File CG3418 / 014

Suncor Energy Products Partnership

Annual Summary Report - 2020
Former Sears Retail Site and Adjacent Hounsfield Heights Area
1620 – 14th Avenue NW
Calgary, Alberta

Clifton

Clifton

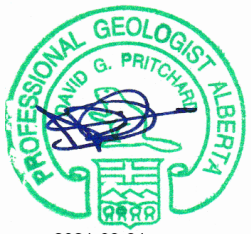
CLIFTON ENGINEERING GROUP INC.

Annual Summary Report - 2020
Former Sears Retail Site and Adjacent Hounsfield Heights Area, 1620 – 14th Avenue NW Calgary, Alberta, 9445

Project No.: CG3418 014

Date: 31 March 2021

Prepared by:
Stephen d'Abadie, PBiol, PEng
Project Manager



2021-03-31

Reviewed by:
David G. Pritchard, PGeo
Director, Environmental Services

PERMIT TO PRACTICE
CLIFTON ENGINEERING GROUP INC.
RM SIGNATURE:
RM APEGA ID #: 55585
DATE: 2021-03-31
PERMIT NUMBER: P014800
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Distribution List:

Recipient	Date	Revision No.	By	Sent Via	Document Type	Description	No. of Hard Copies
Clifton Engineering Group Inc.	31 March 2021	1	SD	E-mail	PDF	Final Report	0
Suncor Energy Inc.	31 March 2021	1	SD	E-mail	PDF	Final Report	0
Alberta Environment and Parks – Barbara Mcewen, Rick McClelland, Craig Knaus and EAS Communications	31 March 2021	1	SD	E-mail	PDF	Final Report	0
City of Calgary – Tyson Allan	31 March 2021	1	SD	E-mail	PDF	Final Report	0
Alberta Health Services – David Crowe	31 March 2021	1	SD	E-mail	PDF	Final Report	0
Hounsfield Heights Briar Hill – Beacon, Plume Committee and General Manager	31 March 2021	1	SD	E-mail	PDF	Final Report	0
BentallGreenOak – David McLean	31 March 2021	1	SD	E-mail	PDF	Final Report	0
Concord North Hill GP Ltd– Calvin Chan	31 March 2021	1	SD	E-mail	PDF	Final Report	0
HHLG – Gary Molnar	31 March 2021	1	SD	E-mail	PDF	Final Report	0
Linda Barron	31 March 2021	1	SD	E-mail	PDF	Final Report	0

Table of Contents

Appendices

1.0 Introduction

Clifton Engineering Group Inc. (Clifton) has been retained by Suncor Energy Products Partnership ("Suncor") to manage the on-going remediation and monitoring and sampling program at the site, which includes the Mall Area north of 14th Avenue NW, and the Hounsfield Heights Area to the south (collectively known as the "Site"). As part of the on-going site management and remediation, Suncor is required, as per Ministerial Order 09/2020, to provide an annual report to Alberta Environment and Parks on 31 March of each calendar year. This requirement has been in place since the 2018 Environmental Protection Order where the previous responsible party, Sears Canada Inc. (Sears), was required to submit an Annual Report. This report documents the third Annual Report for the site and the second Annual Report since the release of Ministerial Order 09/2020.

This Annual Report follows the outline presented in the previous 2020 report, which was updated from the 2019 template to capture the additional requirements set forth in Ministerial Order 09/2020. The current report documents activities associated with the Site between the dates of 01 January 2020 and 31 December 2020.

During the 2020 calendar year, environmental work was completed on behalf of both Sears and Suncor, with Suncor officially taking full responsibility for the Site in an agreement dated 07 August 2020.

2.0 Communication

Communication to the pertinent stakeholders has been completed using a variety of avenues. All communication is tailored to the specific audience and has been conducted in accordance with the communications plan proposed as part of the Revised Remediation Plan. The original Remediation Plan was submitted in December 2018, a revised version in August 2019, a further revision in June 2020 and the final version will be submitted for acceptance by AEP in March 2021. The communications plan has been updated in each version of the plan which has been prepared. The most recent version, to be submitted to AEP in March 2021 will include the following communication strategy which was prepared in 2020.

