained behavior.
 (b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
 (c) Refer to ASTM D1586 for a definition of N value. (N₁)₆₀ is the N value corrected for hammer energy and overburden pressure, and is detailed in ASTM D6066. N values may be affected by a number of factors including: material size, sampler size, hammer weight and type, depth, drilling method, and borehole disturbance. N values are only an approximate guide for cohesive soil and do not apply to frozen soil.
 (d) Undrained shear strength, s_u = 1/2 unconfined compression strength, U_c . Note that Torvane (TV) measures s_u and pocket penetrometer (PP) measures U_c .

SAMPLER ABBREVIATIONS

AR Air Rotary cuttings	GB Grab sample (disturbed from surface/test pit)	SC Soil core (continuous sampler)
AS Auger Sample, cuttings		
CS Chunk/block sample (undisturbed from surface/test pit)	MC Modified California sampler (3-in. OD split spoon, 340-lb hammer)	SS SPT sampler (2-in. OD, 140-lb hammer)
DO Drive Open (split spoon other than SS or MC)	MS Modified Shelby tube	TO Thin-walled, open (Shelby tube)
DP Direct Push (Geoprobe)	R Refusal when driving	TP Thin-walled, piston
	RC Rock core	WS Wash Sample

SOIL CLASSIFICATION / LEGEND

Figure A-1

DRILLING START: September 8, 2016 00:00
DRILLING END: September 8, 2016 00:00
COORDINATES: N: 329,438 E: 367,868

001 - GOLDER - BOREHOLE RECORD - DF STD US LAB E.M.GDT - 11/7/16 16:08
GOLDER\\USLAB\\2015 JOBS\\1523636_01 CRW ENVIRO ASSESSMENT IMAGE DRIVE\\FIELD - GINTI\\152363601 IMAGE REFLECTION ENVRIO.GPJ



**Golder
Associates**

Figure A-2
1 of 1

DRILLING START: September 8, 2016 00:00
DRILLING END: September 8, 2016 00:00
COORDINATES: N: 329,454 E: 367,897


01 - GOLDER - BOREHOLE RECORD - DF STD US LAB E-M.GDT - 11/7/16 16:08
2015 JOBS\1523636.01 CRW ENVIRO ASSESSMENT IMAGE DRIVE\FIELD - GINT\152363601 IMAGE REFLECTION ENV\RIO.GPJ



**Golder
Associates**

1 of 1

01 - GOLDER - BOREHOLE RECORD - DF STD US LAB E-M GDT - 1/17/16 16:08
J:\2015 JOBS\1523636.01 CRW ENVIRO ASSESSMENT IMAGE DRIVE\FIELD - GINT\152363601 IMAGE REFLECTION ENVRIO.GPJ

RECORD OF BOREHOLE DP-3										SHEET: 1 of 1		
PROJECT: Image Drive / Reflection Drive Road Upgrades			DRILLING START: September 8, 2016 00:00			GS ELEV.: na			TOC ELEV.: na			
PROJECT NO.: 1523636.01			DRILLING END: September 8, 2016 00:00			N: 329,446 E: 367,811			DATUM:			
LOCATION: Anchorage, AK												
DEPTH (ft)	BORING METHOD	SOIL PROFILE			SAMPLES			PID CONCENTRATION		NOTES WATER LEVELS	ADDITIONAL LAB TESTING	
		Depth	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in Hammer, 30 inch drop	REC ATT (in)			✕ (ppm)
												2
0		0.0								✕ LEL (%)		
		0.3	ASPHALT (GW), WELL-GRADED GRAVEL; moist		GW		DP			20 40 60 80		
		3.0	(GM), SILTY GRAVEL WITH SAND; moist to wet		GM		-3B					
5	Geoprobe MC5 System						DP					
10		10.0	(ML), SILT WITH GRAVEL; dry to moist		ML		-3C					
							DP					
15		15.0	Bottom of borehole at 15.0 ft. Backfilled with bentonite chips.									
20												
DRILLING CO.: Geotek Alaska, Inc.												
DRILLER: Chris Bizaillon												
DRILL RIG: Geoprobe 6610DT												
LOGGED: C. Valentine												
CHECKED: J. Karp												
REVIEWED: M. Musial												
												

DRILLING CO.: Geotek Alaska, Inc.
DRILLER: Chris Bizailon
DRILL RIG: Geoprobe 6610DT

LOGGED: C. Valentine
CHECKED: J. Karp
REVIEWED: M. Musial



Figure A-4
1 of 1

RECORD OF BOREHOLE DP-5

PROJECT: Image Drive / Reflection Drive Road Upgrades
PROJECT NO.: 1523636.01
LOCATION: Anchorage, AK

DRILLING START: September 8, 2016 00:00
DRILLING END: September 8, 2016 00:00
COORDINATES: N: 329,493 E: 367,948

SHEET: 1 of 1
GS ELEV.:
TOC ELEV.: na
DATUM:

DEPTH (ft)	BORING METHOD	SOIL PROFILE				SAMPLES		PID CONCENTRATION				NOTES WATER LEVELS	ADDITIONAL LAB TESTING		
		Depth	DESCRIPTION	ICE BOND	USCS	GRAPHIC LOG	SAMPLE TYPE & NUMBER	BLOWS per 6 in Hammer, 30 inch drop	REC ATT (in)	X (ppm)				X LEL (%)	
										2	4			6	8
0		0.0													
		0.3	ASPHALT (GW), WELL-GRADED GRAVEL; moist		GW		DP			0					
		3.0	(GM), SILTY GRAVEL, dark gray; wet		GM		-5A			0					
5	Geoprobe MC5 System						DP			0					
							-5B			0					
										0					
										0					
10		10.0	(SP), POORLY GRADED SAND, gray; wet		SP					0					
		12.5	(GM), SILTY GRAVEL, gray; moist		GM		DP			0					
15		15.0	Bottom of borehole at 15.0 ft. Backfilled with bentonite chips.												
20															

DRILLING CO.: Geotek Alaska, Inc.
DRILLER: Chris Bizailon
DRILL RIG: Geoprobe 6610DT

LOGGED: C. Valentine
CHECKED: J. Karp
REVIEWED: M. Musial



Figure A-6

APPENDIX B
SITE PHOTOS TAKEN ON SEPTEMBER 8, 2016

Site Photos taken on September 8, 2016



Photo 1: Typical geoprobe sampler liner.



Photo 2: Purging temporary groundwater well point at DP-1

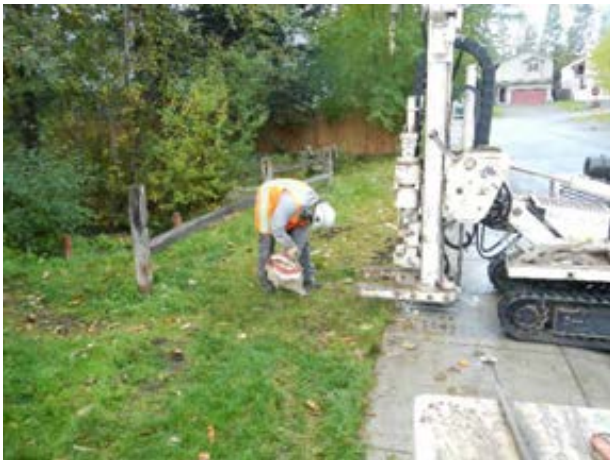


Photo 3: Backfilling DP-2 with bentonite chips



Photo 4: Drilling DP-5.

APPENDIX C
LABORATORY DATA FROM MAY 2016 INVESTIGATION



Laboratory Report of Analysis

To: Golder Associates Inc.
2121 Abbott Road, #100
Anchorage, AK 99507
(907)865-2524

Report Number: **1161603**

Client Project: **Image/Reflection Drive**

Dear Brenton Savikko,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Victoria at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Victoria Pennick
Project Manager
Victoria.Pennick@sgs.com

Date

Print Date: 04/20/2016 1:13:54PM

Case Narrative

SGS Client: **Golder Associates Inc.**
SGS Project: **1161603**
Project Name/Site: **Image/Reflection Drive**
Project Contact: **Brenton Savikko**

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

Print Date: 04/20/2016 1:13:55PM

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

Sample Summary

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Collected</u>	<u>Received</u>	<u>Matrix</u>
BH-8 #5	1161603001	04/06/2016	04/06/2016	Soil/Solid (dry weight)

<u>Method</u>	<u>Method Description</u>
AK101	AK101/8021 Combo. (S)
SW8021B	AK101/8021 Combo. (S)
AK102	Diesel/Residual Range Organics
AK103	Diesel/Residual Range Organics
SM21 2540G	Percent Solids SM2540G

Print Date: 04/20/2016 1:13:57PM

Detectable Results Summary

Client Sample ID: **BH-8 #5**

Lab Sample ID: 1161603001

Semivolatile Organic Fuels

Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	37.5	mg/Kg
Residual Range Organics	38.6	mg/Kg
Gasoline Range Organics	1.44J	mg/Kg
o-Xylene	26.8J	ug/Kg



Results of BH-8 #5

Client Sample ID: **BH-8 #5**
Client Project ID: **Image/Reflection Drive**
Lab Sample ID: 1161603001
Lab Project ID: 1161603

Collection Date: 04/06/16 12:00
Received Date: 04/06/16 15:35
Matrix: Soil/Solid (dry weight)
Solids (%):89.0
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	37.5	22.1	6.86	mg/Kg	1		04/12/16 13:56
Surrogates							
5a Androstane (surr)	101	50-150		%	1		04/12/16 13:56

Batch Information

Analytical Batch: XFC12329
Analytical Method: AK102
Analyst: CJSW
Analytical Date/Time: 04/12/16 13:56
Container ID: 1161603001-A

Prep Batch: XXX35139
Prep Method: SW3550C
Prep Date/Time: 04/11/16 09:03
Prep Initial Wt./Vol.: 30.466 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	38.6	22.1	6.86	mg/Kg	1		04/12/16 13:56
Surrogates							
n-Triacontane-d62 (surr)	97.2	50-150		%	1		04/12/16 13:56

Batch Information

Analytical Batch: XFC12329
Analytical Method: AK103
Analyst: CJSW
Analytical Date/Time: 04/12/16 13:56
Container ID: 1161603001-A

Prep Batch: XXX35139
Prep Method: SW3550C
Prep Date/Time: 04/11/16 09:03
Prep Initial Wt./Vol.: 30.466 g
Prep Extract Vol: 1 mL

**Results of BH-8 #5**

Client Sample ID: **BH-8 #5**
Client Project ID: **Image/Reflection Drive**
Lab Sample ID: 1161603001
Lab Project ID: 1161603

Collection Date: 04/06/16 12:00
Received Date: 04/06/16 15:35
Matrix: Soil/Solid (dry weight)
Solids (%):89.0
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	1.44 J	3.35	1.01	mg/Kg	1		04/15/16 04:51

Surrogates

4-Bromofluorobenzene (surr)	96	50-150		%	1		04/15/16 04:51
-----------------------------	----	--------	--	---	---	--	----------------

Batch Information

Analytical Batch: VFC12962
Analytical Method: AK101
Analyst: S.P
Analytical Date/Time: 04/15/16 04:51
Container ID: 1161603001-B

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 04/06/16 12:00
Prep Initial Wt./Vol.: 51.295 g
Prep Extract Vol: 30.6335 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	8.40 U	16.8	5.37	ug/Kg	1		04/15/16 04:51
Ethylbenzene	16.8 U	33.5	10.5	ug/Kg	1		04/15/16 04:51
o-Xylene	26.8 J	33.5	10.5	ug/Kg	1		04/15/16 04:51
P & M -Xylene	33.5 U	67.1	20.1	ug/Kg	1		04/15/16 04:51
Toluene	16.8 U	33.5	10.5	ug/Kg	1		04/15/16 04:51

Surrogates

1,4-Difluorobenzene (surr)	95.7	72-119		%	1		04/15/16 04:51
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Batch Information

Analytical Batch: VFC12962
Analytical Method: SW8021B
Analyst: S.P
Analytical Date/Time: 04/15/16 04:51
Container ID: 1161603001-B

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 04/06/16 12:00
Prep Initial Wt./Vol.: 51.295 g
Prep Extract Vol: 30.6335 mL



Method Blank

Blank ID: MB for HBN 1731160 [SPT/9866]

Blank Lab ID: 1318918

QC for Samples:

1161603001

Matrix: Soil/Solid (dry weight)

Results by SM21 2540G

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Total Solids	100			%

Batch Information

Analytical Batch: SPT9866

Analytical Method: SM21 2540G

Instrument:

Analyst: K.W

Analytical Date/Time: 4/7/2016 7:53:00PM

Print Date: 04/20/2016 1:14:00PM

SGS North America Inc.

200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group



Duplicate Sample Summary

Original Sample ID: 1161579002

Duplicate Sample ID: 1318919

QC for Samples:

1161603001

Analysis Date: 04/07/2016 19:53

Matrix: Soil/Solid (dry weight)

Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	81.8	82.5	%	0.83	(< 15)

Batch Information

Analytical Batch: SPT9866

Analytical Method: SM21 2540G

Instrument:

Analyst: K.W

Print Date: 04/20/2016 1:14:02PM

SGS North America Inc.

200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group

Method Blank

Blank ID: MB for HBN 1731617 [VXX/28685]
Blank Lab ID: 1319812

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	1.25U	2.50	0.750	mg/Kg
Surrogates				
4-Bromofluorobenzene (surr)	76.4	50-150		%

Batch Information

Analytical Batch: VFC12962
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/14/2016 7:38:00PM

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:03PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [VXX28685]
 Blank Spike Lab ID: 1319815
 Date Analyzed: 04/14/2016 20:54

Spike Duplicate ID: LCSD for HBN 1161603
 [VXX28685]
 Spike Duplicate Lab ID: 1319816
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by AK101

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	12.5	13.5	108	12.5	14.3	114	(60-120)	5.30	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	1.25	85	85	1.25	88.4	88	(50-150)	3.90	

Batch Information

Analytical Batch: **VFC12962**
 Analytical Method: **AK101**
 Instrument: **Agilent 7890A PID/FID**
 Analyst: **S.P**

Prep Batch: **VXX28685**
 Prep Method: **SW5035A**
 Prep Date/Time: **04/14/2016 08:00**
 Spike Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL
 Dupe Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:05PM



Matrix Spike Summary

Original Sample ID: 1161564001
MS Sample ID: 1319817 MS
MSD Sample ID: 1319818 MSD

Analysis Date: 04/15/2016 1:21
Analysis Date: 04/15/2016 1:41
Analysis Date: 04/15/2016 2:00
Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by AK101

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	2.09U	9.46	9.31	98	9.46	9.54	101	60-120	2.50	(< 20)
Surrogates										
4-Bromofluorobenzene (surr)		0.946	0.780	82	0.946	0.799	85	50-150	2.50	

Batch Information

Analytical Batch: VFC12962
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/15/2016 1:41:00AM

Prep Batch: VXX28685
Prep Method: AK101 Extraction (S)
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 68.69g
Prep Extract Vol: 25.00mL

Print Date: 04/20/2016 1:14:06PM

Method Blank

Blank ID: MB for HBN 1731617 [VXX/28685]
Blank Lab ID: 1319812

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	6.25U	12.5	4.00	ug/Kg
Ethylbenzene	12.5U	25.0	7.80	ug/Kg
o-Xylene	12.5U	25.0	7.80	ug/Kg
P & M -Xylene	25.0U	50.0	15.0	ug/Kg
Toluene	12.5U	25.0	7.80	ug/Kg
Surrogates				
1,4-Difluorobenzene (surr)	96.1	72-119		%

Batch Information

Analytical Batch: VFC12962
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/14/2016 7:38:00PM

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL



Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [VXX28685]
Blank Spike Lab ID: 1319813
Date Analyzed: 04/14/2016 19:57

Spike Duplicate ID: LCSD for HBN 1161603
[VXX28685]
Spike Duplicate Lab ID: 1319814
Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by SW8021B

Parameter	Blank Spike (ug/Kg)			Spike Duplicate (ug/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	1250	1320	106	1250	1350	108	(75-125)	2.30	(< 20)
Ethylbenzene	1250	1330	107	1250	1370	109	(75-125)	2.40	(< 20)
o-Xylene	1250	1330	106	1250	1370	110	(75-125)	3.20	(< 20)
P & M -Xylene	2500	2700	108	2500	2760	111	(80-125)	2.30	(< 20)
Toluene	1250	1480	118	1250	1510	121	(70-125)	2.00	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	1250	97.6	98	1250	97.8	98	(72-119)	0.14	

Batch Information

Analytical Batch: VFC12962
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: S.P

Prep Batch: VXX28685
Prep Method: SW5035A
Prep Date/Time: 04/14/2016 08:00
Spike Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL
Dupe Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL

Print Date: 04/20/2016 1:14:09PM



Matrix Spike Summary

Original Sample ID: 1161564001
MS Sample ID: 1319817 MS
MSD Sample ID: 1319818 MSD

Analysis Date: 04/15/2016 1:21
Analysis Date: 04/15/2016 1:41
Analysis Date: 04/15/2016 2:00
Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by SW8021B

Parameter	Sample	Matrix Spike (ug/Kg)			Spike Duplicate (ug/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	10.4U	946	1003	106	946	1016	107	75-125	1.20	(< 20)
Ethylbenzene	20.9U	946	982	104	946	1002	106	75-125	1.90	(< 20)
o-Xylene	20.9U	946	967	102	946	988	104	75-125	2.10	(< 20)
P & M -Xylene	41.7U	1892	1944	103	1892	1985	105	80-125	2.30	(< 20)
Toluene	20.9U	946	990	105	946	1006	106	70-125	1.60	(< 20)

Surrogates

1,4-Difluorobenzene (surr)	946	941	100	946	923	98	72-119	1.90
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Batch Information

Analytical Batch: VFC12962
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: S.P
Analytical Date/Time: 4/15/2016 1:41:00AM

Prep Batch: VXX28685
Prep Method: AK101 Extraction (S)
Prep Date/Time: 4/14/2016 8:00:00AM
Prep Initial Wt./Vol.: 68.69g
Prep Extract Vol: 25.00mL

Print Date: 04/20/2016 1:14:10PM



Method Blank

Blank ID: MB for HBN 1731261 [XXX/35139]
Blank Lab ID: 1319120

Matrix: Soil/Solid (dry weight)

QC for Samples:
1161603001

Results by AK102

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Diesel Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
5a Androstane (surr)	97.9	60-120		%

Batch Information

Analytical Batch: XFC12329
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CJSW
Analytical Date/Time: 4/12/2016 1:17:00PM

Prep Batch: XXX35139
Prep Method: SW3550C
Prep Date/Time: 4/11/2016 9:03:02AM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

Print Date: 04/20/2016 1:14:11PM



Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [XXX35139]
Blank Spike Lab ID: 1319121
Date Analyzed: 04/12/2016 13:27

Spike Duplicate ID: LCSD for HBN 1161603
[XXX35139]
Spike Duplicate Lab ID: 1319122
Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by AK102

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Diesel Range Organics	167	171	103	167	198	119	(75-125)	14.60	(< 20)
Surrogates									
5a Androstane (surr)	3.33	104	104	3.33	116	116	(60-120)	11.30	

Batch Information

Analytical Batch: **XFC12329**
Analytical Method: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **CJSW**

Prep Batch: **XXX35139**
Prep Method: **SW3550C**
Prep Date/Time: **04/11/2016 09:03**
Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

Print Date: 04/20/2016 1:14:12PM



Method Blank

Blank ID: MB for HBN 1731261 [XXX/35139]

Blank Lab ID: 1319120

QC for Samples:

1161603001

Matrix: Soil/Solid (dry weight)

Results by AK103

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Residual Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
n-Triacontane-d62 (surr)	100	60-120		%

Batch Information

Analytical Batch: XFC12329

Analytical Method: AK103

Instrument: Agilent 7890B R

Analyst: CJSW

Analytical Date/Time: 4/12/2016 1:17:00PM

Prep Batch: XXX35139

Prep Method: SW3550C

Prep Date/Time: 4/11/2016 9:03:02AM

Prep Initial Wt./Vol.: 30 g

Prep Extract Vol: 1 mL

Print Date: 04/20/2016 1:14:13PM



Blank Spike Summary

Blank Spike ID: LCS for HBN 1161603 [XXX35139]
Blank Spike Lab ID: 1319121
Date Analyzed: 04/12/2016 13:27

Spike Duplicate ID: LCSD for HBN 1161603
[XXX35139]
Spike Duplicate Lab ID: 1319122
Matrix: Soil/Solid (dry weight)

QC for Samples: 1161603001

Results by AK103

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Residual Range Organics	167	156	94	167	175	105	(60-120)	11.60	(< 20)
Surrogates									
n-Triacontane-d62 (surr)	3.33	88	88	3.33	99.5	100	(60-120)	12.30	

Batch Information

Analytical Batch: **XFC12329**
Analytical Method: **AK103**
Instrument: **Agilent 7890B R**
Analyst: **CJSW**

Prep Batch: **XXX35139**
Prep Method: **SW3550C**
Prep Date/Time: **04/11/2016 09:03**
Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

Print Date: 04/20/2016 1:14:14PM

1161603

SGS North America Inc.
CHAIN OF CUSTODY RECORD

TS Nationwide
Maryland
New York
Indiana
Kentucky
www.us.sos.com

[illegible]



1161603



SAMPLE RECEIPT FORM

Review Criteria:	Yes	N/A	No	Comments/Action Taken:
Were custody seals intact? Note # & location, if applicable. COC accompanied samples?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<i>Exemption permitted if sampler hand carries/delivers.</i>
Temperature blank compliant* (i.e., 0-6°C after CF)? If >6°C, were samples collected <8 hours ago? If <0°C, were all sample containers ice free?	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<i>Exemption permitted if chilled & collected <8 hrs ago.</i>
Cooler ID: ¹ _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ If samples are received <u>without</u> a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank <u>nor</u> cooler temp can be obtained, note "ambient" or "chilled."				<i>Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.</i>
Delivery method (specify all that apply): <input checked="" type="checkbox"/> Client (hand carried) <input type="checkbox"/> USPS <input type="checkbox"/> Lynden <input type="checkbox"/> AK Air <input type="checkbox"/> Alert Courier <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> RAVN <input type="checkbox"/> C&D Delivery <input type="checkbox"/> Carlie <input type="checkbox"/> Pen Air <input type="checkbox"/> Warp Speed <input type="checkbox"/> Other: _____ → For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Yes	N/A	No	
Were samples received within hold time? Do samples match COC* (i.e., sample IDs, dates/times collected)? Were analyses requested unambiguous?	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<i>Note: Refer to form F-083 "Sample Guide" for hold times. Note: If times differ <1hr, record details and login per COC.</i>
Were samples in good condition (no leaks/cracks/breakage)? Packing material used (specify all that apply): <input checked="" type="checkbox"/> Bubble Wrap <input type="checkbox"/> Separate plastic bags <input type="checkbox"/> Vermiculite <input type="checkbox"/> Other:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Were proper containers (type/mass/volume/preservative*) used? Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples? Were all VOA vials free of headspace (i.e., bubbles ≤6 mm)? Were all soil VOAs field extracted with MeOH+BFB?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <i>Exemption permitted for metals (e.g., 200.8/6020A).</i> Samples were sub-sampled and extracted by lab upon receipt
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was pH verified and compliant ? If pH was adjusted, were bottles flagged (i.e., stickers)?	<input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	
For special handling (e.g., "MI" soils, foreign soils, lab filter for dissolved..., lab extract for volatiles, Ref Lab, limited volume), were bottles/paperwork flagged (e.g., sticker)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
For RUSH/SHORT Hold Time , were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
For SITE-SPECIFIC QC , e.g. BMS/BMSD/BDUP, were containers / paperwork flagged accordingly?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	SRF Completed by: CRD PM notified:
Was PEER REVIEW of sample numbering/labeling completed ?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Peer Reviewed by:
Additional notes (if applicable):				
<i>Note to Client: Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.</i>				



Sample Containers and Preservatives

<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>	<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>
1161603001-A	No Preservative Required	OK			
1161603001-B	Methanol field pres. 4 C	OK			

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.

BU - The container was received with headspace greater than 6mm.

DM- The container was received damaged.

FR- The container was received frozen and not usable for Bacteria or BOD analyses.

PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

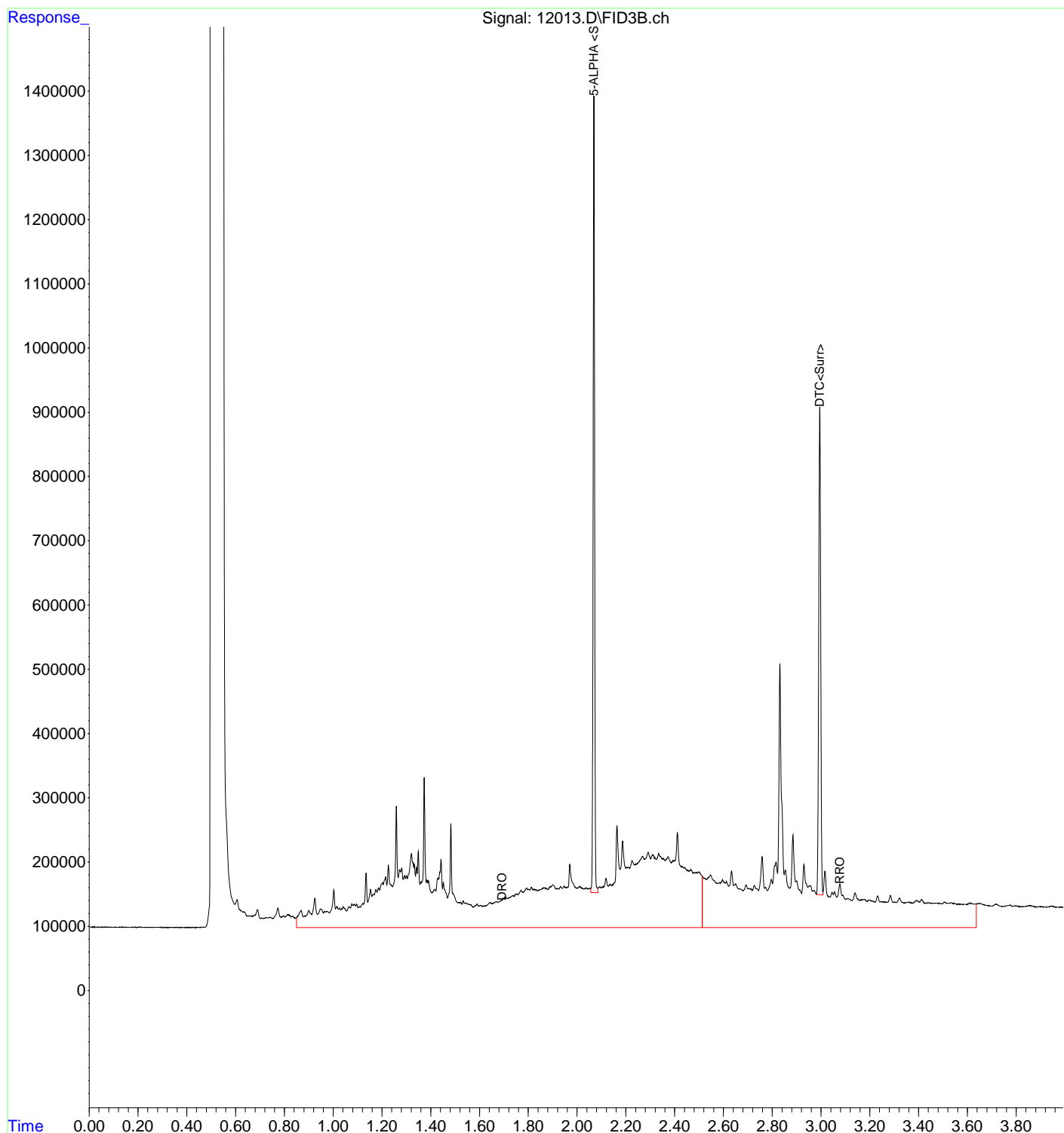
PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

CHROMATOGRAMS

Data Path : Z:\04\SF\DATA\041216\
Data File : 12013.D
Signal(s) : FID3B.ch
Acq On : 12 Apr 2016 1:56 pm
Operator : CJSW
Sample :
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Apr 13 11:59:20 2016
Quant Method : Z:\04\SF\METHOD\SFR2016-0407A.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Fri Apr 08 09:05:55 2016
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

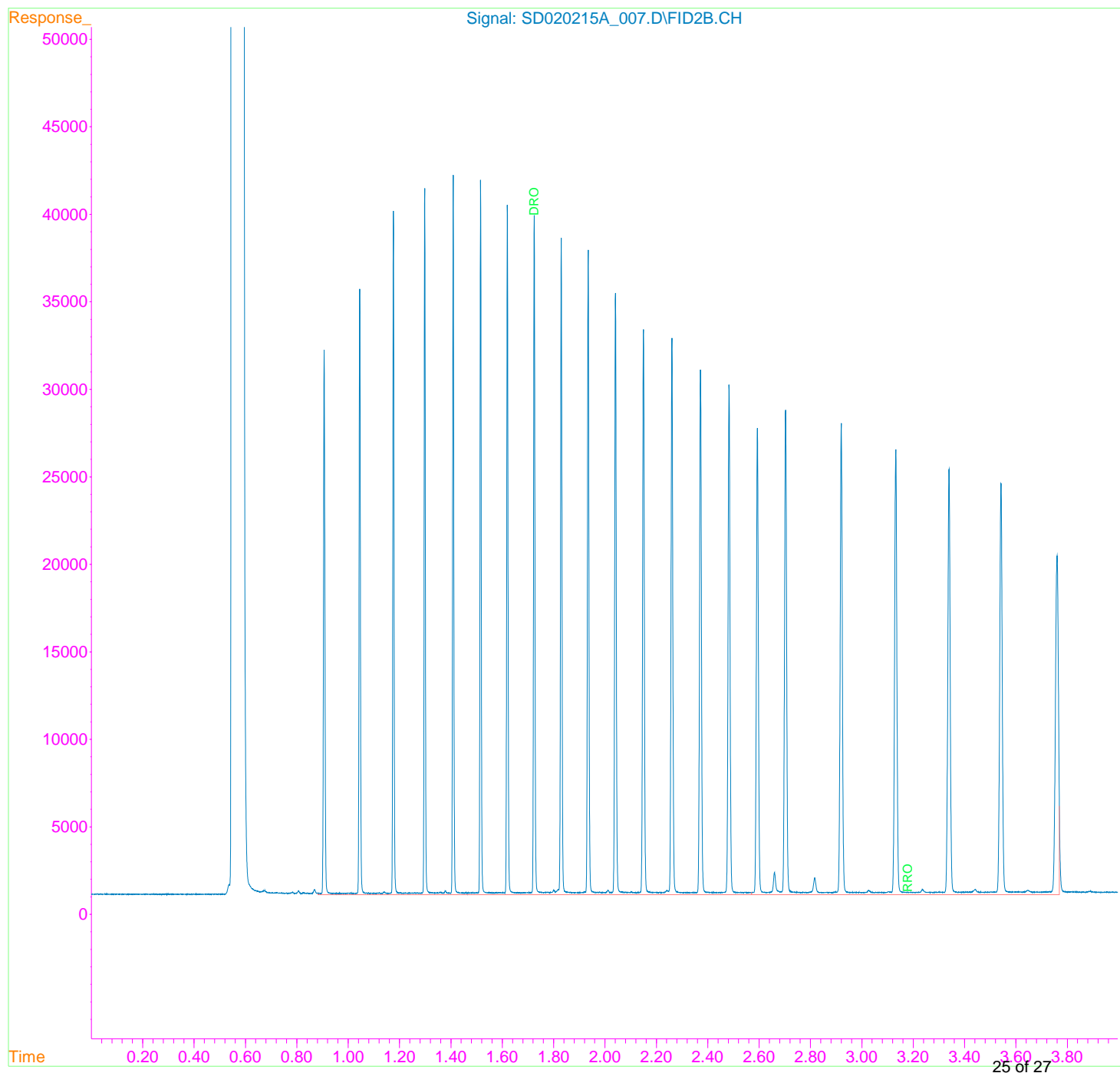


Data Path : Z:\01\SD\DATA\020215A\
Data File : SD020215A_007.D
Signal(s) : FID2B.CH
Acq On : 02 Feb 2015 1:01 pm
Operator : NLL
Sample : NAS
Misc :
ALS Vial : 2 Sample Multiplier: 1

Normal Alkane Standards

Integration File: autoint1.e
Quant Time: Feb 02 13:21:38 2015
Quant Method : Z:\01\SD\METHOD\SDR2015-0130C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Mon Feb 02 09:35:16 2015
Response via : Initial Calibration
Integrator: ChemStation 6890 Scale Mode: Small noise peaks clipped

Volume Inj. :
Signal Phase :
Signal Info :

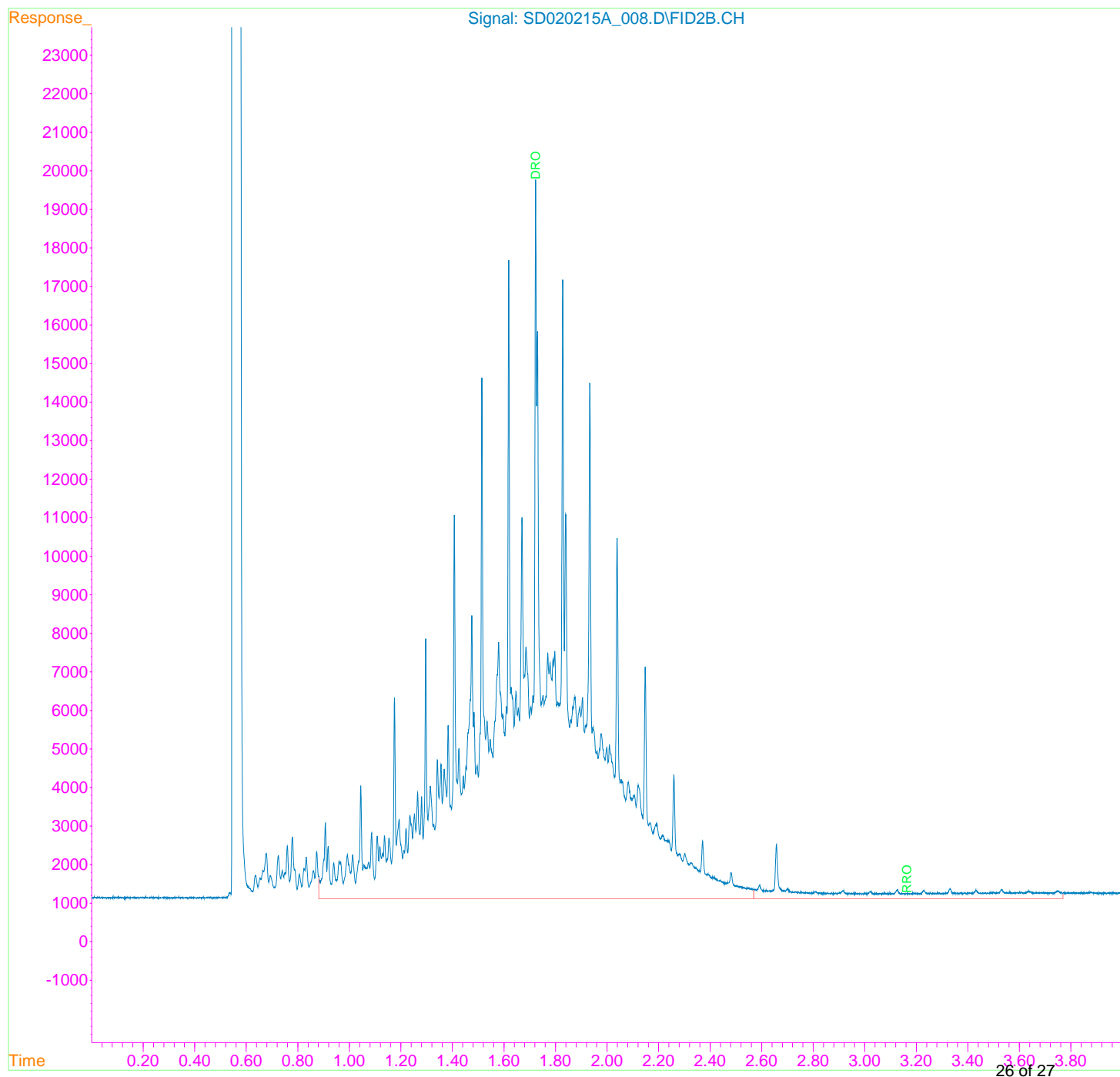


Data Path : Z:\01\SD\DATA\020215A\
Data File : SD020215A_008.D
Signal(s) : FID2B.CH
Acq On : 02 Feb 2015 1:11 pm
Operator : NLL
Sample : CCVB
Misc :
ALS Vial : 3 Sample Multiplier: 1

Diesel Range Organics
Diesel standard

Integration File: autoint1.e
Quant Time: Feb 02 13:23:42 2015
Quant Method : Z:\01\SD\METHOD\SDR2015-0130C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Mon Feb 02 09:35:16 2015
Response via : Initial Calibration
Integrator: ChemStation 6890 Scale Mode: Small noise peaks clipped

Volume Inj. :
Signal Phase :
Signal Info :

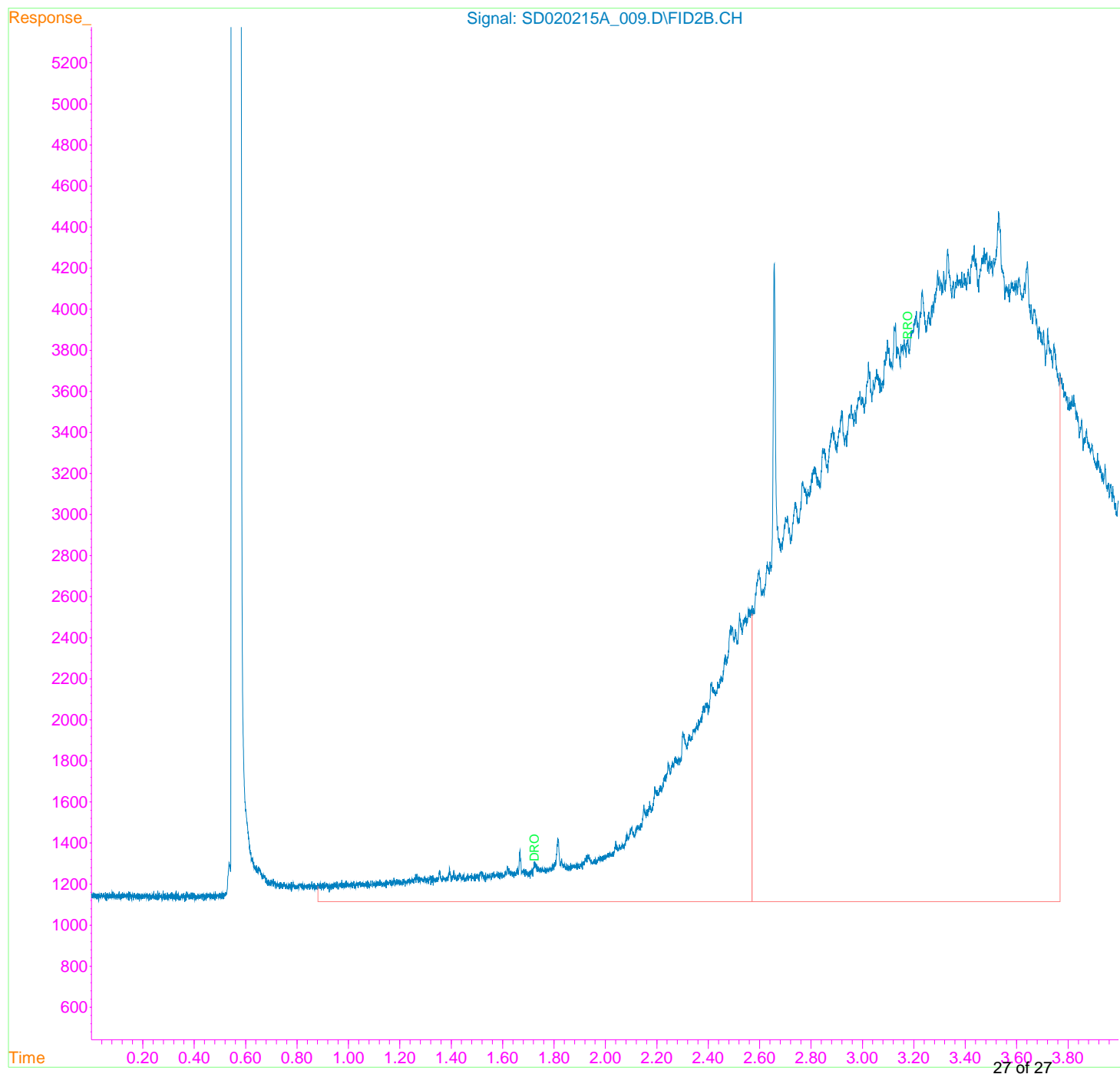


Data Path : Z:\01\SD\DATA\020215A\
Data File : SD020215A_009.D
Signal(s) : FID2B.CH
Acq On : 02 Feb 2015 1:21 pm
Operator : NLL
Sample : CCVR
Misc :
ALS Vial : 4 Sample Multiplier: 1

Residual Range Organics
"Lube Oil" standard

Integration File: autoint1.e
Quant Time: Feb 02 13:28:20 2015
Quant Method : Z:\01\SD\METHOD\SDR2015-0130C.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Mon Feb 02 09:35:16 2015
Response via : Initial Calibration
Integrator: ChemStation 6890 Scale Mode: Small noise peaks clipped

Volume Inj. :
Signal Phase :
Signal Info :



APPENDIX D
LABORATORY DATA FROM SEPTEMBER 2016 INVESTIGATION

Laboratory Data Review Checklist

Completed by:	Christopher Valentine		
Title:	Project Engineer	Date:	Nov 23, 2016
CS Report Name:	Image / Reflection Drive	Report Date:	Sep 23, 2016
Consultant Firm:	Golder Associates Inc.		
Laboratory Name:	SGS	Laboratory Report Number:	1165330
ADEC File Number:	n/a	ADEC RecKey Number:	n/a

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

--

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

☐ Yes ☒ No ☐ NA (Please explain) Comments:

--

2. Chain of Custody (COC)

a. COC information completed, signed, and dated (including released/received by)?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

--

b. Correct analyses requested?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

--

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{ C}$)?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

The cooler was measured with temperature blank at 5.9° C

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

Sample condition documented, all samples in good condition

d. If there were any discrepancies, were they documented? - For example, incorrect sample containers/preservation, sample temperature outside of acceptance range, insufficient or missing samples, etc.?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

Sample DP-3C accidentally listed as DP-3A on COC

e. Data quality or usability affected? (Please explain)

Comments:

Sample results were usable for project purposes without qualification with respect to sample documentation and receipt conditions.

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☐ Yes ☒ No ☐ NA (Please explain)

Comments:

c. Were all corrective actions documented?

☐ Yes ☐ No ☒ NA (Please explain)

Comments:

none

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Sample results were usable for project purposes with some qualifications for out of control QC.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

b. All applicable holding times met?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

c. All soils reported on a dry weight basis?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

e. Data quality or usability affected? (Please explain)

Comments:

Sample results were usable for project purposes with respect to holding times and reporting limits.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

ii. All method blank results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

iii. If above PQL, what samples are affected?

Comments:

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

v. Data quality or usability affected? (Please explain) Comments:

All results were usable for project purposes.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

ii. Metals/Inorganics - One LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐ Yes ☐ No ☒ NA (Please explain) Comments:

no metals sample taken

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/DMSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐ Yes ☒ No ☐ NA (Please explain) Comments:

See Table 3 for summary, and see section 3.3.3 of report for explanation

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

none

vi. Do the affected samples(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☒ No ☐ NA (Please explain) Comments:

no flags needed

vii. Data quality or usability affected? (Please explain)

Comments:

no

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐ Yes ☒ No ☐ NA (Please explain) Comments:

iv. Data quality or usability affected? (Use the comment box to explain.).

Comments:

Sample results were usable for project purposes with respect to surrogate recoveries.

d. Trip Blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

iii. All results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

The water and soil trip blank results were all less than LOQ

iv. If above PQL, what samples are affected?

Comments:

All associated project sample results were less than LOQ.

v. Data quality or usability affected? (Please explain.)

Comments:

Sample results were usable for project purposes. Data quality or usability was not affected.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

There was one set of field duplicate submitted for this project. Soil field duplicate was DP-2C from DP-2A, and water field duplicate was DP-6 from DP-1.

ii. Submitted blind to lab?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute Value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

All analytes met field duplicate RPD criteria.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

Sample results were usable for project purposes.

f. Decontamination or Equipment Blank (if applicable)

☐ Yes ☐ No ☒ NA (Please explain)

Comments:

No equipment blank taken

i. All results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

ii. If above PQL, what samples are affected?

Comments:

iii. Data quality or usability affected? (Please explain.)

Comments:

Data quality or usability was not affected.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

Reset Form

Laboratory Report of Analysis

To: Golder Associates Inc.
2121 Abbott Road, #100
Anchorage, AK 99507
(907)344-6001

Report Number: **1165330**

Client Project: **Image Reflection Drive**

Dear Chris Valentine,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Victoria at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.


SGS North America Inc.
Environmental Services - Alaska Division
Project Manager

Victoria Pennick
2016.09.23
14:27:08 -08'00'

Victoria Pennick
Project Manager
Victoria.Pennick@sgs.com

Date

Print Date: 09/23/2016 8:02:24AM

Case Narrative

SGS Client: **Golder Associates Inc.**
SGS Project: **1165330**
Project Name/Site: **Image Reflection Drive**
Project Contact: **Chris Valentine**

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

Print Date: 09/23/2016 8:02:26AM

Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB	Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB	Closing Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.

Sample Summary

<u>Client Sample ID</u>	<u>Lab Sample ID</u>	<u>Collected</u>	<u>Received</u>	<u>Matrix</u>
DP-1A	1165330001	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-1B	1165330002	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-2A	1165330003	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-2C	1165330004	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-2B	1165330005	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-3C	1165330006	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-3B	1165330007	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-4A	1165330008	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-4B	1165330009	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-5A	1165330010	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-5B	1165330011	09/08/2016	09/08/2016	Soil/Solid (dry weight)
Trip Blank	1165330012	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-1	1165330013	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
DP-6	1165330014	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
DP-2	1165330015	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
DP-3	1165330016	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
DP-4	1165330017	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
DP-5	1165330018	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
Trip Blank	1165330019	09/08/2016	09/08/2016	Water (Surface, Eff., Ground)
DP-5B MS	1165330020	09/08/2016	09/08/2016	Soil/Solid (dry weight)
DP-5B MSD	1165330021	09/08/2016	09/08/2016	Soil/Solid (dry weight)

<u>Method</u>	<u>Method Description</u>
AK101	AK101/8021 Combo.
SW8021B	AK101/8021 Combo.
AK101	AK101/8021 Combo. (S)
SW8021B	AK101/8021 Combo. (S)
AK102	Diesel/Residual Range Organics
AK103	Diesel/Residual Range Organics
AK102	DRO/RRO Low Volume Water
AK103	DRO/RRO Low Volume Water
SM21 2540G	Percent Solids SM2540G

Print Date: 09/23/2016 8:02:32AM

Detectable Results Summary

Client Sample ID: DP-1A Lab Sample ID: 1165330001	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Residual Range Organics	25.9	mg/Kg
Client Sample ID: DP-1B Lab Sample ID: 1165330002	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Residual Range Organics	9.86J	mg/Kg
Volatile Fuels	Gasoline Range Organics	0.741J	mg/Kg
Client Sample ID: DP-2A Lab Sample ID: 1165330003	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	56.0J	mg/Kg
	Residual Range Organics	511	mg/Kg
Client Sample ID: DP-2C Lab Sample ID: 1165330004	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	130	mg/Kg
	Residual Range Organics	1810	mg/Kg
Client Sample ID: DP-2B Lab Sample ID: 1165330005	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	7.45J	mg/Kg
	Residual Range Organics	12.1J	mg/Kg
Client Sample ID: DP-3C Lab Sample ID: 1165330006	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Residual Range Organics	6.89J	mg/Kg
Volatile Fuels	Gasoline Range Organics	0.598J	mg/Kg
Client Sample ID: DP-3B Lab Sample ID: 1165330007	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	15.2J	mg/Kg
	Residual Range Organics	85.3	mg/Kg
Volatile Fuels	Gasoline Range Organics	0.678J	mg/Kg
Client Sample ID: DP-4A Lab Sample ID: 1165330008	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	16.1J	mg/Kg
	Residual Range Organics	37.7	mg/Kg
Volatile Fuels	Gasoline Range Organics	0.538J	mg/Kg
Client Sample ID: DP-4B Lab Sample ID: 1165330009	<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Semivolatile Organic Fuels	Diesel Range Organics	10.7J	mg/Kg
	Residual Range Organics	17.3J	mg/Kg
Volatile Fuels	Gasoline Range Organics	0.904J	mg/Kg

Detectable Results Summary

Client Sample ID: **DP-5A**
 Lab Sample ID: 1165330010
Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	13.2J	mg/Kg
Residual Range Organics	42.1	mg/Kg
Gasoline Range Organics	0.680J	mg/Kg

Volatile Fuels

Client Sample ID: **DP-5B**
 Lab Sample ID: 1165330011
Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	9.55J	mg/Kg
Residual Range Organics	42.6	mg/Kg

Client Sample ID: **Trip Blank**
 Lab Sample ID: 1165330012
Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Gasoline Range Organics	0.787J	mg/Kg

Client Sample ID: **DP-1**
 Lab Sample ID: 1165330013
Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	0.229J	mg/L

Client Sample ID: **DP-6**
 Lab Sample ID: 1165330014
Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	0.212J	mg/L

Client Sample ID: **DP-2**
 Lab Sample ID: 1165330015
Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	0.187J	mg/L

Client Sample ID: **DP-3**
 Lab Sample ID: 1165330016
Semivolatile Organic Fuels
Volatile Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	0.240J	mg/L
Toluene	0.510J	ug/L

Client Sample ID: **DP-4**
 Lab Sample ID: 1165330017
Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result</u>	<u>Units</u>
Diesel Range Organics	0.322J	mg/L
Residual Range Organics	0.250J	mg/L



Results of DP-1A

Client Sample ID: **DP-1A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330001
Lab Project ID: 1165330

Collection Date: 09/08/16 09:20
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):89.1
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	11.1 U	22.2	6.89	mg/Kg	1		09/18/16 03:20
Surrogates							
5a Androstane (surr)	88.2	50-150		%	1		09/18/16 03:20

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 03:20
Container ID: 1165330001-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.285 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	25.9	22.2	6.89	mg/Kg	1		09/18/16 03:20
Surrogates							
n-Triacontane-d62 (surr)	107	50-150		%	1		09/18/16 03:20

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 03:20
Container ID: 1165330001-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.285 g
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-1A

Client Sample ID: **DP-1A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330001
Lab Project ID: 1165330

Collection Date: 09/08/16 09:20
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):89.1
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	1.20 U	2.40	0.721	mg/Kg	1		09/10/16 14:33

Surrogates

4-Bromofluorobenzene (surr)	108	50-150		%	1		09/10/16 14:33
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 14:33
Container ID: 1165330001-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 09:20
Prep Initial Wt./Vol.: 78.156 g
Prep Extract Vol: 33.4934 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	6.00 U	12.0	3.85	ug/Kg	1		09/10/16 14:33
Ethylbenzene	12.0 U	24.0	7.50	ug/Kg	1		09/10/16 14:33
o-Xylene	12.0 U	24.0	7.50	ug/Kg	1		09/10/16 14:33
P & M -Xylene	24.1 U	48.1	14.4	ug/Kg	1		09/10/16 14:33
Toluene	12.0 U	24.0	7.50	ug/Kg	1		09/10/16 14:33

Surrogates

1,4-Difluorobenzene (surr)	93.2	72-119		%	1		09/10/16 14:33
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 14:33
Container ID: 1165330001-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 09:20
Prep Initial Wt./Vol.: 78.156 g
Prep Extract Vol: 33.4934 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-1B

Client Sample ID: **DP-1B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330002
Lab Project ID: 1165330

Collection Date: 09/08/16 09:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):84.5
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	11.8 U	23.6	7.31	mg/Kg	1		09/18/16 03:31
Surrogates							
5a Androstane (surr)	83.5	50-150		%	1		09/18/16 03:31

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 03:31
Container ID: 1165330002-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.115 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	9.86 J	23.6	7.31	mg/Kg	1		09/18/16 03:31
Surrogates							
n-Triacontane-d62 (surr)	86.5	50-150		%	1		09/18/16 03:31

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 03:31
Container ID: 1165330002-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.115 g
Prep Extract Vol: 1 mL



Results of DP-1B

Client Sample ID: **DP-1B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330002
Lab Project ID: 1165330

Collection Date: 09/08/16 09:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):84.5
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.741 J	2.24	0.671	mg/Kg	1		09/10/16 14:52

Surrogates

4-Bromofluorobenzene (surr)	136	50-150		%	1		09/10/16 14:52
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 14:52
Container ID: 1165330002-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 09:35
Prep Initial Wt./Vol.: 111.674 g
Prep Extract Vol: 42.2604 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	5.60 U	11.2	3.58	ug/Kg	1		09/10/16 14:52
Ethylbenzene	11.2 U	22.4	6.98	ug/Kg	1		09/10/16 14:52
o-Xylene	11.2 U	22.4	6.98	ug/Kg	1		09/10/16 14:52
P & M -Xylene	22.4 U	44.8	13.4	ug/Kg	1		09/10/16 14:52
Toluene	11.2 U	22.4	6.98	ug/Kg	1		09/10/16 14:52

Surrogates

1,4-Difluorobenzene (surr)	93.2	72-119		%	1		09/10/16 14:52
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 14:52
Container ID: 1165330002-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 09:35
Prep Initial Wt./Vol.: 111.674 g
Prep Extract Vol: 42.2604 mL



Results of DP-2A

Client Sample ID: **DP-2A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330003
Lab Project ID: 1165330

Collection Date: 09/08/16 10:20
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):86.5
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	56.0 J	114	35.3	mg/Kg	1		09/18/16 03:41
Surrogates							
5a Androstane (surr)	101	50-150		%	1		09/18/16 03:41

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 03:41
Container ID: 1165330003-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.493 g
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	511	114	35.3	mg/Kg	1		09/18/16 03:41
Surrogates							
n-Triacontane-d62 (surr)	108	50-150		%	1		09/18/16 03:41

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 03:41
Container ID: 1165330003-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.493 g
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-2A

Client Sample ID: **DP-2A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330003
Lab Project ID: 1165330

Collection Date: 09/08/16 10:20
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):86.5
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	1.43 U	2.86	0.859	mg/Kg	1		09/10/16 15:10

Surrogates

4-Bromofluorobenzene (surr)	111	50-150		%	1		09/10/16 15:10
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 15:10
Container ID: 1165330003-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 10:20
Prep Initial Wt./Vol.: 69.303 g
Prep Extract Vol: 34.3456 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	7.15 U	14.3	4.58	ug/Kg	1		09/10/16 15:10
Ethylbenzene	14.3 U	28.6	8.94	ug/Kg	1		09/10/16 15:10
o-Xylene	14.3 U	28.6	8.94	ug/Kg	1		09/10/16 15:10
P & M -Xylene	28.6 U	57.3	17.2	ug/Kg	1		09/10/16 15:10
Toluene	14.3 U	28.6	8.94	ug/Kg	1		09/10/16 15:10

Surrogates

1,4-Difluorobenzene (surr)	91.3	72-119		%	1		09/10/16 15:10
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 15:10
Container ID: 1165330003-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 10:20
Prep Initial Wt./Vol.: 69.303 g
Prep Extract Vol: 34.3456 mL



Results of DP-2C

Client Sample ID: **DP-2C**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330004
Lab Project ID: 1165330

Collection Date: 09/08/16 10:20
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):86.9
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	130	114	35.2	mg/Kg	1		09/18/16 03:51
Surrogates							
5a Androstane (surr)	101	50-150		%	1		09/18/16 03:51

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 03:51
Container ID: 1165330004-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.372 g
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	1810	114	35.2	mg/Kg	1		09/18/16 03:51
Surrogates							
n-Triacontane-d62 (surr)	63.4	50-150		%	1		09/18/16 03:51

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 03:51
Container ID: 1165330004-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.372 g
Prep Extract Vol: 5 mL



Results of DP-2C

Client Sample ID: **DP-2C**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330004
Lab Project ID: 1165330

Collection Date: 09/08/16 10:20
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):86.9
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	1.40 U	2.80	0.840	mg/Kg	1		09/10/16 15:29

Surrogates

4-Bromofluorobenzene (surr)	109	50-150		%	1		09/10/16 15:29
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 15:29
Container ID: 1165330004-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 10:20
Prep Initial Wt./Vol.: 70.206 g
Prep Extract Vol: 34.1721 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	7.00 U	14.0	4.48	ug/Kg	1		09/10/16 15:29
Ethylbenzene	14.0 U	28.0	8.73	ug/Kg	1		09/10/16 15:29
o-Xylene	14.0 U	28.0	8.73	ug/Kg	1		09/10/16 15:29
P & M -Xylene	28.0 U	56.0	16.8	ug/Kg	1		09/10/16 15:29
Toluene	14.0 U	28.0	8.73	ug/Kg	1		09/10/16 15:29

Surrogates

1,4-Difluorobenzene (surr)	92.7	72-119		%	1		09/10/16 15:29
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 15:29
Container ID: 1165330004-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 10:20
Prep Initial Wt./Vol.: 70.206 g
Prep Extract Vol: 34.1721 mL



Results of DP-2B

Client Sample ID: **DP-2B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330005
Lab Project ID: 1165330

Collection Date: 09/08/16 10:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):86.7
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	7.45 J	22.9	7.10	mg/Kg	1		09/18/16 04:02
Surrogates							
5a Androstane (surr)	83.5	50-150		%	1		09/18/16 04:02

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 04:02
Container ID: 1165330005-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.212 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	12.1 J	22.9	7.10	mg/Kg	1		09/18/16 04:02
Surrogates							
n-Triacontane-d62 (surr)	84.8	50-150		%	1		09/18/16 04:02

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 04:02
Container ID: 1165330005-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.212 g
Prep Extract Vol: 1 mL



Results of DP-2B

Client Sample ID: **DP-2B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330005
Lab Project ID: 1165330

Collection Date: 09/08/16 10:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):86.7
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.975 U	1.95	0.585	mg/Kg	1		09/10/16 15:47

Surrogates

4-Bromofluorobenzene (surr)	138	50-150		%	1		09/10/16 15:47
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 15:47
Container ID: 1165330005-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 10:35
Prep Initial Wt./Vol.: 122.018 g
Prep Extract Vol: 41.2472 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	4.88 U	9.75	3.12	ug/Kg	1		09/10/16 15:47
Ethylbenzene	9.75 U	19.5	6.08	ug/Kg	1		09/10/16 15:47
o-Xylene	9.75 U	19.5	6.08	ug/Kg	1		09/10/16 15:47
P & M -Xylene	19.5 U	39.0	11.7	ug/Kg	1		09/10/16 15:47
Toluene	9.75 U	19.5	6.08	ug/Kg	1		09/10/16 15:47

Surrogates

1,4-Difluorobenzene (surr)	92.7	72-119		%	1		09/10/16 15:47
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 15:47
Container ID: 1165330005-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 10:35
Prep Initial Wt./Vol.: 122.018 g
Prep Extract Vol: 41.2472 mL



Results of DP-3C

Client Sample ID: **DP-3C**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330006
Lab Project ID: 1165330

Collection Date: 09/08/16 11:40
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):92.2
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	10.8 U	21.5	6.67	mg/Kg	1		09/18/16 04:12
Surrogates							
5a Androstane (surr)	83.8	50-150		%	1		09/18/16 04:12

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 04:12
Container ID: 1165330006-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.253 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	6.89 J	21.5	6.67	mg/Kg	1		09/18/16 04:12
Surrogates							
n-Triacontane-d62 (surr)	85.3	50-150		%	1		09/18/16 04:12

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 04:12
Container ID: 1165330006-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.253 g
Prep Extract Vol: 1 mL



Results of DP-3C

Client Sample ID: **DP-3C**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330006
Lab Project ID: 1165330

Collection Date: 09/08/16 11:40
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):92.2
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.598 J	1.58	0.475	mg/Kg	1		09/10/16 16:06

Surrogates

4-Bromofluorobenzene (surr)	116	50-150		%	1		09/10/16 16:06
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 16:06
Container ID: 1165330006-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 11:40
Prep Initial Wt./Vol.: 116.777 g
Prep Extract Vol: 34.0775 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	3.96 U	7.91	2.53	ug/Kg	1		09/10/16 16:06
Ethylbenzene	7.90 U	15.8	4.94	ug/Kg	1		09/10/16 16:06
o-Xylene	7.90 U	15.8	4.94	ug/Kg	1		09/10/16 16:06
P & M -Xylene	15.8 U	31.6	9.49	ug/Kg	1		09/10/16 16:06
Toluene	7.90 U	15.8	4.94	ug/Kg	1		09/10/16 16:06

Surrogates

1,4-Difluorobenzene (surr)	94.5	72-119		%	1		09/10/16 16:06
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 16:06
Container ID: 1165330006-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 11:40
Prep Initial Wt./Vol.: 116.777 g
Prep Extract Vol: 34.0775 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-3B

Client Sample ID: **DP-3B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330007
Lab Project ID: 1165330

Collection Date: 09/08/16 11:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):89.1
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	15.2 J	22.4	6.95	mg/Kg	1		09/18/16 04:23
Surrogates							
5a Androstane (surr)	92.2	50-150		%	1		09/18/16 04:23

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 04:23
Container ID: 1165330007-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.018 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	85.3	22.4	6.95	mg/Kg	1		09/18/16 04:23
Surrogates							
n-Triacontane-d62 (surr)	105	50-150		%	1		09/18/16 04:23

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 04:23
Container ID: 1165330007-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.018 g
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-3B

Client Sample ID: **DP-3B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330007
Lab Project ID: 1165330

Collection Date: 09/08/16 11:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):89.1
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.678 J	2.14	0.641	mg/Kg	1		09/10/16 16:24

Surrogates

4-Bromofluorobenzene (surr)	117	50-150		%	1		09/10/16 16:24
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 16:24
Container ID: 1165330007-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 11:35
Prep Initial Wt./Vol.: 91.938 g
Prep Extract Vol: 35.0063 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	5.35 U	10.7	3.42	ug/Kg	1		09/10/16 16:24
Ethylbenzene	10.7 U	21.4	6.67	ug/Kg	1		09/10/16 16:24
o-Xylene	10.7 U	21.4	6.67	ug/Kg	1		09/10/16 16:24
P & M -Xylene	21.4 U	42.7	12.8	ug/Kg	1		09/10/16 16:24
Toluene	10.7 U	21.4	6.67	ug/Kg	1		09/10/16 16:24

Surrogates

1,4-Difluorobenzene (surr)	95.1	72-119		%	1		09/10/16 16:24
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 16:24
Container ID: 1165330007-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 11:35
Prep Initial Wt./Vol.: 91.938 g
Prep Extract Vol: 35.0063 mL



Results of DP-4A

Client Sample ID: **DP-4A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330008
Lab Project ID: 1165330

Collection Date: 09/08/16 12:30
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):93.4
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	16.1 J	21.3	6.59	mg/Kg	1		09/18/16 04:33
Surrogates							
5a Androstane (surr)	90.2	50-150		%	1		09/18/16 04:33

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 04:33
Container ID: 1165330008-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.222 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	37.7	21.3	6.59	mg/Kg	1		09/18/16 04:33
Surrogates							
n-Triacontane-d62 (surr)	98.4	50-150		%	1		09/18/16 04:33

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 04:33
Container ID: 1165330008-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.222 g
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-4A

Client Sample ID: **DP-4A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330008
Lab Project ID: 1165330

Collection Date: 09/08/16 12:30
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):93.4
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.538 J	1.54	0.461	mg/Kg	1		09/10/16 16:43

Surrogates

4-Bromofluorobenzene (surr)	122	50-150		%	1		09/10/16 16:43
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 16:43
Container ID: 1165330008-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 12:30
Prep Initial Wt./Vol.: 113.033 g
Prep Extract Vol: 32.4424 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	3.84 U	7.68	2.46	ug/Kg	1		09/10/16 16:43
Ethylbenzene	7.70 U	15.4	4.79	ug/Kg	1		09/10/16 16:43
o-Xylene	7.70 U	15.4	4.79	ug/Kg	1		09/10/16 16:43
P & M -Xylene	15.4 U	30.7	9.22	ug/Kg	1		09/10/16 16:43
Toluene	7.70 U	15.4	4.79	ug/Kg	1		09/10/16 16:43

Surrogates

1,4-Difluorobenzene (surr)	96.9	72-119		%	1		09/10/16 16:43
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 16:43
Container ID: 1165330008-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 12:30
Prep Initial Wt./Vol.: 113.033 g
Prep Extract Vol: 32.4424 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-4B

Client Sample ID: **DP-4B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330009
Lab Project ID: 1165330

Collection Date: 09/08/16 12:45
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):84.3
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	10.7 J	23.4	7.26	mg/Kg	1		09/18/16 04:43
Surrogates							
5a Androstane (surr)	87.7	50-150		%	1		09/18/16 04:43

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 04:43
Container ID: 1165330009-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.394 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	17.3 J	23.4	7.26	mg/Kg	1		09/18/16 04:43
Surrogates							
n-Triacontane-d62 (surr)	88.7	50-150		%	1		09/18/16 04:43

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 04:43
Container ID: 1165330009-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.394 g
Prep Extract Vol: 1 mL



Results of DP-4B

Client Sample ID: **DP-4B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330009
Lab Project ID: 1165330

Collection Date: 09/08/16 12:45
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):84.3
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.904 J	2.64	0.791	mg/Kg	1		09/10/16 17:02

Surrogates

4-Bromofluorobenzene (surr)	137	50-150		%	1		09/10/16 17:02
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 17:02
Container ID: 1165330009-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 12:45
Prep Initial Wt./Vol.: 87.128 g
Prep Extract Vol: 38.7132 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	6.60 U	13.2	4.22	ug/Kg	1		09/10/16 17:02
Ethylbenzene	13.2 U	26.4	8.23	ug/Kg	1		09/10/16 17:02
o-Xylene	13.2 U	26.4	8.23	ug/Kg	1		09/10/16 17:02
P & M -Xylene	26.4 U	52.7	15.8	ug/Kg	1		09/10/16 17:02
Toluene	13.2 U	26.4	8.23	ug/Kg	1		09/10/16 17:02

Surrogates

1,4-Difluorobenzene (surr)	92.7	72-119		%	1		09/10/16 17:02
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 17:02
Container ID: 1165330009-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 12:45
Prep Initial Wt./Vol.: 87.128 g
Prep Extract Vol: 38.7132 mL



Results of DP-5A

Client Sample ID: **DP-5A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330010
Lab Project ID: 1165330

Collection Date: 09/08/16 13:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):90.3
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	13.2 J	21.9	6.78	mg/Kg	1		09/18/16 04:54
Surrogates							
5a Androstane (surr)	90.4	50-150		%	1		09/18/16 04:54

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 04:54
Container ID: 1165330010-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.363 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	42.1	21.9	6.78	mg/Kg	1		09/18/16 04:54
Surrogates							
n-Triacontane-d62 (surr)	93.9	50-150		%	1		09/18/16 04:54

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 04:54
Container ID: 1165330010-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.363 g
Prep Extract Vol: 1 mL



Results of DP-5A

Client Sample ID: **DP-5A**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330010
Lab Project ID: 1165330

Collection Date: 09/08/16 13:35
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):90.3
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.680 J	2.11	0.634	mg/Kg	1		09/10/16 17:20

Surrogates

4-Bromofluorobenzene (surr)	127	50-150		%	1		09/10/16 17:20
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 17:20
Container ID: 1165330010-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 13:35
Prep Initial Wt./Vol.: 87.662 g
Prep Extract Vol: 33.4647 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	5.30 U	10.6	3.38	ug/Kg	1		09/10/16 17:20
Ethylbenzene	10.6 U	21.1	6.59	ug/Kg	1		09/10/16 17:20
o-Xylene	10.6 U	21.1	6.59	ug/Kg	1		09/10/16 17:20
P & M -Xylene	21.1 U	42.3	12.7	ug/Kg	1		09/10/16 17:20
Toluene	10.6 U	21.1	6.59	ug/Kg	1		09/10/16 17:20

Surrogates

1,4-Difluorobenzene (surr)	94.8	72-119		%	1		09/10/16 17:20
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 17:20
Container ID: 1165330010-B

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 13:35
Prep Initial Wt./Vol.: 87.662 g
Prep Extract Vol: 33.4647 mL



Results of DP-5B

Client Sample ID: **DP-5B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330011
Lab Project ID: 1165330

Collection Date: 09/08/16 13:40
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):87.7
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	9.55 J	22.7	7.03	mg/Kg	1		09/18/16 05:24
Surrogates							
5a Androstane (surr)	90.9	50-150		%	1		09/18/16 05:24

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/18/16 05:24
Container ID: 1165330011-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.149 g
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	42.6	22.7	7.03	mg/Kg	1		09/18/16 05:24
Surrogates							
n-Triacontane-d62 (surr)	110	50-150		%	1		09/18/16 05:24

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/18/16 05:24
Container ID: 1165330011-A

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 09/16/16 21:12
Prep Initial Wt./Vol.: 30.149 g
Prep Extract Vol: 1 mL



Results of DP-5B

Client Sample ID: **DP-5B**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330011
Lab Project ID: 1165330

Collection Date: 09/08/16 13:40
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):87.7
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	1.08 U	2.16	0.648	mg/Kg	1		09/10/16 17:39

Surrogates

4-Bromofluorobenzene (surr)	124	50-150		%	1		09/10/16 17:39
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 17:39
Container ID: 1165330011-C

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 13:40
Prep Initial Wt./Vol.: 97.391 g
Prep Extract Vol: 36.9392 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	5.40 U	10.8	3.46	ug/Kg	1		09/10/16 17:39
Ethylbenzene	10.8 U	21.6	6.74	ug/Kg	1		09/10/16 17:39
o-Xylene	10.8 U	21.6	6.74	ug/Kg	1		09/10/16 17:39
P & M -Xylene	21.6 U	43.2	13.0	ug/Kg	1		09/10/16 17:39
Toluene	10.8 U	21.6	6.74	ug/Kg	1		09/10/16 17:39

Surrogates

1,4-Difluorobenzene (surr)	94	72-119		%	1		09/10/16 17:39
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 17:39
Container ID: 1165330011-C

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 13:40
Prep Initial Wt./Vol.: 97.391 g
Prep Extract Vol: 36.9392 mL



Results of Trip Blank

Client Sample ID: **Trip Blank**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330012
Lab Project ID: 1165330

Collection Date: 09/08/16 13:40
Received Date: 09/08/16 16:49
Matrix: Soil/Solid (dry weight)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.787 J	2.49	0.747	mg/Kg	1		09/10/16 14:15

Surrogates

4-Bromofluorobenzene (surr)	101	50-150		%	1		09/10/16 14:15
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Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 14:15
Container ID: 1165330012-A

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 13:40
Prep Initial Wt./Vol.: 50.183 g
Prep Extract Vol: 25 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	6.25 U	12.5	3.99	ug/Kg	1		09/10/16 14:15
Ethylbenzene	12.4 U	24.9	7.77	ug/Kg	1		09/10/16 14:15
o-Xylene	12.4 U	24.9	7.77	ug/Kg	1		09/10/16 14:15
P & M -Xylene	24.9 U	49.8	14.9	ug/Kg	1		09/10/16 14:15
Toluene	12.4 U	24.9	7.77	ug/Kg	1		09/10/16 14:15

Surrogates

1,4-Difluorobenzene (surr)	96.5	72-119		%	1		09/10/16 14:15
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 14:15
Container ID: 1165330012-A

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 09/08/16 13:40
Prep Initial Wt./Vol.: 50.183 g
Prep Extract Vol: 25 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-1

Client Sample ID: **DP-1**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330013
Lab Project ID: 1165330

Collection Date: 09/08/16 10:10
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	0.229 J	0.600	0.180	mg/L	1		09/15/16 23:09
Surrogates							
5a Androstane (surr)	79.6	50-150		%	1		09/15/16 23:09

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/15/16 23:09
Container ID: 1165330013-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	0.250 U	0.500	0.150	mg/L	1		09/15/16 23:09
Surrogates							
n-Triacontane-d62 (surr)	81.7	50-150		%	1		09/15/16 23:09

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/15/16 23:09
Container ID: 1165330013-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-1

Client Sample ID: **DP-1**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330013
Lab Project ID: 1165330

Collection Date: 09/08/16 10:10
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/11/16 00:27

Surrogates

4-Bromofluorobenzene (surr)	103	50-150		%	1		09/11/16 00:27
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/11/16 00:27
Container ID: 1165330013-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/16 00:27
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/16 00:27
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/11/16 00:27
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/11/16 00:27
Toluene	0.500 U	1.00	0.310	ug/L	1		09/11/16 00:27

Surrogates

1,4-Difluorobenzene (surr)	92.1	77-115		%	1		09/11/16 00:27
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/11/16 00:27
Container ID: 1165330013-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-6

Client Sample ID: **DP-6**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330014
Lab Project ID: 1165330

Collection Date: 09/08/16 10:15
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	0.212 J	0.577	0.173	mg/L	1		09/15/16 23:20
Surrogates							
5a Androstane (surr)	94.4	50-150		%	1		09/15/16 23:20

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/15/16 23:20
Container ID: 1165330014-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 260 mL
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	0.240 U	0.481	0.144	mg/L	1		09/15/16 23:20
Surrogates							
n-Triacontane-d62 (surr)	93.7	50-150		%	1		09/15/16 23:20

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/15/16 23:20
Container ID: 1165330014-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 260 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-6

Client Sample ID: **DP-6**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330014
Lab Project ID: 1165330

Collection Date: 09/08/16 10:15
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/11/16 00:45

Surrogates

4-Bromofluorobenzene (surr)	105	50-150		%	1		09/11/16 00:45
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/11/16 00:45
Container ID: 1165330014-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/16 00:45
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/16 00:45
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/11/16 00:45
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/11/16 00:45
Toluene	0.500 U	1.00	0.310	ug/L	1		09/11/16 00:45

Surrogates

1,4-Difluorobenzene (surr)	90.1	77-115		%	1		09/11/16 00:45
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/11/16 00:45
Container ID: 1165330014-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated

SGS North America Inc.

200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group



Results of DP-2

Client Sample ID: **DP-2**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330015
Lab Project ID: 1165330

Collection Date: 09/08/16 10:55
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	0.187 J	0.605	0.181	mg/L	1		09/15/16 23:30
Surrogates							
5a Androstane (surr)	82.9	50-150		%	1		09/15/16 23:30

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/15/16 23:30
Container ID: 1165330015-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 248 mL
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	0.252 U	0.504	0.151	mg/L	1		09/15/16 23:30
Surrogates							
n-Triacontane-d62 (surr)	80.5	50-150		%	1		09/15/16 23:30

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/15/16 23:30
Container ID: 1165330015-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 248 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-2

Client Sample ID: **DP-2**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330015
Lab Project ID: 1165330

Collection Date: 09/08/16 10:55
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/11/16 01:04

Surrogates

4-Bromofluorobenzene (surr)	108	50-150		%	1		09/11/16 01:04
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/11/16 01:04
Container ID: 1165330015-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/16 01:04
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:04
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:04
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/11/16 01:04
Toluene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:04

Surrogates

1,4-Difluorobenzene (surr)	92	77-115		%	1		09/11/16 01:04
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/11/16 01:04
Container ID: 1165330015-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL



Results of DP-3

Client Sample ID: **DP-3**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330016
Lab Project ID: 1165330

Collection Date: 09/08/16 12:10
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	0.240 J	0.636	0.191	mg/L	1		09/15/16 23:40
Surrogates							
5a Androstane (surr)	77.6	50-150		%	1		09/15/16 23:40

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/15/16 23:40
Container ID: 1165330016-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 236 mL
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	0.265 U	0.530	0.159	mg/L	1		09/15/16 23:40
Surrogates							
n-Triacontane-d62 (surr)	75.8	50-150		%	1		09/15/16 23:40

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/15/16 23:40
Container ID: 1165330016-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 236 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-3

Client Sample ID: **DP-3**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330016
Lab Project ID: 1165330

Collection Date: 09/08/16 12:10
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/11/16 01:22

Surrogates

4-Bromofluorobenzene (surr)	105	50-150		%	1		09/11/16 01:22
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/11/16 01:22
Container ID: 1165330016-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/16 01:22
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:22
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:22
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/11/16 01:22
Toluene	0.510 J	1.00	0.310	ug/L	1		09/11/16 01:22

Surrogates

1,4-Difluorobenzene (surr)	92.9	77-115		%	1		09/11/16 01:22
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/11/16 01:22
Container ID: 1165330016-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL



Results of DP-4

Client Sample ID: **DP-4**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330017
Lab Project ID: 1165330

Collection Date: 09/08/16 13:05
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	0.322 J	0.620	0.186	mg/L	1		09/15/16 23:51
Surrogates							
5a Androstane (surr)	87	50-150		%	1		09/15/16 23:51

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/15/16 23:51
Container ID: 1165330017-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 242 mL
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	0.250 J	0.517	0.155	mg/L	1		09/15/16 23:51
Surrogates							
n-Triacontane-d62 (surr)	87.9	50-150		%	1		09/15/16 23:51

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/15/16 23:51
Container ID: 1165330017-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 242 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-4

Client Sample ID: **DP-4**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330017
Lab Project ID: 1165330

Collection Date: 09/08/16 13:05
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/11/16 01:41

Surrogates

4-Bromofluorobenzene (surr)	105	50-150		%	1		09/11/16 01:41
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/11/16 01:41
Container ID: 1165330017-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/16 01:41
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:41
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:41
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/11/16 01:41
Toluene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:41

Surrogates

1,4-Difluorobenzene (surr)	93.6	77-115		%	1		09/11/16 01:41
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/11/16 01:41
Container ID: 1165330017-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL



Results of DP-5

Client Sample ID: **DP-5**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330018
Lab Project ID: 1165330

Collection Date: 09/08/16 14:00
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Semivolatile Organic Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Diesel Range Organics	0.300 U	0.600	0.180	mg/L	1		09/16/16 00:00
Surrogates							
5a Androstane (surr)	89.8	50-150		%	1		09/16/16 00:00

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Analyst: CRA
Analytical Date/Time: 09/16/16 00:00
Container ID: 1165330018-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Residual Range Organics	0.250 U	0.500	0.150	mg/L	1		09/16/16 00:00
Surrogates							
n-Triacontane-d62 (surr)	85.4	50-150		%	1		09/16/16 00:00

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Analyst: CRA
Analytical Date/Time: 09/16/16 00:00
Container ID: 1165330018-A

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 09/15/16 08:48
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of DP-5

Client Sample ID: **DP-5**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330018
Lab Project ID: 1165330

Collection Date: 09/08/16 14:00
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/11/16 01:59

Surrogates

4-Bromofluorobenzene (surr)	111	50-150		%	1		09/11/16 01:59
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/11/16 01:59
Container ID: 1165330018-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/11/16 01:59
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:59
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:59
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/11/16 01:59
Toluene	0.500 U	1.00	0.310	ug/L	1		09/11/16 01:59

Surrogates

1,4-Difluorobenzene (surr)	92.2	77-115		%	1		09/11/16 01:59
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/11/16 01:59
Container ID: 1165330018-C

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Results of Trip Blank

Client Sample ID: **Trip Blank**
Client Project ID: **Image Reflection Drive**
Lab Sample ID: 1165330019
Lab Project ID: 1165330

Collection Date: 09/08/16 10:10
Received Date: 09/08/16 16:49
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Volatile Fuels

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Gasoline Range Organics	0.0500 U	0.100	0.0310	mg/L	1		09/10/16 23:31

Surrogates

4-Bromofluorobenzene (surr)	111	50-150		%	1		09/10/16 23:31
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Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Analyst: ST
Analytical Date/Time: 09/10/16 23:31
Container ID: 1165330019-A

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

<u>Parameter</u>	<u>Result Qual</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>	<u>DF</u>	<u>Allowable Limits</u>	<u>Date Analyzed</u>
Benzene	0.250 U	0.500	0.150	ug/L	1		09/10/16 23:31
Ethylbenzene	0.500 U	1.00	0.310	ug/L	1		09/10/16 23:31
o-Xylene	0.500 U	1.00	0.310	ug/L	1		09/10/16 23:31
P & M -Xylene	1.00 U	2.00	0.620	ug/L	1		09/10/16 23:31
Toluene	0.500 U	1.00	0.310	ug/L	1		09/10/16 23:31

Surrogates

1,4-Difluorobenzene (surr)	90.4	77-115		%	1		09/10/16 23:31
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Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Analyst: ST
Analytical Date/Time: 09/10/16 23:31
Container ID: 1165330019-A

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/16 06:00
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:02:36AM

J flagging is activated



Method Blank

Blank ID: MB for HBN 1743156 [SPT/9997]

Blank Lab ID: 1352098

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008, 1165330009, 1165330010, 1165330011

Results by SM21 2540G

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Total Solids	100			%

Batch Information

Analytical Batch: SPT9997

Analytical Method: SM21 2540G

Instrument:

Analyst: RJA

Analytical Date/Time: 9/14/2016 5:34:00PM

Print Date: 09/23/2016 8:02:47AM

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Duplicate Sample Summary

Original Sample ID: 1165214018

Duplicate Sample ID: 1352100

QC for Samples:

Analysis Date: 09/14/2016 17:34

Matrix: Soil/Solid (dry weight)

Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	94.1	94.2	%	0.17	(< 15)

Batch Information

Analytical Batch: SPT9997

Analytical Method: SM21 2540G

Instrument:

Analyst: RJA

Print Date: 09/23/2016 8:02:48AM

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Duplicate Sample Summary

Original Sample ID: 1165292005

Duplicate Sample ID: 1352101

Analysis Date: 09/14/2016 17:34

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008,
1165330009, 1165330010, 1165330011

Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	89.1	89.4	%	0.27	(< 15)

Batch Information

Analytical Batch: SPT9997

Analytical Method: SM21 2540G

Instrument:

Analyst: RJA

Print Date: 09/23/2016 8:02:48AM

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Duplicate Sample Summary

Original Sample ID: 1165348003

Duplicate Sample ID: 1352102

Analysis Date: 09/14/2016 17:34

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008,
1165330009, 1165330010, 1165330011

Results by SM21 2540G

<u>NAME</u>	<u>Original</u>	<u>Duplicate</u>	<u>Units</u>	<u>RPD (%)</u>	<u>RPD CL</u>
Total Solids	92.4	93.2	%	0.85	(< 15)

Batch Information

Analytical Batch: SPT9997

Analytical Method: SM21 2540G

Instrument:

Analyst: RJA

Print Date: 09/23/2016 8:02:48AM

SGS North America Inc.

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Method Blank

Blank ID: MB for HBN 1742949 [VXX/29534]
Blank Lab ID: 1351262

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008, 1165330009, 1165330010, 1165330011, 1165330012

Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	0.937J	2.50	0.750	mg/Kg
Surrogates				
4-Bromofluorobenzene (surr)	106	50-150		%

Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 9/10/2016 1:42:00PM

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 9/10/2016 12:30:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

Print Date: 09/23/2016 8:02:52AM



Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [VXX29534]
Blank Spike Lab ID: 1351265
Date Analyzed: 09/10/2016 13:05

Spike Duplicate ID: LCSD for HBN 1165330
[VXX29534]
Spike Duplicate Lab ID: 1351266
Matrix: Soil/Solid (dry weight)

QC for Samples: 1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007,
1165330008, 1165330009, 1165330010, 1165330011, 1165330012

Results by AK101

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	12.5	12.5	100	12.5	12.7	102	(60-120)	2.10	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	1.25	107	107	1.25	109	109	(50-150)	1.40	

Batch Information

Analytical Batch: **VFC13298**
Analytical Method: **AK101**
Instrument: **Agilent 7890A PID/FID**
Analyst: **ST**

Prep Batch: **VXX29534**
Prep Method: **SW5035A**
Prep Date/Time: **09/10/2016 00:30**
Spike Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL
Dupe Init Wt./Vol.: 12.5 mg/Kg Extract Vol: 25 mL

Print Date: 09/23/2016 8:02:55AM



Billable Matrix Spike Summary

Original Sample ID: 1165330011
MS Sample ID: 1165330020 BMS
MSD Sample ID: 1165330021 BMSD

Analysis Date: 09/10/2016 17:39
Analysis Date: 09/10/2016 21:40
Analysis Date: 09/10/2016 21:58
Matrix: Soil/Solid (dry weight)

QC for Samples:

Results by AK101

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	1.08U	10.8	10.7	100	10.8	10.6	98	60-120	1.40	(< 20)
Surrogates										
4-Bromofluorobenzene (surr)		0.732	0.896	122	0.732	0.884	121	50-150	1.40	

Batch Information

Analytical Batch: VFC13298
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 9/10/2016 9:40:00PM

Prep Batch: VXX29534
Prep Method: AK101 Extraction (S)
Prep Date/Time: 9/8/2016 10:10:00AM
Prep Initial Wt./Vol.: 97.39g
Prep Extract Vol: 36.94mL

Print Date: 09/23/2016 8:02:56AM



Method Blank

Blank ID: MB for HBN 1742949 [VXX/29534]
Blank Lab ID: 1351262

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008, 1165330009, 1165330010, 1165330011, 1165330012

Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	6.25U	12.5	4.00	ug/Kg
Ethylbenzene	12.5U	25.0	7.80	ug/Kg
o-Xylene	12.5U	25.0	7.80	ug/Kg
P & M -Xylene	25.0U	50.0	15.0	ug/Kg
Toluene	12.5U	25.0	7.80	ug/Kg
Surrogates				
1,4-Difluorobenzene (surr)	94.7	72-119		%

Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 9/10/2016 1:42:00PM

Prep Batch: VXX29534
Prep Method: SW5035A
Prep Date/Time: 9/10/2016 12:30:00AM
Prep Initial Wt./Vol.: 50 g
Prep Extract Vol: 25 mL

Print Date: 09/23/2016 8:02:57AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [VXX29534]
 Blank Spike Lab ID: 1351263
 Date Analyzed: 09/10/2016 12:28

Spike Duplicate ID: LCSD for HBN 1165330
 [VXX29534]
 Spike Duplicate Lab ID: 1351264
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007,
 1165330008, 1165330009, 1165330010, 1165330011, 1165330012

Results by SW8021B

Parameter	Blank Spike (ug/Kg)			Spike Duplicate (ug/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	1250	1400	112	1250	1370	110	(75-125)	1.80	(< 20)
Ethylbenzene	1250	1310	105	1250	1300	104	(75-125)	0.33	(< 20)
o-Xylene	1250	1280	103	1250	1280	103	(75-125)	0.12	(< 20)
P & M -Xylene	2500	2650	106	2500	2650	106	(80-125)	0.17	(< 20)
Toluene	1250	1320	106	1250	1310	105	(70-125)	1.30	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	1250	94.7	95	1250	94.1	94	(72-119)	0.64	

Batch Information

Analytical Batch: VFC13298
 Analytical Method: SW8021B
 Instrument: Agilent 7890A PID/FID
 Analyst: ST

Prep Batch: VXX29534
 Prep Method: SW5035A
 Prep Date/Time: 09/10/2016 00:30
 Spike Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL
 Dupe Init Wt./Vol.: 1250 ug/Kg Extract Vol: 25 mL

Print Date: 09/23/2016 8:03:00AM

Billable Matrix Spike Summary

Original Sample ID: 1165330011
MS Sample ID: 1165330020 BMS
MSD Sample ID: 1165330021 BMSD

Analysis Date: 09/10/2016 17:39
Analysis Date: 09/10/2016 21:03
Analysis Date: 09/10/2016 21:21
Matrix: Soil/Solid (dry weight)

QC for Samples:

Results by SW8021B

Parameter	Sample	Matrix Spike (ug/Kg)			Spike Duplicate (ug/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	5.40U	1078	1163	108	1078	1152	107	75-125	1.50	(< 20)
Ethylbenzene	10.8U	1078	1115	104	1078	1099	102	75-125	1.50	(< 20)
o-Xylene	10.8U	1078	1124	104	1078	1109	103	75-125	1.40	(< 20)
P & M -Xylene	21.6U	2155	2269	106	2155	2235	104	80-125	1.50	(< 20)
Toluene	10.8U	1078	1090	101	1078	1074	100	70-125	1.40	(< 20)

Surrogates

1,4-Difluorobenzene (surr)	1083	1006	93	1083	998	92	72-119	0.86
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Batch Information

Analytical Batch: VFC13298
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 9/10/2016 9:03:00PM

Prep Batch: VXX29534
Prep Method: AK101 Extraction (S)
Prep Date/Time: 9/8/2016 10:10:00AM
Prep Initial Wt./Vol.: 97.39g
Prep Extract Vol: 36.94mL

Print Date: 09/23/2016 8:03:01AM

Method Blank

Blank ID: MB for HBN 1742950 [VXX/29535]
Blank Lab ID: 1351267

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018, 1165330019

Results by AK101

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Gasoline Range Organics	0.0500U	0.100	0.0310	mg/L
Surrogates				
4-Bromofluorobenzene (surr)	102	50-150		%

Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 9/10/2016 11:12:00PM

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 9/10/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:03:02AM



Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [VXX29535]
Blank Spike Lab ID: 1351270
Date Analyzed: 09/10/2016 22:35

Spike Duplicate ID: LCSD for HBN 1165330
[VXX29535]
Spike Duplicate Lab ID: 1351271
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018, 1165330019

Results by AK101

Parameter	Blank Spike (mg/L)			Spike Duplicate (mg/L)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Gasoline Range Organics	1.00	0.944	94	1.00	0.949	95	(60-120)	0.54	(< 20)
Surrogates									
4-Bromofluorobenzene (surr)	0.0500	109	109	0.0500	110	110	(50-150)	1.30	

Batch Information

Analytical Batch: VFC13286
Analytical Method: AK101
Instrument: Agilent 7890A PID/FID
Analyst: ST

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/2016 06:00
Spike Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 1.00 mg/L Extract Vol: 5 mL

Print Date: 09/23/2016 8:03:05AM



Method Blank

Blank ID: MB for HBN 1742950 [VXX/29535]
Blank Lab ID: 1351267

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018, 1165330019

Results by SW8021B

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Benzene	0.250U	0.500	0.150	ug/L
Ethylbenzene	0.500U	1.00	0.310	ug/L
o-Xylene	0.500U	1.00	0.310	ug/L
P & M -Xylene	1.00U	2.00	0.620	ug/L
Toluene	0.500U	1.00	0.310	ug/L
Surrogates				
1,4-Difluorobenzene (surr)	93.5	77-115		%

Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST
Analytical Date/Time: 9/10/2016 11:12:00PM

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 9/10/2016 6:00:00AM
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 5 mL

Print Date: 09/23/2016 8:03:07AM



Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [VXX29535]
Blank Spike Lab ID: 1351268
Date Analyzed: 09/10/2016 22:17

Spike Duplicate ID: LCSD for HBN 1165330
[VXX29535]
Spike Duplicate Lab ID: 1351269
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018, 1165330019

Results by SW8021B

Parameter	Blank Spike (ug/L)			Spike Duplicate (ug/L)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Benzene	100	103	103	100	105	105	(80-120)	2.00	(< 20)
Ethylbenzene	100	98.7	99	100	97.5	98	(75-125)	1.20	(< 20)
o-Xylene	100	100	100	100	92.0	92	(80-120)	8.40	(< 20)
P & M -Xylene	200	200	100	200	188	94	(75-130)	6.30	(< 20)
Toluene	100	96.3	96	100	99.8	100	(75-120)	3.60	(< 20)
Surrogates									
1,4-Difluorobenzene (surr)	50	94.2	94	50	95	95	(77-115)	0.78	

Batch Information

Analytical Batch: VFC13286
Analytical Method: SW8021B
Instrument: Agilent 7890A PID/FID
Analyst: ST

Prep Batch: VXX29535
Prep Method: SW5030B
Prep Date/Time: 09/10/2016 06:00
Spike Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: 100 ug/L Extract Vol: 5 mL

Print Date: 09/23/2016 8:03:14AM



Method Blank

Blank ID: MB for HBN 1743153 [XXX/36299]
Blank Lab ID: 1352089

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018

Results by AK102

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Diesel Range Organics	0.300U	0.600	0.180	mg/L
Surrogates				
5a Androstane (surr)	94.8	60-120		%

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CRA
Analytical Date/Time: 9/15/2016 9:16:00PM

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 9/15/2016 8:48:09AM
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:17AM



Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [XXX36299]
Blank Spike Lab ID: 1352090
Date Analyzed: 09/15/2016 21:27

Spike Duplicate ID: LCSD for HBN 1165330
[XXX36299]
Spike Duplicate Lab ID: 1352091
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018

Results by AK102

Parameter	Blank Spike (mg/L)			Spike Duplicate (mg/L)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Diesel Range Organics	20	18.9	95	20	19.0	95	(75-125)	0.30	(< 20)
Surrogates									
5a Androstane (surr)	0.4	95.5	96	0.4	95.3	95	(60-120)	0.19	

Batch Information

Analytical Batch: **XFC12847**
Analytical Method: **AK102**
Instrument: **Agilent 7890B R**
Analyst: **CRA**

Prep Batch: **XXX36299**
Prep Method: **SW3520C**
Prep Date/Time: **09/15/2016 08:48**
Spike Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL
Dupe Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:21AM

Method Blank

Blank ID: MB for HBN 1743153 [XXX/36299]
Blank Lab ID: 1352089

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018

Results by AK103

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Residual Range Organics	0.250U	0.500	0.150	mg/L
Surrogates				
n-Triacontane-d62 (surr)	93.8	60-120		%

Batch Information

Analytical Batch: XFC12847
Analytical Method: AK103
Instrument: Agilent 7890B R
Analyst: CRA
Analytical Date/Time: 9/15/2016 9:16:00PM

Prep Batch: XXX36299
Prep Method: SW3520C
Prep Date/Time: 9/15/2016 8:48:09AM
Prep Initial Wt./Vol.: 250 mL
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:24AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [XXX36299]
 Blank Spike Lab ID: 1352090
 Date Analyzed: 09/15/2016 21:27

Spike Duplicate ID: LCSD for HBN 1165330
 [XXX36299]
 Spike Duplicate Lab ID: 1352091
 Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165330013, 1165330014, 1165330015, 1165330016, 1165330017, 1165330018

Results by AK103

Parameter	Blank Spike (mg/L)			Spike Duplicate (mg/L)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Residual Range Organics	20	18.5	93	20	18.7	94	(60-120)	1.20	(< 20)
Surrogates									
n-Triacontane-d62 (surr)	0.4	99	99	0.4	104	104	(60-120)	4.50	

Batch Information

Analytical Batch: **XFC12847**
 Analytical Method: **AK103**
 Instrument: **Agilent 7890B R**
 Analyst: **CRA**

Prep Batch: **XXX36299**
 Prep Method: **SW3520C**
 Prep Date/Time: **09/15/2016 08:48**
 Spike Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL
 Dupe Init Wt./Vol.: 20 mg/L Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:26AM

Method Blank

Blank ID: MB for HBN 1743295 [XXX/36322]
Blank Lab ID: 1352676

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008, 1165330009, 1165330010, 1165330011

Results by AK102

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Diesel Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
5a Androstane (surr)	92.1	60-120		%

Batch Information

Analytical Batch: XFC12844
Analytical Method: AK102
Instrument: Agilent 7890B R
Analyst: CRA
Analytical Date/Time: 9/19/2016 11:43:00AM

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 9/16/2016 9:12:25PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:29AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [XXX36322]
 Blank Spike Lab ID: 1352677
 Date Analyzed: 09/18/2016 02:39

Spike Duplicate ID: LCSD for HBN 1165330
 [XXX36322]
 Spike Duplicate Lab ID: 1352678
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007,
 1165330008, 1165330009, 1165330010, 1165330011

Results by AK102

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Diesel Range Organics	167	146	88	167	139	83	(75-125)	5.10	(< 20)
Surrogates									
5a Androstane (surr)	3.33	90.5	91	3.33	88.6	89	(60-120)	2.10	

Batch Information

Analytical Batch: **XFC12843**
 Analytical Method: **AK102**
 Instrument: **Agilent 7890B F**
 Analyst: **CRA**

Prep Batch: **XXX36322**
 Prep Method: **SW3550C**
 Prep Date/Time: **09/16/2016 21:12**
 Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
 Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:32AM



Billable Matrix Spike Summary

Original Sample ID: 1165330011
MS Sample ID: 1165330020 BMS
MSD Sample ID: 1165330021 BMSD

Analysis Date: 09/18/2016 5:24
Analysis Date: 09/18/2016 5:35
Analysis Date: 09/18/2016 5:45
Matrix: Soil/Solid (dry weight)

QC for Samples:

Results by AK102

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Diesel Range Organics	9.55J	188	152	76	188	170	85	60-140	11.20	(< 50)
Surrogates										
5a Androstane (surr)		3.76	3.17	84	3.76	3.60	96	50-150	12.90	

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK102
Instrument: Agilent 7890B F
Analyst: CRA
Analytical Date/Time: 9/18/2016 5:35:00AM

Prep Batch: XXX36322
Prep Method: Sonication Extraction Soil AK102
Prep Date/Time: 9/16/2016 9:12:25PM
Prep Initial Wt./Vol.: 30.33g
Prep Extract Vol: 1.00mL

Print Date: 09/23/2016 8:03:33AM



Method Blank

Blank ID: MB for HBN 1743295 [XXX/36322]
Blank Lab ID: 1352676

Matrix: Soil/Solid (dry weight)

QC for Samples:

1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007, 1165330008, 1165330009, 1165330010, 1165330011

Results by AK103

<u>Parameter</u>	<u>Results</u>	<u>LOQ/CL</u>	<u>DL</u>	<u>Units</u>
Residual Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
n-Triacontane-d62 (surr)	93.3	60-120		%

Batch Information

Analytical Batch: XFC12844
Analytical Method: AK103
Instrument: Agilent 7890B R
Analyst: CRA
Analytical Date/Time: 9/19/2016 11:43:00AM

Prep Batch: XXX36322
Prep Method: SW3550C
Prep Date/Time: 9/16/2016 9:12:25PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:35AM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1165330 [XXX36322]
 Blank Spike Lab ID: 1352677
 Date Analyzed: 09/18/2016 02:39

Spike Duplicate ID: LCSD for HBN 1165330
 [XXX36322]
 Spike Duplicate Lab ID: 1352678
 Matrix: Soil/Solid (dry weight)

QC for Samples: 1165330001, 1165330002, 1165330003, 1165330004, 1165330005, 1165330006, 1165330007,
 1165330008, 1165330009, 1165330010, 1165330011

Results by AK103

Parameter	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
	Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Residual Range Organics	167	158	95	167	145	87	(60-120)	8.30	(< 20)
Surrogates									
n-Triacontane-d62 (surr)	3.33	93.9	94	3.33	86.2	86	(60-120)	8.50	

Batch Information

Analytical Batch: **XFC12843**
 Analytical Method: **AK103**
 Instrument: **Agilent 7890B F**
 Analyst: **CRA**

Prep Batch: **XXX36322**
 Prep Method: **SW3550C**
 Prep Date/Time: **09/16/2016 21:12**
 Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
 Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

Print Date: 09/23/2016 8:03:38AM

Billable Matrix Spike Summary

Original Sample ID: 1165330011
MS Sample ID: 1165330020 BMS
MSD Sample ID: 1165330021 BMSD

Analysis Date: 09/18/2016 5:24
Analysis Date: 09/18/2016 5:35
Analysis Date: 09/18/2016 5:45
Matrix: Soil/Solid (dry weight)

QC for Samples:

Results by AK103

Parameter	Sample	Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)			CL	RPD (%)	RPD CL
		Spike	Result	Rec (%)	Spike	Result	Rec (%)			
Residual Range Organics	42.6	188	178	72	188	209	88	60-140	15.60	(< 50)
Surrogates										
n-Triacontane-d62 (surr)		3.76	3.16	84	3.76	3.88	103	50-150	20.30	

Batch Information

Analytical Batch: XFC12843
Analytical Method: AK103
Instrument: Agilent 7890B F
Analyst: CRA
Analytical Date/Time: 9/18/2016 5:35:00AM

Prep Batch: XXX36322
Prep Method: Sonication Extraction Soil AK102
Prep Date/Time: 9/16/2016 9:12:25PM
Prep Initial Wt./Vol.: 30.33g
Prep Extract Vol: 1.00mL

Print Date: 09/23/2016 8:03:39AM

<http://www.sos.com/terms-and-conditions>



SGS North America Inc.
CHAIN OF CUSTODY RECORD

1165330



CLIENT: Golder Associates		PHONE #: 907-865-2516		Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.		Page 2 of 2			
CONTACT: Chris Valentine		PROJECT NAME: Image Reflection Drive		Section 3		Preservative			
REPORTS TO: Chris Valentine		E-MAIL:		Section 4		DOD Project? Yes No			
INVOICE TO: Golder Associates		QUOTE #: 336269		Section 5		Data Deliverable Requirements: 336269			
P.O. #:		DATE: 9/8/16		Time: 1630		Received By: [Signature]			
RESERVED for lab use		SAMPLE IDENTIFICATION		DATE		Time			
		DP-3		9/8/16		1630			
		DP-4A		"		"			
		DP-4B		"		"			
		DP-4		"		"			
		DP-5A		"		"			
		DP-5B		"		"			
		DP-5		"		"			
		Trip Blank		"		"			
		Trip Blank		"		"			
Section 1		Section 2		Section 3		Section 4		Section 5	
PRESERVATIVE		CONTAINER		PRES. TYPE		GROBTEX (AK101/B021B)		GROBTEX (AK102/AK103)	
HCL		HCL		HCL		HCL		HCL	
NONE		NONE		NONE		NONE		NONE	
Comp		Grab		All		Multi-Inch (manually)		Remarks/LOC ID	
5		5		5		5		5	
2		2		2		2		2	
2		2		2		2		2	
5		5		5		5		5	
2		2		2		2		2	
3		3		3		3		3	
5		5		5		5		5	
1		1		1		1		1	
3		3		3		3		3	
Relinquished By: (1)		Relinquished By: (2)		Relinquished By: (3)		Relinquished By: (4)		Relinquished By: (5)	
Date		Date		Date		Date		Date	
9/8/16		9/8/16		9/8/16		9/8/16		9/8/16	
Time		Time		Time		Time		Time	
1630		1630		1630		1630		1630	
Received By: [Signature]		Received By: [Signature]		Received By: [Signature]		Received By: [Signature]		Received By: [Signature]	
Chain of Custody Seal: (Circle)		Chain of Custody Seal: (Circle)		Chain of Custody Seal: (Circle)		Chain of Custody Seal: (Circle)		Chain of Custody Seal: (Circle)	
INTACT		INTACT		INTACT		INTACT		INTACT	
BROKEN		BROKEN		BROKEN		BROKEN		BROKEN	
ABSENT		ABSENT		ABSENT		ABSENT		ABSENT	
(See attached Sample Receipt Form)		(See attached Sample Receipt Form)		(See attached Sample Receipt Form)		(See attached Sample Receipt Form)		(See attached Sample Receipt Form)	

Pennick, Victoria (Anchorage)

From: Valentine, Christopher [Christopher_Valentine@golder.com]
Sent: Friday, September 09, 2016 2:14 PM
To: Pennick, Victoria (Anchorage)
Subject: RE: 1165330 - Image Reflection Drive

Hi Tori,

The jar is correct, it's DP-3C.

Thanks,

Chris

Christopher Valentine, PE | Project Engineer | **Golder Associates Inc.**

2121 Abbott Road, Suite 100, Anchorage, Alaska, USA 99507

T: +1 (907) 344-6001 | **D:** +1 (907) 865-2516 | **F:** +1 (907) 344-6011 | **C:** +1 (907) 223 4776 | **E:** CValentine@golder.com
| www.golder.com

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Please consider the environment before printing this email.

From: Pennick, Victoria (Anchorage) [<mailto:Victoria.Pennick@sgs.com>]
Sent: Friday, September 09, 2016 2:05 PM
To: Valentine, Christopher <Christopher_Valentine@golder.com>
Subject: 1165330 - Image Reflection Drive

Hi Chris,

One sample had a bit of a discrepancy on between the jar and COC.

DP-3A on the COC actually had DP-3C on the jars. We logged it per the COC... but I'd like to confirm the correct ID.


COC is attached. They logged the soils first, then the waters (easier on the login process not to be bouncing back and forth between tests or matrices), so the numbering is out of order.

Let me know if you have any questions?

Kindest regards,
Tori



e-SAMPLE RECEIPT FORM

1165330		 1 1 6 5 3 3 0	
Review Criteria	Y/N (yes/no)	Exceptions Noted below	
Were Custody Seals intact? Note # & location	<input checked="" type="checkbox"/>	<input type="checkbox"/> exemption permitted if sampler hand carries/delivers.	
COC accompanied samples?	<input checked="" type="checkbox"/>	1F-1S	
<input type="checkbox"/> **exemption permitted if chilled & collected <8hrs ago or chilling not required (i.e., waste, oil)	<input checked="" type="checkbox"/>	Cooler ID: 1 @ 5.9 °C Therm ID: D11	
Temperature blank compliant* (i.e., 0-6 °C after CF)?	<input checked="" type="checkbox"/>	Cooler ID: @ °C Therm ID:	
	<input checked="" type="checkbox"/>	Cooler ID: @ °C Therm ID:	
	<input checked="" type="checkbox"/>	Cooler ID: @ °C Therm ID:	
	<input checked="" type="checkbox"/>	Cooler ID: @ °C Therm ID:	
*If >6°C, were samples collected <8 hours ago?	<input checked="" type="checkbox"/>		
If <0°C, were sample containers ice free?	<input checked="" type="checkbox"/>		
If samples received <u>without</u> a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled".			
Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.			
Note: Refer to form F-083 "Sample Guide" for hold times.			
Were samples received within hold time?	<input checked="" type="checkbox"/>		
Do samples match COC ** (i.e., sample IDs, dates/times collected)?	<input checked="" type="checkbox"/>	Sample 6, DP-3A on COC and DP-3C on Jar Logged per COC	
**Note: If times differ <1hr, record details & login per COC.			
Were analyses requested unambiguous?	<input checked="" type="checkbox"/>		
<input type="checkbox"/> ***Exemption permitted for metals (e.g., 200.8/6020A).	<input checked="" type="checkbox"/>		
Were proper containers (type/mass/volume/preservative***) used?	<input checked="" type="checkbox"/>		
IF APPLICABLE			
Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?	<input checked="" type="checkbox"/>		
Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?	<input checked="" type="checkbox"/>		
Were all soil VOAs field extracted with MeOH+BFB?	<input checked="" type="checkbox"/>		
Note to Client: Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.			
Additional notes (if applicable):			



Sample Containers and Preservatives

<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>	<u>Container Id</u>	<u>Preservative</u>	<u>Container Condition</u>
1165330001-A	No Preservative Required	OK	1165330016-D	HCL to pH < 2	OK
1165330001-B	Methanol field pres. 4 C	OK	1165330016-E	HCL to pH < 2	OK
1165330002-A	No Preservative Required	OK	1165330017-A	HCL to pH < 2	OK
1165330002-B	Methanol field pres. 4 C	OK	1165330017-B	HCL to pH < 2	OK
1165330003-A	No Preservative Required	OK	1165330017-C	HCL to pH < 2	OK
1165330003-B	Methanol field pres. 4 C	OK	1165330017-D	HCL to pH < 2	OK
1165330004-A	No Preservative Required	OK	1165330017-E	HCL to pH < 2	OK
1165330004-B	Methanol field pres. 4 C	OK	1165330018-A	HCL to pH < 2	OK
1165330005-A	No Preservative Required	OK	1165330018-B	HCL to pH < 2	OK
1165330005-B	Methanol field pres. 4 C	OK	1165330018-C	HCL to pH < 2	OK
1165330006-A	No Preservative Required	OK	1165330018-D	HCL to pH < 2	OK
1165330006-B	Methanol field pres. 4 C	OK	1165330018-E	HCL to pH < 2	OK
1165330007-A	No Preservative Required	OK	1165330019-A	HCL to pH < 2	OK
1165330007-B	Methanol field pres. 4 C	OK	1165330019-B	HCL to pH < 2	OK
1165330008-A	No Preservative Required	OK	1165330019-C	HCL to pH < 2	OK
1165330008-B	Methanol field pres. 4 C	OK	1165330020-A	No Preservative Required	OK
1165330009-A	No Preservative Required	OK	1165330020-B	No Preservative Required	OK
1165330009-B	Methanol field pres. 4 C	OK	1165330020-C	Methanol field pres. 4 C	OK
1165330010-A	No Preservative Required	OK	1165330021-A	No Preservative Required	OK
1165330010-B	Methanol field pres. 4 C	OK	1165330021-B	No Preservative Required	OK
1165330011-A	No Preservative Required	OK	1165330021-C	Methanol field pres. 4 C	OK
1165330011-B	No Preservative Required	OK			
1165330011-C	Methanol field pres. 4 C	OK			
1165330012-A	Methanol field pres. 4 C	OK			
1165330013-A	HCL to pH < 2	OK			
1165330013-B	HCL to pH < 2	OK			
1165330013-C	HCL to pH < 2	OK			
1165330013-D	HCL to pH < 2	OK			
1165330013-E	HCL to pH < 2	OK			
1165330014-A	HCL to pH < 2	OK			
1165330014-B	HCL to pH < 2	OK			
1165330014-C	HCL to pH < 2	OK			
1165330014-D	HCL to pH < 2	OK			
1165330014-E	HCL to pH < 2	OK			
1165330015-A	HCL to pH < 2	OK			
1165330015-B	HCL to pH < 2	OK			
1165330015-C	HCL to pH < 2	OK			
1165330015-D	HCL to pH < 2	OK			
1165330015-E	HCL to pH < 2	OK			
1165330016-A	HCL to pH < 2	OK			
1165330016-B	HCL to pH < 2	OK			
1165330016-C	HCL to pH < 2	OK			

Container Id

Preservative

Container
Condition

Container Id

Preservative

Container
Condition

Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

OK - The container was received at an acceptable pH for the analysis requested.

BU - The container was received with headspace greater than 6mm.

DM- The container was received damaged.

FR- The container was received frozen and not usable for Bacteria or BOD analyses.

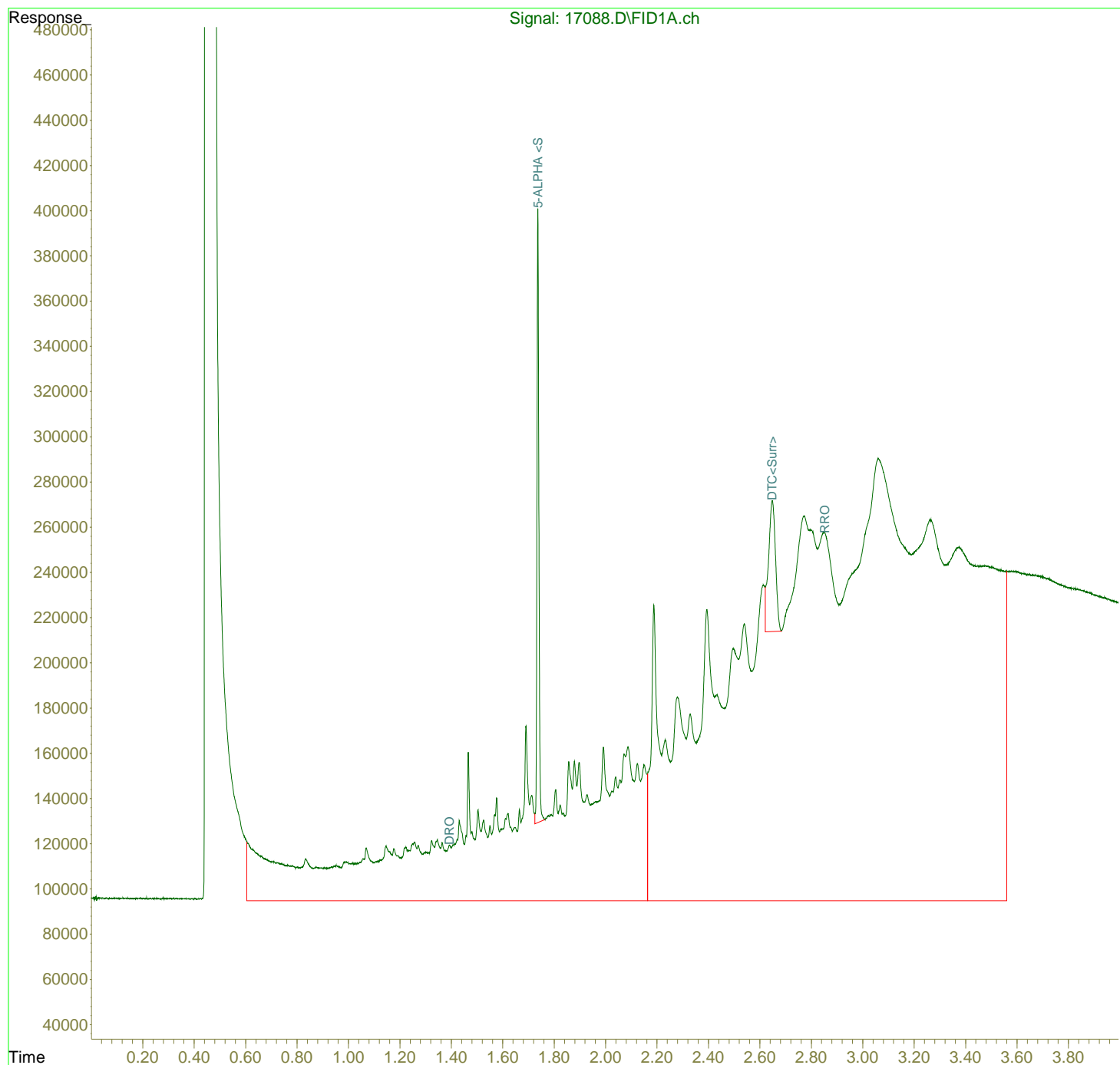
PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

Data Path : Z:\09\SF\DATA\091716\
Data File : 17088.D
Signal(s) : FID1A.ch
Acq On : 18 Sep 2016 3:41 am
Operator : NRO
Sample : 1165330003
Misc :
ALS Vial : 111 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Sep 18 15:41:26 2016
Quant Method : Z:\09\SF\Method\SFF2016-083116E.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Thu Sep 01 17:51:04 2016
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Data Path : Z:\09\SF\DATA\091716\
Data File : 17090.D
Signal(s) : FID1A.ch
Acq On : 18 Sep 2016 3:51 am
Operator : NRO
Sample : 1166533004
Misc :
ALS Vial : 112 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Sep 18 15:42:45 2016
Quant Method : Z:\09\SF\Method\SFF2016-083116E.M
Quant Title : DRO/RRO by Method AK 102/103
QLast Update : Thu Sep 01 17:51:04 2016
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

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solutions@golder.com
www.golder.com

Golder Associates Inc.
2121 Abbott Road, Suite 100
Anchorage, AK 99507 USA
Tel: (907) 344-6001
Fax: (907) 344-6011



Engineering Earth's Development, Preserving Earth's Integrity

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Lift Station Analysis and Drawings

Appendix N

Image Reflection Drainage Improvements - Lift Station Wet Well Design - Detentior

Lift Station Cycle Time Calculations

Design Flow (10 Year):	5973.96	GPM	
Design Flow (5 Year)	3756.73	GPM	
Wet Well Diameter:	22.56758334		20x20 equivalent diameter
Height Pump 1 On:	3.5		
Wet Well Volume	1400.0	CF =	10472 Gal
Height Pump 2 On:	5		
Wet Well + Storage	2000.0	CF =	14960 Gal
Height Pump 3 On:	5.5		
High Volume Alarm (Max Storage)	2200.0	CF =	16456 Gal
Depth Pump Off to Alarm	6		
Max Capacity	2400.0	CF =	17952 Gal
Pump 1 Output	2000	GPM	
Pump 2 Output	2000	GPM	
Pump 3 Output	2000	GPM	Pump 3 on at 5 year? NO

Lift Station 5 year Storm Event

Design Flow 5-year (gpm)	3756.73	Min Cycle Time	10.00	Min
Flow In From Cell (gpm)	3756.729	Max Cycle Time	197.50	Min
Flow Out Through Pump (gpm)	4000	Avg Starts Per Hr.	2.875	
Maximum Water Voume in LS	16087.05	Starts in Less than 10 Min	0.00	
Maximum Volume Allowed	17952			

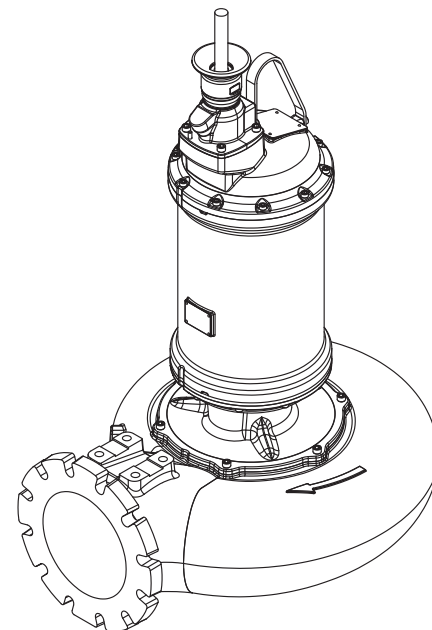
Lift Station 10 year Storm Event

Design Flow 10 year (gpm)	5973.961	Min Cycle Time	176.00	Min
Flow In From Cell (gpm)	5973.961	Max Cycle Time	197.50	Min
Flow Out Through Pump (gpm)	6000	Avg Starts Per Hr.	1.666667	
Maximum Water Voume in LS	16087.05	Starts in Less than 5 Min	0.00	Alt Pumps
Maximum Volume Allowed	17952	Starts in Less than 10 Min	2.00	

Solids Handling Submersible Pumps

Specifications:

DISCHARGE	10", 125 lb. Horizontal Flange Slotted to accommodate 200mm ISO Flanges
LIQUID TEMPERATURE	104°F (40°C) Continuous
VOLUTE	Cast Iron ASTM A-48, Class 30
WEAR RING	C954 Lead-Free Bronze
MOTOR HOUSING	Cast Iron ASTM A-48, Class 30
SEAL PLATE	Ductile Iron ASTM A-536, 65-45-12
IMPELLER:	
<i>Design</i>	Enclosed Dual Vane, With Pump Out Vaness on Back Side. Dynamically Balanced ISO G6.3
<i>Material</i>	Ductile Iron ASTM A-536, 65-45-12
SHAFT	416 Stainless Steel
"O" RINGS	Buna-N
HARDWARE	300 Series Stainless Steel
LIFTING BAIL	300 Series Stainless Steel
PAINT	Axalta™ Corlar® Epoxy, Two Coats
SEAL:	
<i>Design</i>	Tandem Mechanical, Oil Filled Reservoir.
<i>Material: Inboard</i>	Rotating Faces - Carbon Stationary Faces - Ceramic
<i>Material: Outboard</i>	Rotating Faces - Silicon Carbide Stationary Faces - Silicon Carbide Elastomer - Buna-N Hardware - 300 Series Stainless
CORD ENTRY	50 ft. (12.1m) Cord. Rigid quick change epoxy-potted housing
POWER CORD	CSA Certified Submersible Power Cable 2000V - Ordered Separately
SPEED	1150 or 870 RPM
UPPER BEARING:	
<i>Design</i>	Single Row, Ball, Oil Lubricated
<i>Load</i>	Radial
LOWER BEARING:	
<i>Design</i>	Double Row, Ball, Oil Lubricated
<i>Load</i>	Radial & Thrust
MOTOR:	
<i>Design</i>	NEMA B Three Phase Torque Curve. Oil-Filled, Squirrel Cage Induction, Inverter Duty rated per NEMA MG1
<i>Insulation</i>	Class H Varnish & Magnet Wire
THREE PHASE	Requires overload protection to be included in control panel.
MOISTURE SENSOR	Normally Open (N/O), Requires Relay in Control Panel
TEMPERATURE SENSOR	Three Normally Closed (N/C). To be wired in series with control circuit.
OPTIONAL EQUIPMENT	Seal Material, Impeller Trims, Cord Length, Leg Kit
MARKINGS	CSA
WEIGHT	1262 lbs (572 Kg)
SUBMERGENCE	Max Depth 66ft (20m)
RECOMMENDED:	
<i>Accessories</i>	Break Away Fitting (BAF) Check Valve Control Panel



Series: 10SHD

25 - 100HP, 1150RPM, 60Hz

10 - 30HP, 870RPM, 60Hz



Canadian Standards Association
File No. LR16567

Sample Specifications: Section 0.1J Page F.

DESCRIPTION:

SUBMERSIBLE NON-CLOG SEWAGE
PUMP DESIGNED FOR RAW SEWAGE
APPLICATIONS.

Series 10SHD

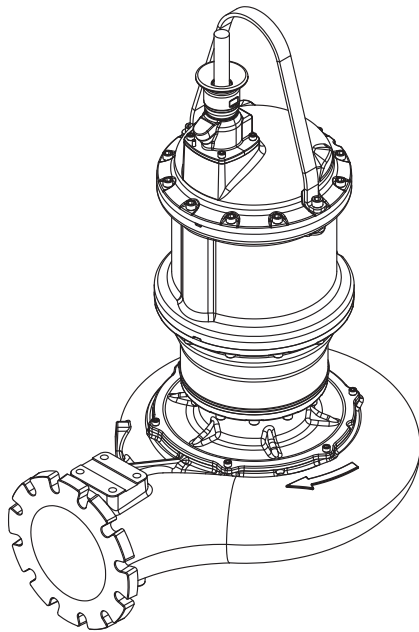
32 Frame Driver

4" Spherical Solids Handling

BARNES®

www.cranepumps.com

Solids Handling Submersible Pumps



Specifications:

DISCHARGE	10", 125 lb. Horizontal Flange Slotted to accommodate 200mm ISO Flanges
LIQUID TEMPERATURE	104°F (40°C) Continuous
VOLUTE	Cast Iron ASTM A-48, Class 30
WEAR RING	C954 Lead-Free Bronze
MOTOR HOUSING	Cast Iron ASTM A-48, Class 30
SEAL PLATE	Ductile Iron ASTM A-536, 65-45-12
IMPELLER:	
<i>Design</i>	Enclosed Dual Vane, With Pump Out Vanes on Back Side. Dynamically Balanced ISO G6.3
<i>Material</i>	Ductile Iron ASTM A-536, 65-45-12
SHAFT	416 Stainless Steel
"O" RINGS	Buna-N
HARDWARE	300 Series Stainless Steel
LIFTING BAIL	300 Series Stainless Steel
PAINT	Axalta™ Corlar® Epoxy, Two Coats
SEAL:	
<i>Design</i>	Tandem Mechanical, Oil Filled Reservoir.
<i>Material: Inboard</i>	Rotating Faces - Carbon Stationary Faces - Ceramic
<i>Material: Outboard</i>	Rotating Faces - Silicon Carbide Stationary Faces - Silicon Carbide Elastomer - Buna-N Hardware - 300 Series Stainless
CORD ENTRY	50 ft. (12.1m) Cord. Rigid quick change epoxy-potted housing
POWER CORD	CSA Certified Submersible Power Cable 2000V - Ordered Separately
SPEED	1150 or 870 RPM
UPPER BEARING:	
<i>Design</i>	Single Row, Ball, Oil Lubricated
<i>Load</i>	Radial
LOWER BEARING:	
<i>Design</i>	Double Row, Ball, Oil Lubricated
<i>Load</i>	Radial & Thrust
MOTOR: Design	NEMA B Three Phase Torque Curve. Oil-Filled, Squirrel Cage Induction, Inverter Duty rated per NEMA MG1
<i>Insulation</i>	Class H Varnish & Magnet Wire
THREE PHASE	Requires overload protection to be included in control panel.
MOISTURE SENSOR	Normally Open (N/O), Requires Relay in Control Panel
TEMPERATURE SENSOR	Three Normally Closed (N/C). To be wired in series with control circuit.
OPTIONAL EQUIPMENT	Seal Material, Impeller Trims, Cord Length, Leg Kit
MARKINGS	CSA
WEIGHT	1876 lbs (851 Kg)
SUBMERGENCE	Max Depth 66ft (20m)

RECOMMENDED:

<i>Accessories</i>	Break Away Fitting (BAF) Check Valve Control Panel
--------------------	--

Series: 10SHD

50 - 100HP, 1150RPM, 60Hz

40 - 50HP, 870RPM, 60Hz



Canadian Standards Association
File No. LR16567

Sample Specifications: Section 0.1J Page F.

DESCRIPTION:

SUBMERSIBLE NON-CLOG SEWAGE
PUMP DESIGNED FOR RAW SEWAGE
APPLICATIONS.

SECTION 0.1J
PAGE 2
DATE 3/17

CRANE®

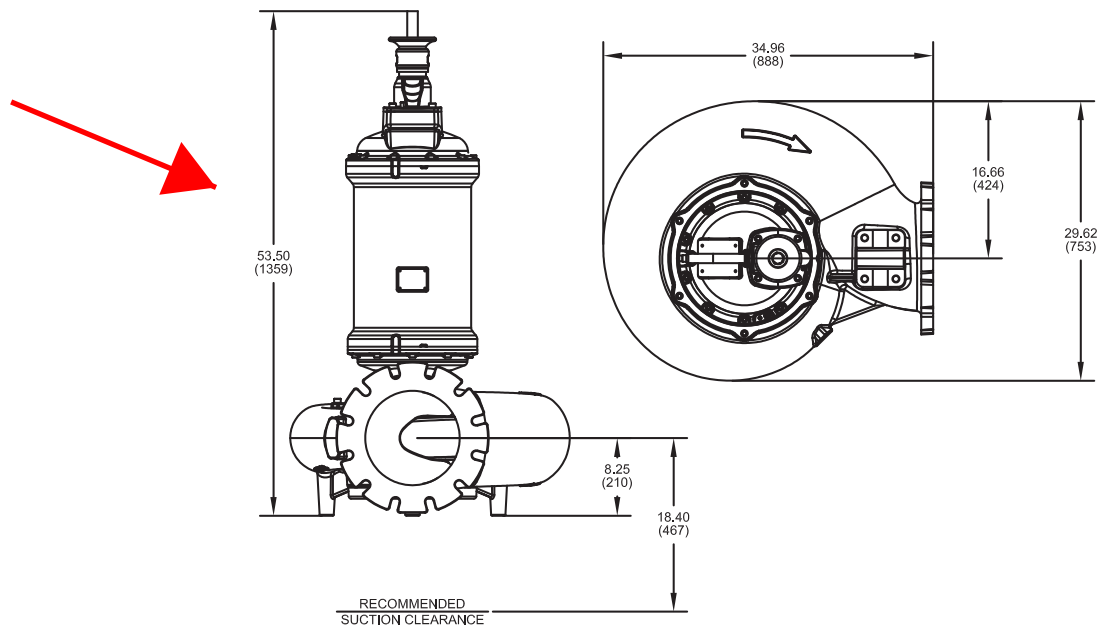
A Crane Co. Company

PUMPS & SYSTEMS

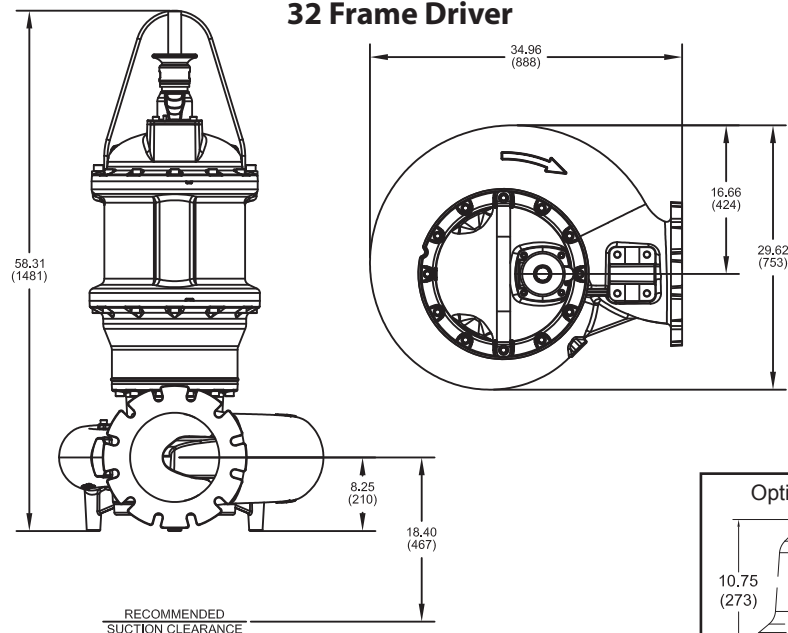
USA: (937) 778-8947 • Canada: (905) 457-6223 • International: (937) 615-3598

Solids Handling Submersible Pumps

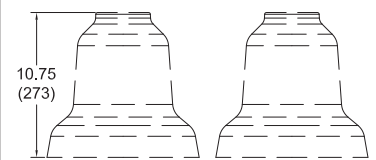
28 Frame Driver



32 Frame Driver



Optional Leg Kit - p/n 125506C



IMPORTANT !

- 1.) MOISTURE AND TEMPERATURE SENSORS MUST BE CONNECTED TO VALIDATE THE CSA LISTING.
- 2.) A SPECIAL MOISTURE SENSOR RELAY IS REQUIRED IN THE CONTROL PANEL FOR PROPER OPERATION OF THE MOISTURE SENSORS. CONTACT BARNES PUMPS FOR INFORMATION CONCERNING MOISTURE SENSING RELAYS FOR CUSTOMER SUPPLIED CONTROL PANELS.
- 3.) THESE PUMPS ARE CSA LISTED FOR PUMPING WATER AND WASTEWATER. **DO NOT USE TO PUMP FLAMMABLE LIQUIDS.**
- 4.) INSTALLATIONS SUCH AS DECORATIVE FOUNTAINS OR WATER FEATURES PROVIDED FOR VISUAL ENJOYMENT MUST BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE ANSI/NFPA 70 AND/OR THE AUTHORITY HAVING JURISDICTION. THIS PUMP IS NOT INTENDED FOR USE IN SWIMMING POOLS, RECREATIONAL WATER PARKS, OR INSTALLATIONS IN WHICH HUMAN CONTACT WITH PUMPED MEDIA IS A COMMON OCCURRENCE.
- 5.) THIS PUMP IS NOT APPROPRIATE FOR THOSE APPLICATIONS SPECIFIED AS CLASS 1 DIVISION 1 HAZARDOUS LOCATIONS.

Series 10SHDX

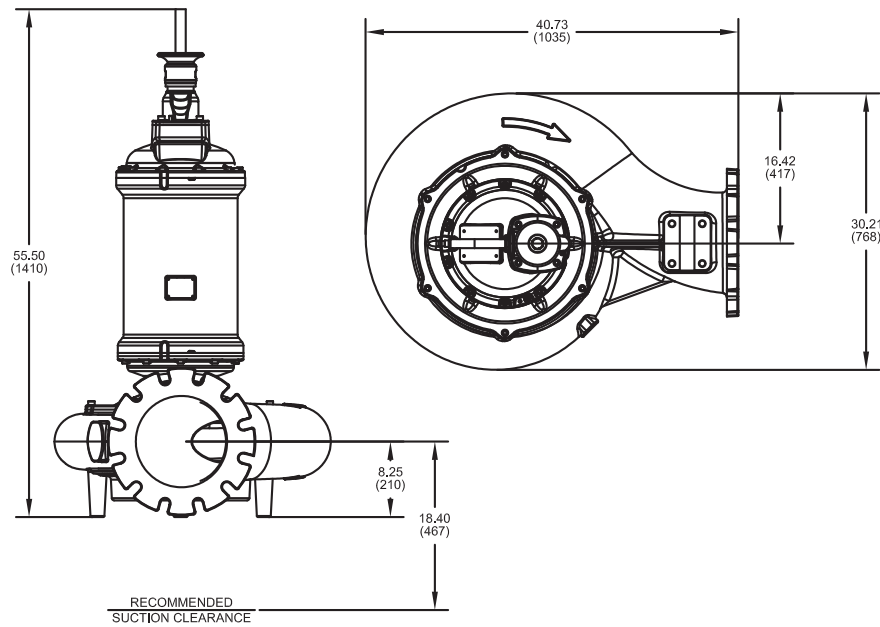
4" Spherical Solids Handling

BARNES®

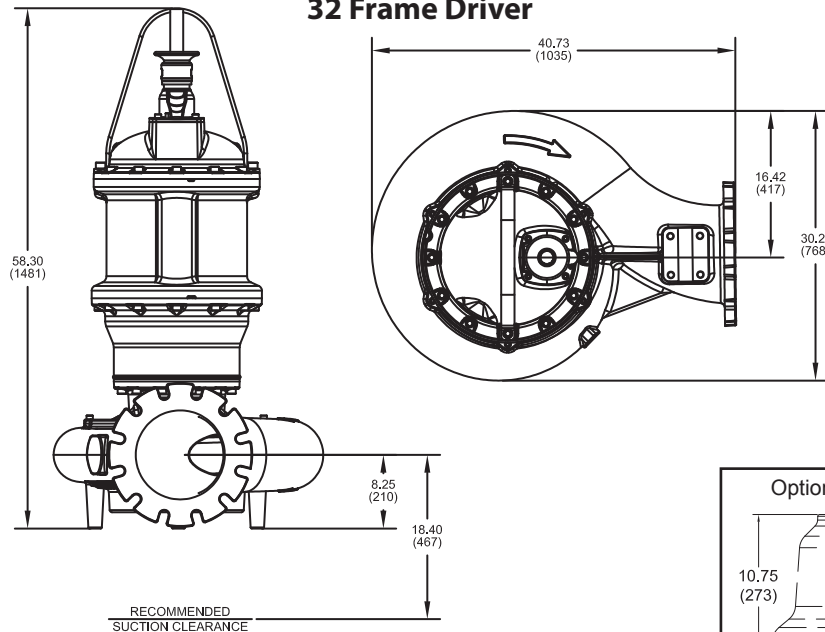
www.cranepumps.com

Solids Handling Submersible Pumps

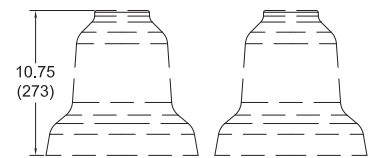
28 Frame Driver



32 Frame Driver



Optional Leg Kit - p/n 125506C



IMPORTANT !

- 1.) MOISTURE AND TEMPERATURE SENSORS MUST BE CONNECTED TO VALIDATE THE CSA LISTING.
- 2.) A SPECIAL MOISTURE SENSOR RELAY IS REQUIRED IN THE CONTROL PANEL FOR PROPER OPERATION OF THE MOISTURE SENSORS. CONTACT BARNES PUMPS FOR INFORMATION CONCERNING MOISTURE SENSING RELAYS FOR CUSTOMER SUPPLIED CONTROL PANELS.
- 3.) THESE PUMPS ARE CSA LISTED FOR PUMPING WATER AND WASTEWATER. **DO NOT USE TO PUMP FLAMMABLE LIQUIDS.**
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- 5.) THIS PUMP IS NOT APPROPRIATE FOR THOSE APPLICATIONS SPECIFIED AS CLASS 1 DIVISION 1 HAZARDOUS LOCATIONS.

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PAGE 4
DATE 5/17

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PUMPS & SYSTEMS

USA: (937) 778-8947 • Canada: (905) 457-6223 • International: (937) 615-3598

Solids Handling Submersible Pumps

	MODEL NO	PART NO	HP	VOLT	PH	Hz	RPM (Nom)	NEMA START CODE	FULL LOAD AMPS	SERVICE FACTOR	SERVICE FACTOR AMPS	LOCKED ROTOR AMPS	DRIVER FRAME	CORD P/N ▲	CORD SIZE
dumnd MDHS	10SHDW25096	139428	25.0	208 230	3	60	1150	G	75.2 70.8	1.2 1.2	90.8 82.6	354.0	28	138319	2/4 - 18/4
	10SHDW25046	139429	25.0	460	3	60	1150	G	35.4	1.2	41.3	177.0	28	138317	8/4 - 18/4
	10SHDW25056	139430	25.0	575	3	60	1150	G	28.3	1.2	33.0	141.6	28	138317	8/4 - 18/4
	10SHDW30096	139431	30.0	208 230	3	60	1150	E	90.8 82.6	1.2 1.2	114.9 99.7	354.0	28	138319	2/4 - 18/4
	10SHDW30046	139432	30.0	460	3	60	1150	E	41.3	1.2	49.9	177.0	28	138317	8/4 - 18/4
	10SHDW30056	139433	30.0	575	3	60	1150	E	33.0	1.2	39.9	141.6	28	138317	8/4 - 18/4
	10SHDW40036	139434	40.0	230	3	60	1150	E	110.4	1.2	131.8	476.0	28	138319	2/4 - 18/4
	10SHDW40046	139435	40.0	460	3	60	1150	E	55.2	1.2	65.9	238.0	28	138318	6/4 - 18/4
	10SHDW40056	139436	40.0	575	3	60	1150	E	44.2	1.2	52.7	190.4	28	138317	8/4 - 18/4
	10SHDW50046	139437	50.0	460	3	60	1150	H	76.4	1.15	84.0	400.0	32	138318	6/4 - 18/4
	10SHDW50056	139438	50.0	575	3	60	1150	H	61.2	1.15	67.2	320.0	32	138318	6/4 - 18/4
	10SHDW60046	139639	60.0	460	3	60	1150	F	86.7	1.15	96.8	400.0	32	138319	2/4 - 18/4
	10SHDW60056	139640	60.0	575	3	60	1150	F	69.4	1.15	77.4	320.0	32	138318	6/4 - 18/4
	10SHDW10098	139439	10.0	208 230	3	60	870	L	37.2 38.6	1.2	42.0 42.2	230.0	28	138317	8/4 - 18/4
	10SHDW10048	139440	10.0	460	3	60	870	L	19.3	1.2	21.1	115.0	28	138317	8/4 - 18/4
	10SHDW10058	139441	10.0	575	3	60	870	L	15.4	1.2	16.9	92.0	28	138317	8/4 - 18/4
	10SHDW15098	139442	15.0	208 230	3	60	870	G	50.4 48.4	1.2	59.0 55.6	230.0	28	138317	8/4 - 18/4
	10SHDW15048	139443	15.0	460	3	60	870	G	24.2	1.2	27.8	115.0	28	138317	8/4 - 18/4
	10SHDW15058	139444	15.0	575	3	60	870	G	19.4	1.2	22.2	92.0	28	138317	8/4 - 18/4
	10SHDW20098	139445	20.0	208 230	3	60	870	J	69.0 75.1	1.2	76.0 79.0	400.0	28	138318	6/4 - 18/4
	10SHDW20048	139446	20.0	460	3	60	870	J	37.6	1.2	41.1	200.0	28	138317	8/4 - 18/4
	10SHDW20058	139447	20.0	575	3	60	870	J	30.1	1.2	32.9	160.0	28	138317	8/4 - 18/4
	10SHDW25098	139448	25.0	208 230	3	60	870	H	82.3 84.0	1.2	98.8 94.5	400.0	28	138319	2/4 - 18/4
	10SHDW25048	139449	25.0	460	3	60	870	H	42.0	1.2	47.2	200.0	28	138317	8/4 - 18/4
	10SHDW25058	139450	25.0	575	3	60	870	H	33.6	1.2	37.8	160.0	28	138317	8/4 - 18/4

IMPORTANT !

Moisture and Temperature sensor leads are integral to power cord.

Pump rated for operation at ± 10% voltage at motor.

▲ Cord Suffix: XC - 30 Feet, XF - 50 Feet, XJ - 75 Feet, or XL - 100 Feet.

▲ Cord sold separately.

CRANE®

PUMPS & SYSTEMS

Series 10SHDX

4" Spherical Solids Handling

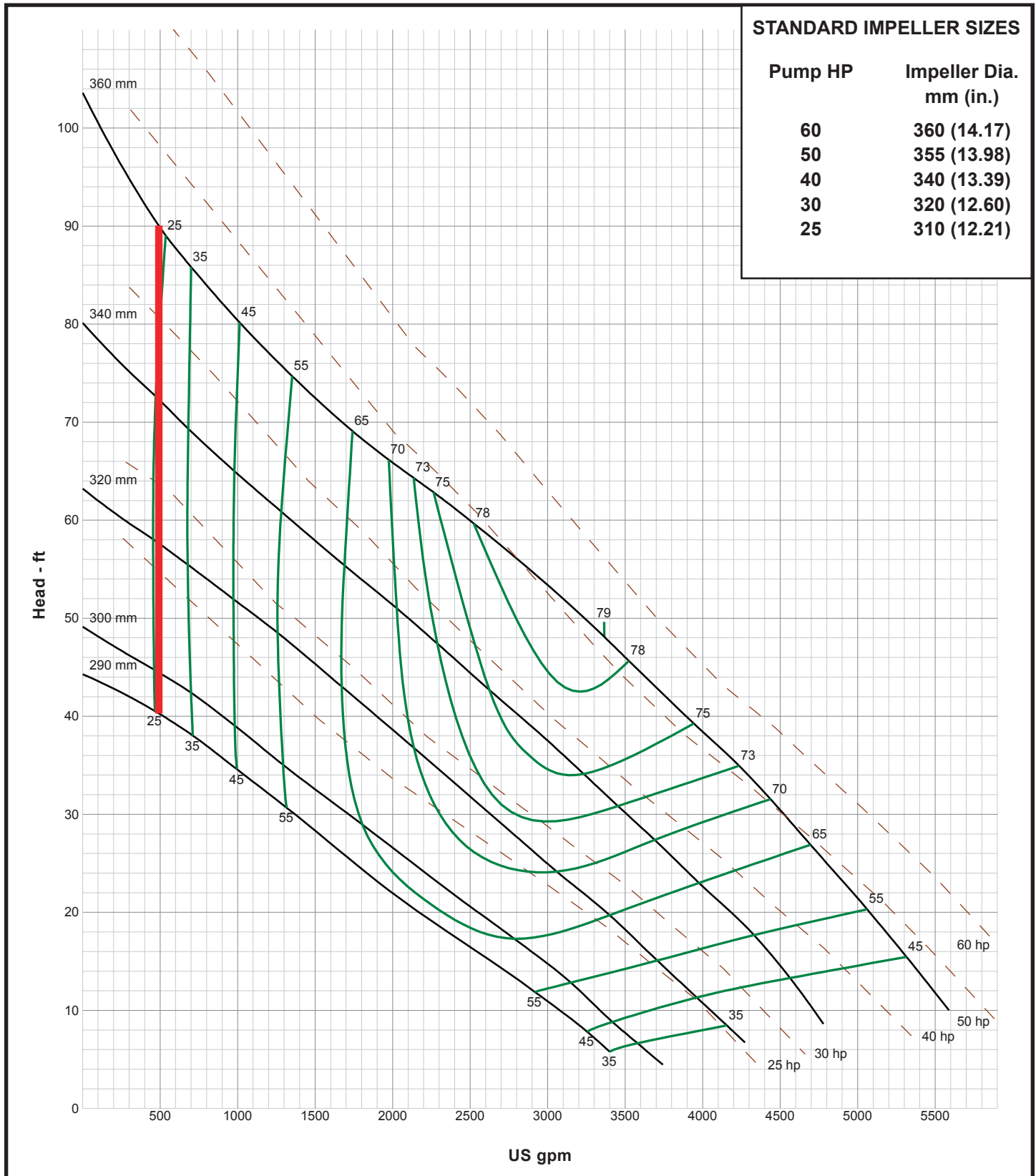
Solids Handling Submersible Pumps

	MODEL NO	PART NO	HP	VOLT	PH	Hz	RPM (Nom)	NEMA START CODE	FULL LOAD AMPS	SERVICE FACTOR	SERVICE FACTOR AMPS	LOCKED ROTOR AMPS	DRIVER FRAME	CORD P/N ▲	CORD SIZE
Pump XHDXS	10SHDX40036	139423	40.0	230	3	60	1150	E	110.4	1.2	131.8	476.0	28	138319	2/4 - 18/4
	10SHDX40046	139493	40.0	460	3	60	1150	E	55.2	1.2	65.9	238.0	28	138318	6/4 - 18/4
	10SHDX40056	140056	40.0	575	3	60	1150	E	44.2	1.2	52.7	190.4	28	138317	8/4 - 18/4
	10SHDX50046	139618	50.0	460	3	60	1150	H	76.4	1.15	84.0	400.0	32	138318	6/4 - 18/4
	10SHDX50056	139619	50.0	575	3	60	1150	H	61.2	1.15	67.2	320.0	32	138318	6/4 - 18/4
	10SHDX60046	139620	60.0	460	3	60	1150	F	86.7	1.15	96.8	400.0	32	138319	2/4 - 18/4
	10SHDX60056	139621	60.0	575	3	60	1150	F	69.4	1.15	77.4	320.0	32	138318	6/4 - 18/4
	10SHDX75046	139622	75.0	460	3	60	1150	H	109.3	1.15	119.5	612.0	32	138319	2/4 - 18/4
	10SHDX75056	139623	75.0	575	3	60	1150	H	87.4	1.15	95.6	489.6	32	138319	2/4 - 18/4
	10SHDX100046	139624	100.0	460	3	60	1150	E	135.0	1.0	135.0	612.0	32	138319	2/4 - 18/4
	10SHDX100056	139625	100.0	575	3	60	1150	E	108.0	1.0	108.0	489.6	32	138319	2/4 - 18/4
	10SHDX15098	139990	15.0	208 230	3	60	870	G	50.4 48.4	1.2	59.0 55.6	230.0	28	138317	8/4 - 18/4
	10SHDX15048	139991	15.0	460	3	60	870	G	24.2	1.2	27.8	115.0	28	138317	8/4 - 18/4
	10SHDX15058	139992	15.0	575	3	60	870	G	19.4	1.2	22.2	92.0	28	138317	8/4 - 18/4
	10SHDX20098	139626	20.0	208 230	3	60	870	J	69.0 75.1	1.2	76.0 79.0	400.0	28	138318	6/4 - 18/4
	10SHDX20048	139627	20.0	460	3	60	870	J	37.6	1.2	41.1	200.0	28	138317	8/4 - 18/4
	10SHDX20058	139628	20.0	575	3	60	870	J	30.1	1.2	32.9	160.0	28	138317	8/4 - 18/4
	10SHDX25098	139629	25.0	208 230	3	60	870	H	82.3 84.0	1.2	98.8 94.5	400.0	28	138319	2/4 - 18/4
	10SHDX25048	139630	25.0	460	3	60	870	H	42.0	1.2	47.2	200.0	28	138317	8/4 - 18/4
	10SHDX25058	139631	25.0	575	3	60	870	H	33.6	1.2	37.8	160.0	28	138317	8/4 - 18/4
	10SHDX30098	139632	30.0	208 230	3	60	870	F	98.8 94.5	1.2	124.1 108.6	400.0	28	138319	2/4 - 18/4
	10SHDX30048	139633	30.0	460	3	60	870	F	47.2	1.2	54.3	200.0	28	138317	8/4 - 18/4
	10SHDX30058	139634	30.0	575	3	60	870	F	37.8	1.2	43.5	160.0	28	138317	8/4 - 18/4
	10SHDX40048	139635	40.0	460	3	60	870	F	62.2	1.15	69.4	275.0	32	138318	6/4 - 18/4
	10SHDX40058	139636	40.0	575	3	60	870	F	49.8	1.15	55.5	220.0	32	138317	8/4 - 18/4
	10SHDX50048	139637	50.0	460	3	60	870	D	74.5	1.15	84.9	275.0	32	138318	6/4 - 18/4
	10SHDX50058	139638	50.0	575	3	60	870	D	59.0	1.15	67.4	220.0	32	138317	8/4 - 18/4

IMPORTANT !

Moisture and Temperature sensor leads are integral to power cord.
Pump rated for operation at ± 10% voltage at motor.
▲ Cord Suffix: XC - 30 Feet, XF - 50 Feet, XJ - 75 Feet, or XL - 100 Feet.
▲ Cord sold separately.

Solids Handling Submersible Pumps



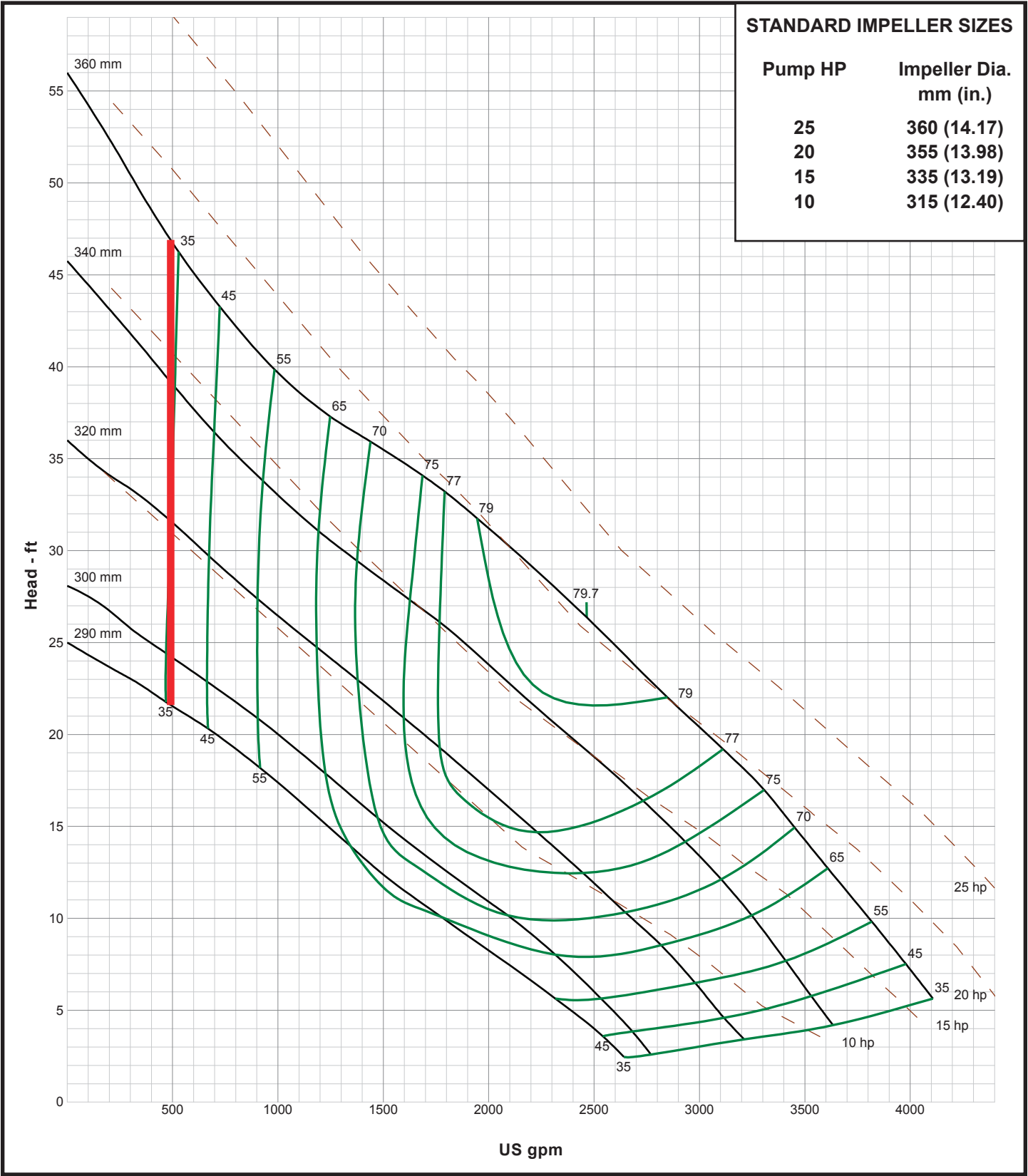
Series 10SHDW

Performance Curve
10 - 25HP, 870RPM, 60Hz

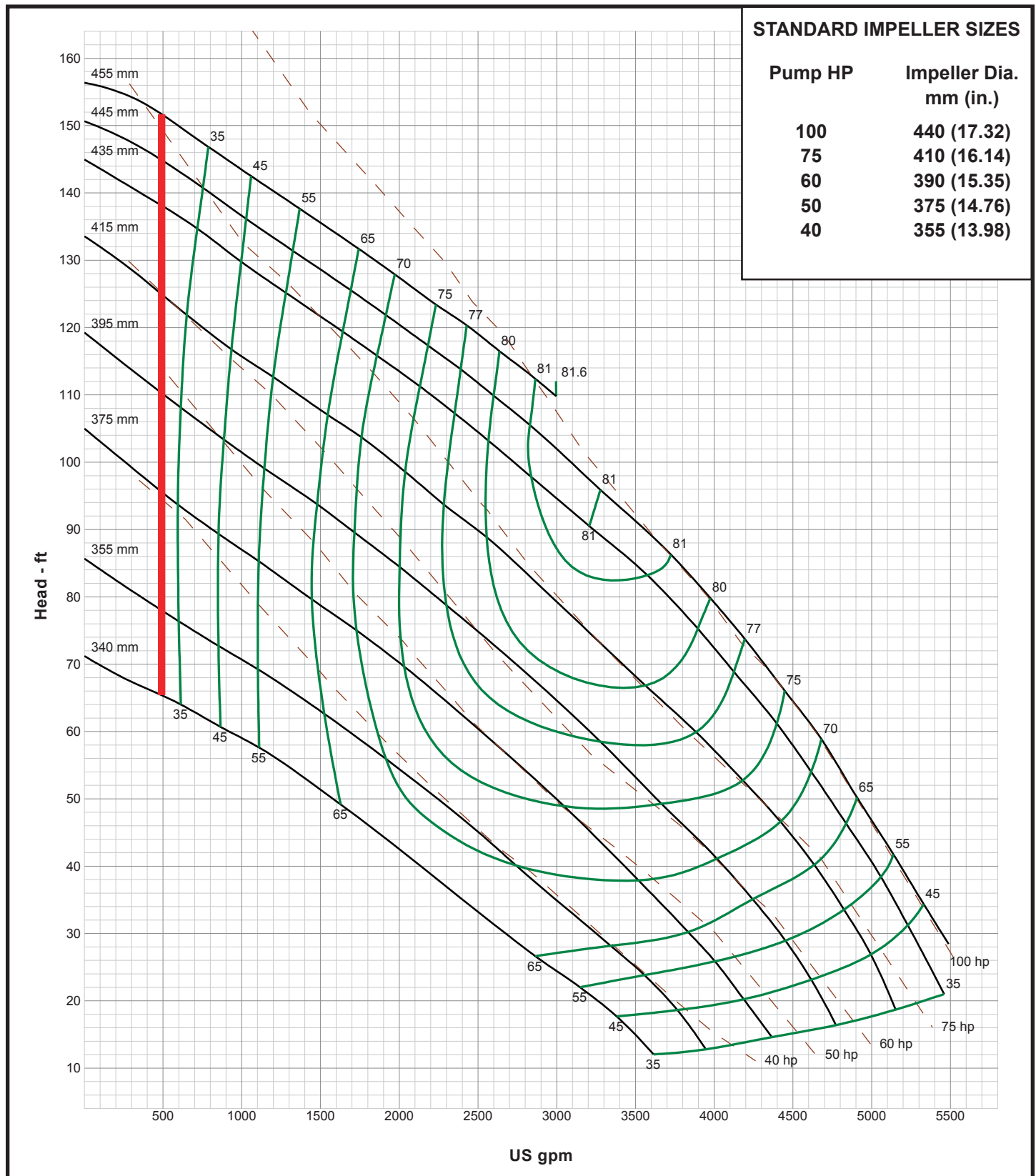


www.cranepumps.com

Solids Handling Submersible Pumps



Solids Handling Submersible Pumps



Series 10SHDX

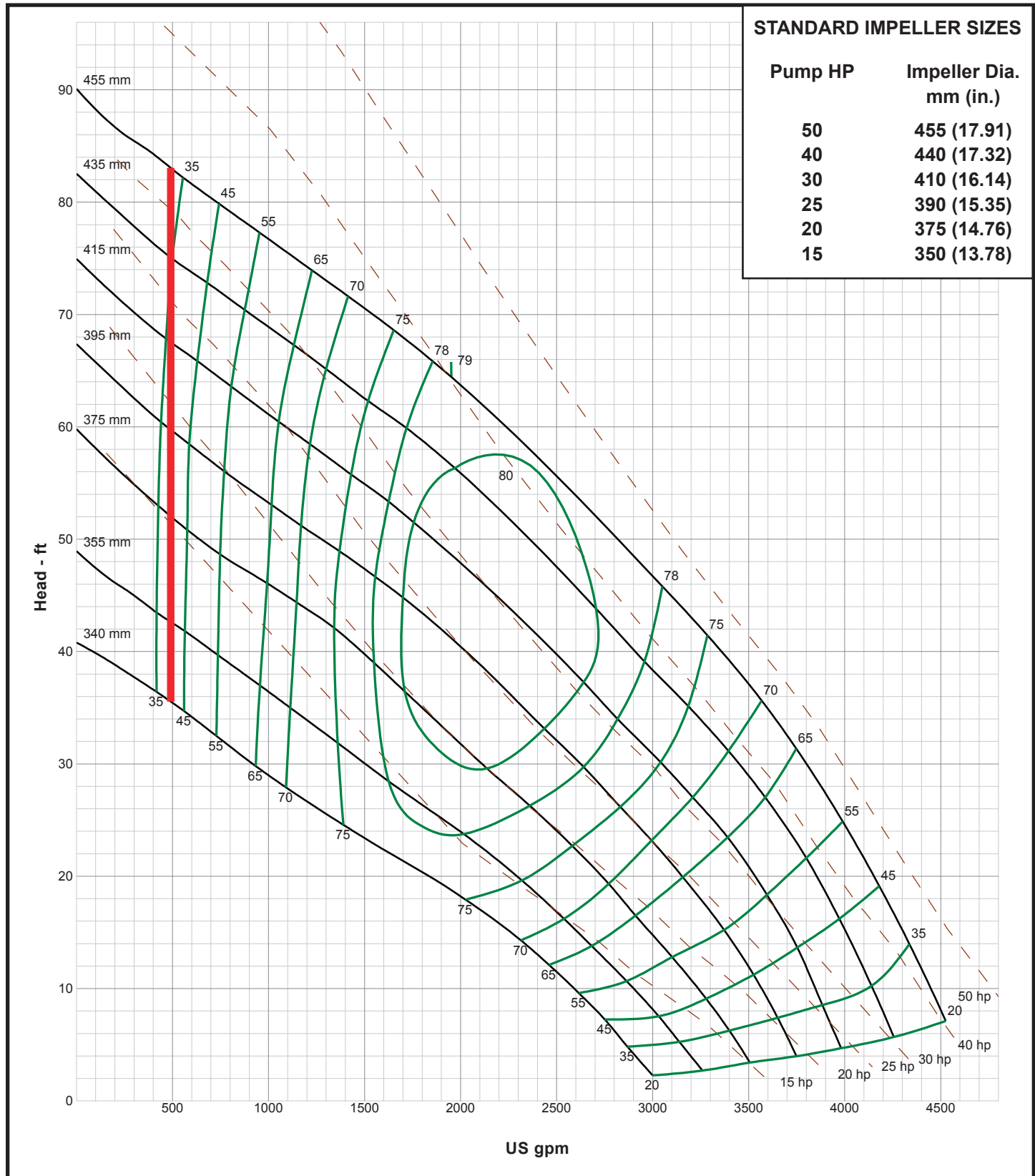
Performance Curve

15 - 50HP, 870RPM, 60Hz

BARNES®

www.cranepumps.com

Solids Handling Submersible Pumps



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DATE 2/16

CRANE®

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PUMPS & SYSTEMS

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ALASKA PUMP & SUPPLY, INC

8401 BRAYTON DRIVE • ANCHORAGE, ALASKA 99507 • PHONE: (907) 563-3424 • FAX: (907) 562-5449

November 16, 2017

ATTN: Jonathan Capua - CRW Engineering

QUOTE: AKP17-1173

Project: CRW Barnes Pumps

PH: 907-646-5680

Email: jcapua@crweng.com

We are pleased to provide pricing for the following equipment:

Qty	Part #	Description	Each	Total
3	10SHDX30098	BARNES 10SHD 28 FRAME 10 INCH DISCHARGE, CAST IRON VALUTE, CAST IRON MOTOR HOUSING, ENCLOSED DUAL VAIN DUCTILE IRON IMPELLER, CARBON/CERAMIC X SILICON CARBIDE/SILICON CARBIDE MECHANICAL SEAL & BUNA-N ELASTOMERS, NORMALLY OPEN MOISTURE SENSOR, (3) NORMALLY CLOSED THERMAL SENSORS, 50 FEET OF CABLE	\$ 19,351.00	\$ 58,053.00
Please reference AKP17-1173 when placing order.				Total: \$58,053.00

Subject to Alaska Pumps Terms & Conditions of Sale. Net Thirty (30) Terms are subject to Alaska Pumps' credit department approval.

F.O.B: Alaska Pump

Ships: 7-9 Weeks

Regards,

John Murphy

Sales / Projects

DXP / Alaska Pump & Supply, Inc.

Direct: (907) 793-4819

FAX: (907) 562-5449

John.Murphy@dxpe.com

Job Name: CRW Barnes Pumps

Date: 11/16/2017

DXP | Alaska Pump & Supply, Inc.

AKP17-1173

**DXP | ALASKA PUMP & SUPPLY, INC.
STANDARD TERMS & CONDITIONS OF SALE**

Terms of Payment: Payment is due thirty (30) days after the date of the invoice. Interest on the unpaid balance will be charged on all overdue monies at the rate of 18% per annum or the highest rate allowable by law, whichever is less. Customer agrees to pay all collection costs, including actual reasonable attorney's fees incurred in collecting monies due hereunder. Seller reserves the right to require payment in advance or provide other credit terms if Buyer's credit is not acceptable to Seller.

Identification and Risk of Loss: The products, goods and/or equipment shall be identified to the contract and risk of loss shall pass to Buyer when the products, goods and/or equipment are placed in the hands of the carrier.

Freight: All prices are FOB point of manufacture and do not include freight unless specifically listed as included. Seller shall not be responsible for actions, inactions or delays by the carrier.

Conditions: All orders are accepted with the understanding that they are subject to Seller's ability to obtain the necessary products, goods and/or equipment.

Not Included: Unless specifically provided herein, the products, goods, equipment, and/or services listed do not include freight, haulage, unloading, freight claims, installation, erection, concrete, grout, water, utilities, lubricating grease and oil, power, tools, labor, controls, conduit, wiring, meters, main disconnects, piping, valves, fittings, gaskets, hardware, taxes, covers, field painting, insurance, testing, royalties, maintenance, operation, erection supervision, start-up services, personnel transportation, anchor bolts, welding rod, or asset.

Inspection: Buyer shall inspect Seller's products, goods and/or equipment upon receipt and if Buyer's inspection reveals any defects, Buyer shall notify the Seller within three (3) days after receipt of the products, goods and/or equipment of any claim Buyer might have concerning such defects or of any claim discovered by Buyer. Buyer's failure to notify Seller within such three day period shall constitute a waiver by Buyer of all claims covering such defects.

Errors: Seller reserves the right to correct any clerical and/or stenographic error or omission.

Cancellation: Buyer may cancel this order only upon written notice and payment to Seller of reasonable cancellation charges.

Returns: Seller will not accept returns of chemicals, electrical items or special orders. Seller will not accept returns of any products, goods and/or equipment after ninety (90) days from the date of the invoice. Buyer will be assessed a reasonable restocking fee on any accepted returns.

Approvals: Buyer is responsible for obtaining any required engineers', owners', and/or governmental agencies' approval of the products, goods, equipment and/or services. Seller does not warrant that the products, goods, equipment and/or services will meet any such approvals or specifications.

Limitation of Liability: In no event shall Seller be liable for any lost profits, down time, lost sales, operating or maintenance costs, or for any other special, indirect, incidental or consequential damages of Buyer.

Warranties: SELLER MAKES NO EXPRESS WARRANTIES WITH RESPECT TO ANY PRODUCT, GOODS AND/OR EQUIPMENT SOLD OR SERVICES PERFORMED AND SELLER SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Seller does not authorize anyone to make a warranty of any kind on its behalf and Buyer should not rely on any statement to that effect. Seller is not the manufacturer of the products, goods and/or equipment. If the manufacturer of the products, goods and/or equipment warrants the products, goods and/or equipment that Buyer has purchased, Buyer shall have whatever manufacturer's warranty there is subject to the terms and conditions of the warranty. The Buyer's sole and exclusive remedy, if any, shall be against the manufacturer and not Seller.

Integration: These Terms and Conditions constitute the entire agreement between Buyer and Seller with respect to this transaction and supercede and replace all prior negotiations agreements, and representation, oral or written. These Terms and Conditions may not be amended or modified except pursuant to a written document signed by both parties.

Governing Law: The terms of this agreement and all rights and obligations of the parties hereunder shall be governed by the laws of the State of Alaska.

Binding Effect: These Terms and Conditions shall be binding on the parties hereto and their heirs, personal representatives, successors, and assigns. The undersigned acknowledges and agrees to Alaska Pump & Supply, Inc. terms and conditions of sale/quote as referenced in our quote AKP17-1173 and is subject to Alaska Pump & Supply Inc.'s Standard Terms and Conditions of Sale which are outlined above and agrees to be bound by said Terms and Conditions. No other conditions previous or after date below apply.

Letters and Quotes: Notwithstanding any language to the contrary, nothing contained in our letters or quotes constitutes or is intended to constitute engineering work requiring a stamp or engineering seal by Alaska Pump & Supply, Inc.. We neither convey nor imply that the company or persons are practicing engineering herein.

Customer Name Printed

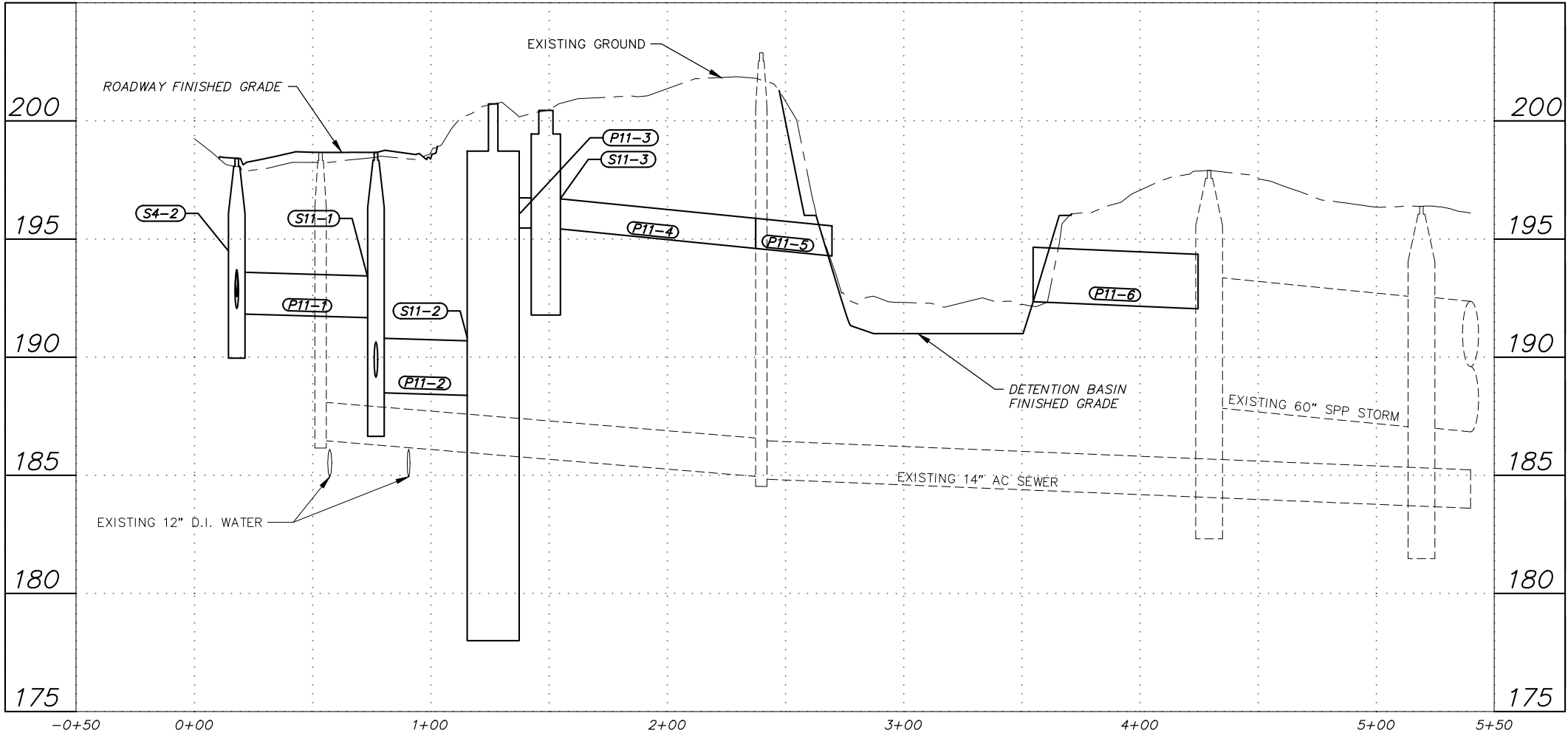
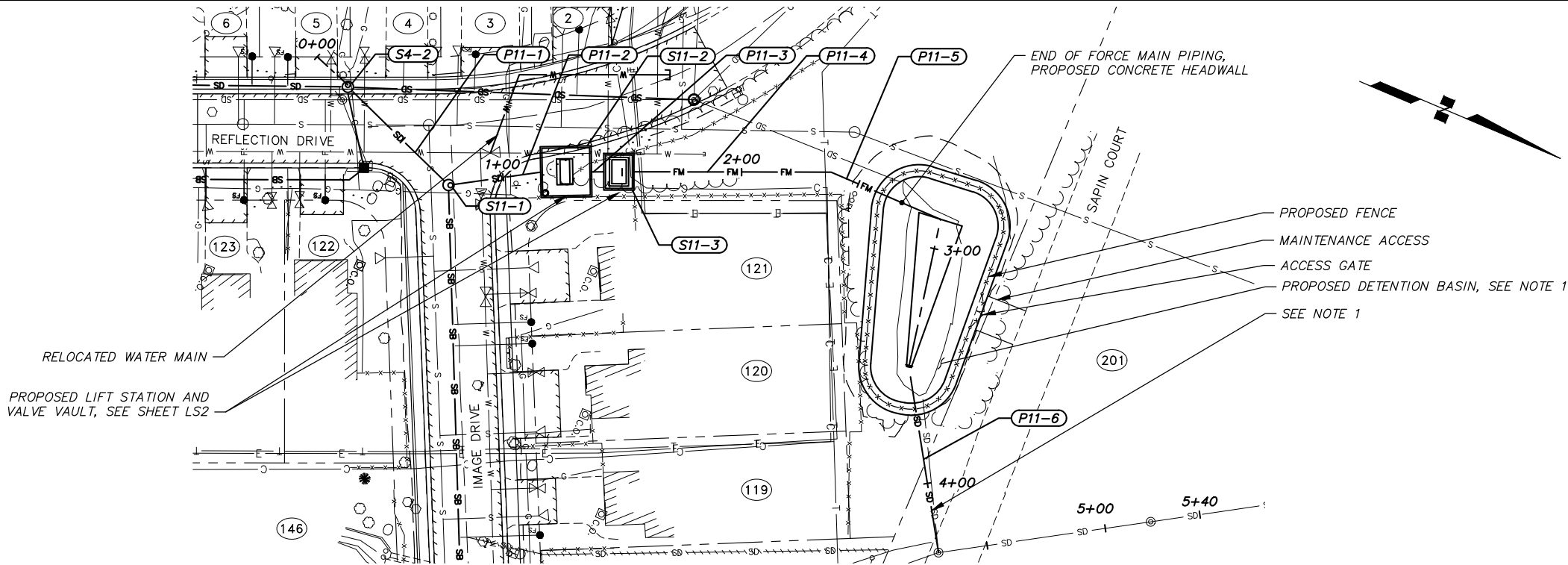
Company Name Printed

X _____
Customer Signature

Date:

NOTES:

1. INSTALL HEAT TRACE ALONG DETENTION BASIN FLOOR AND OUTFALL PIPE P11-6.

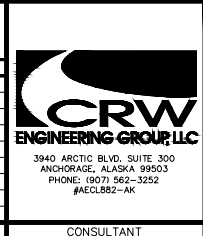


RECORD DRAWING

1. DATA PROVIDED BY: _____ TITLE: _____
THIS WILL SERVE TO CERTIFY THAT THESE RECORD DRAWINGS ARE A TRUE AND ACCURATE REPRESENTATION OF THE PROJECT AS CONSTRUCTED.
CONTRACTOR: _____
BY: _____ TITLE: _____ DATE: _____
2. DATA TRANSFERRED BY: _____ TITLE: _____
COMPANY: _____ DATE: _____
3. BASED ON PERIODIC FIELD OBSERVATIONS BY THE ENGINEER (OR AN INDIVIDUAL UNDER HIS/HER DIRECT SUPERVISION), THE CONTRACTOR-PROVIDED DATA APPEARS TO REPRESENT THE PROJECT AS CONSTRUCTED.
DATA TRANSFER CHECKED BY: _____ TITLE: _____
COMPANY: _____ DATE: _____
BY: _____

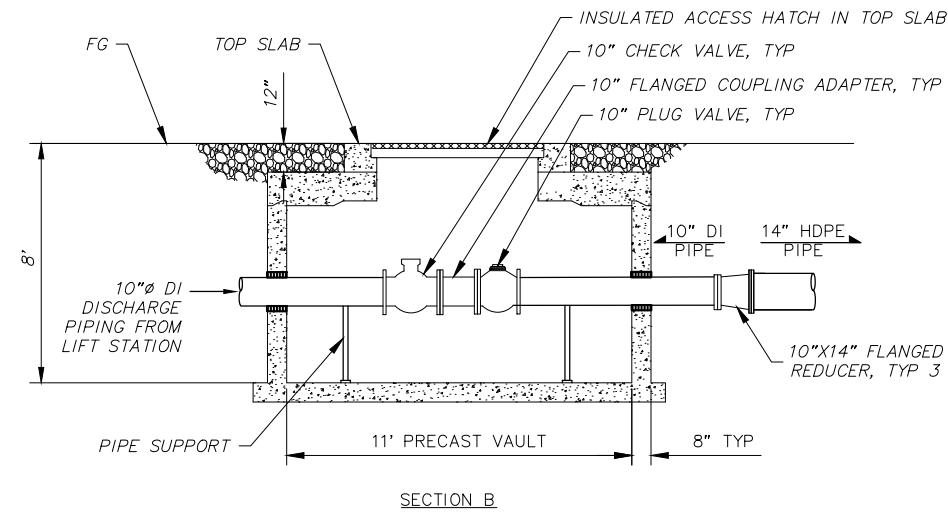
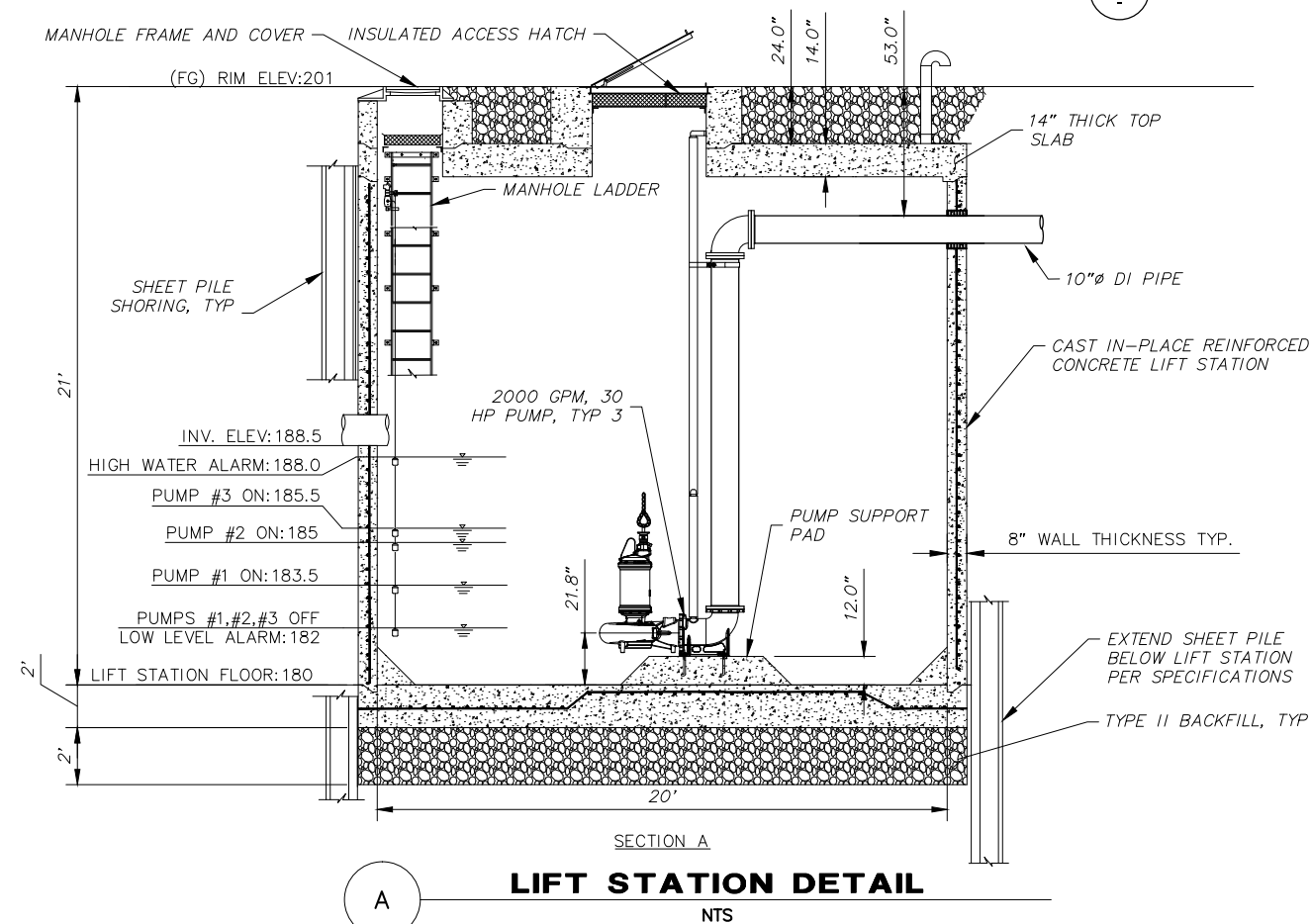
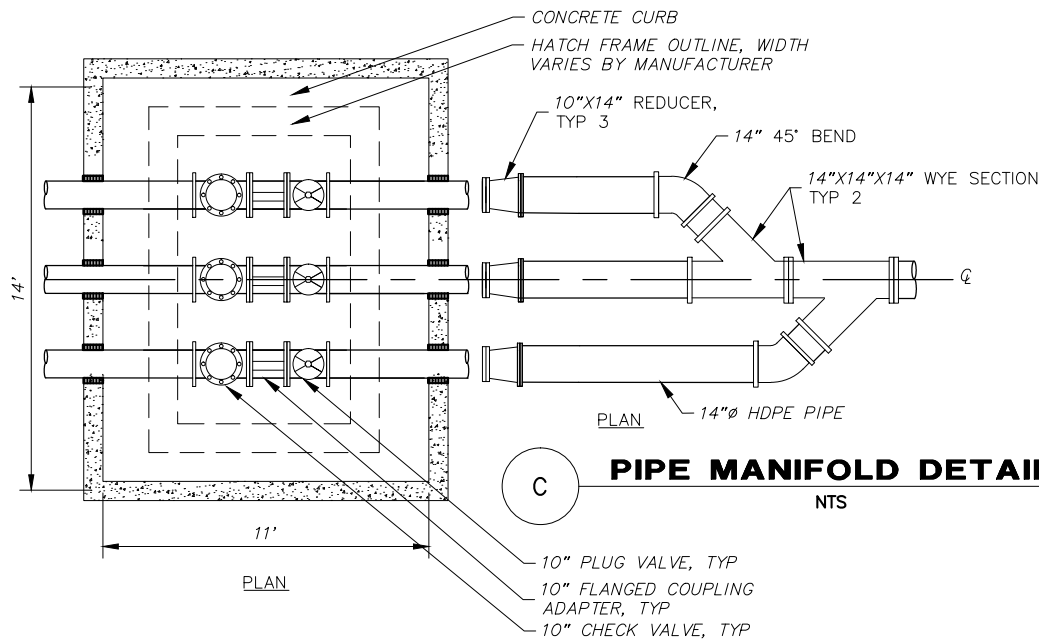
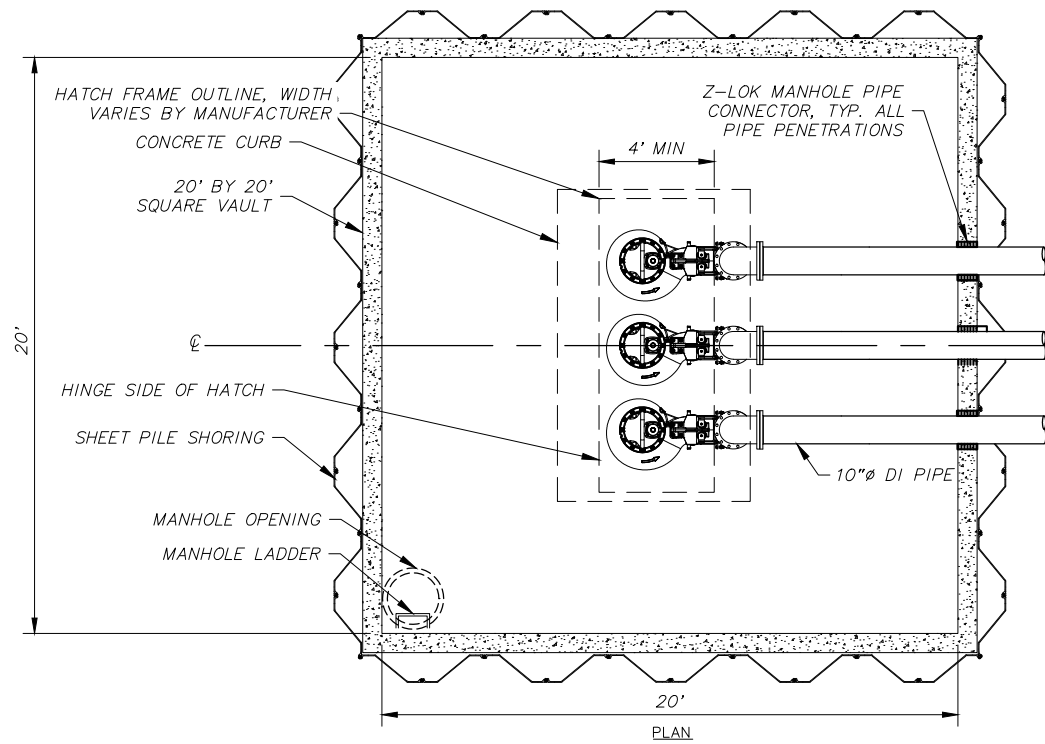
DATA	DRAWN BY	CHECKED BY
BASE		
TOPOGRAPHY		
PROFILE		
STORM SEWER		
WATER/SANITARY SEWER		
GAS		
TELEPHONE		
ELECTRIC		
DESIGN		
QUANTITIES		
PRELIMINARY/FINAL		
MUNICIPAL/STATE		

FIELD BOOKS	TBM NO.	LOCATION	ELEV.	REV.	DATE	DESCRIPTION	BY
DESIGN							
STAKING							
ASBUILT							
CONTRACTOR							
INSPECTOR							
BASIS OF THIS DATUM							
PLAN CHECK							
CONSTRUCTION RECORD							
VERTICAL DATUM							
REVISIONS							
CONSULTANT							
SEAL							



PROJECT MANAGEMENT AND ENGINEERING DEPARTMENT		
14-50	IMAGE DRIVE/REFLECTION DRIVE AREA ROAD RECONSTRUCTION	SCH.
LIFT STATION PLAN AND PROFILE		
SCALE HOR. 1"=30' VER. 1"=3'	GRID 1627, 1727 DATE DEC 2017 STATUS DSR	LS1 of LS2

File: s:\jebdata\10133.00 Image Reflection Area Reconstruction\00 CADD\01 Working Set\01 Civil\10133.00 Lift Station Detail.dwg



LIFT STATION DETAIL

VALVE VAULT DETAIL

RECORD DRAWING

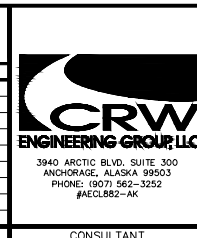
1. DATA PROVIDED BY: _____ TITLE: _____
THIS WILL SERVE TO CERTIFY THAT THESE RECORD DRAWINGS ARE A TRUE AND ACCURATE REPRESENTATION OF THE PROJECT AS CONSTRUCTED.
CONTRACTOR: _____ DATE: _____
BY: _____

2. DATA TRANSFERRED BY: _____ TITLE: _____
COMPANY: _____ DATE: _____

3. BASED ON PERIODIC FIELD OBSERVATIONS BY THE ENGINEER (OR AN INDIVIDUAL UNDER HIS/HER DIRECT SUPERVISION), THE CONTRACTOR-PROVIDED DATA APPEARS TO REPRESENT THE PROJECT AS CONSTRUCTED.
DATA TRANSFER CHECKED BY: _____ TITLE: _____
COMPANY: _____ DATE: _____
BY: _____

DATA	DRAWN BY	CHECKED BY
BASE		
TOPOGRAPHY		
PROFILE		
STORM SEWER		
WATER/SANITARY SEWER		
GAS		
TELEPHONE		
ELECTRIC		
DESIGN		
QUANTITIES		
PRELIMINARY/FINAL		
MUNICIPAL/STATE		

FIELD BOOKS	TBM NO.	LOCATION	ELEV.	REV	DATE	DESCRIPTION	BY
DESIGN							
STAKING							
ASBUILT							
CONTRACTOR							
INSPECTOR							
BASIS OF THIS DATUM							
PLAN CHECK							
CONSTRUCTION RECORD							
VERTICAL DATUM							
REVISIONS							



PROJECT MANAGEMENT AND ENGINEERING DEPARTMENT			
14-50	IMAGE DRIVE/REFLECTION DRIVE AREA ROAD RECONSTRUCTION		SCH.
LIFT STATION DETAILS			
:			
SCALE		GRID 1627, 1727	LS2 of LS2
HOR. NTS VER. NTS		DATE DEC. 2017 STATUS DSR	
		SHEET	