2.1 Two-Way Communication Strategy

The plan to establish an effective two-way communication strategy has already begun. It is Suncor's intent to engage concerned residents via a virtual meeting in the new year. Suncor will be reaching out to the residents in March 2021 to schedule this meeting. Suncor recognizes that it may take some time to develop a truly effective two-way communication strategy and look forward to working with the residents to achieve this. The information presented below forms the current basis of the communication strategy.

2.1.1 Website

Suncor has implemented a new website (www.suncor.com/hounsfield-heights) to house all the historical reports from the Sears website, as well as new reports, and the regular community bulletins and notifications. Furthermore, a notification has been placed on the Sears Canada EPO website homepage to redirect traffic toward the new Suncor website.

2.1.2 Key Communication Contact

Suncor has also established a site-specific email address (hounsfieldheights@suncor.com) for use by the residents of Hounsfield Heights. This email address is directly linked to the responsible Suncor team to ensure that a timely response is provided to the residents according to the Ministerial Order. Having one point of contact will ensure that someone from the Suncor team will always be available to respond. This email address is intended to be the primary form of communication, but Suncor understands that on occasion communication by phone with an individual team member may be the preferred and most effective way to communicate.

2.1.3 Community Bulletins

In 2020, Suncor posted the first community bulletin on its website, and distributed it via mail to all residents within the Site. The bulletin provides information on how the residents can contact Suncor should they have any questions. In addition to this, the bulletin has asked residents to notify Suncor on their preference (mail vs e-mail) to be contacted for future bulletins.

2.2 Summary of 2020 Communication

In 2020, communication was as follows:

- Clifton, on behalf of Sears and Suncor, circulated two communication bulletins, one in April and one in November 2020. The April 2020 bulletin was under Sears letterhead and provided a summary of the CCAA proceedings as well as the environmental work which had been completed since the prior post and a summary of the upcoming work. The November 2020 bulletin was under Suncor letterhead and introduced the Suncor team, the work completed since the previous post and the upcoming work, along with an email address for residents to communicate through.
- A notice to all stakeholders was distributed in August 2020 via mail as well as being posted on the Sears and Suncor communications website documenting the formal remediation responsibility transition from Sears to Suncor.
- Sears continued to make its communication website accessible to all members of the community, specifically designed to allow easy access to all publicly available reports and communications related to the project. Once the Suncor communications website was activated in August 2020, a redirection notice was placed on the Sears website and all documents on the Sears website were transferred to the new communications website. Only the Suncor website was updated with new documents following its implementation.

- Clifton, on behalf of Sears, was in contact with select residents to obtain approval and access to perform the soil vapour monitoring program contingency plan.
- Additional communication with residents in the Hounsfield Heights – Briar Hill Community as well as the private property owners of the Mall Area was through email, phone, or in-person communication. This was completed on an as needed, basis. If specified, Clifton contacted residents using their communication method of choice; and
- Additional communication with stakeholders such as AEP and the City of Calgary was through email, phone, or in-person communication.

All communication in 2020 including that with individual property owners was related to the discussion of results of historical work completed, work being currently completed and future proposed work or as a means of requesting access to specific portions of the Site which required additional consent, either verbally or through an access agreement. Specific concerns were related to the communication process with all landowners and the technical information presented within reports which were responded to individually through email.

3.0 Environmental Work

In 2020, Clifton, on behalf of the responsible party(ies) completed the following activities associated with the Site:

- Groundwater Monitoring and Sampling: October/January (2019/2020), May/June 2020 and November 2020.
- Soil Vapour Sampling: January/February 2020 and November/December 2020.
- Soil Vapour Contingency Plan Sampling: January 2020, July 2020 and November 2020.
- Permeable Reactive Barrier (Plumestop™): Performance Monitoring.
- Dual Phase Vapour Extraction (DPVE) system: Operation and Performance Assessment.
- Revised Remediation Plan (Version 2.0): Revisions
- LPH (Liquid Petroleum Hydrocarbon) Assessment: Permitting; and
- SV32 Exceedance: Delineation Activities.

Figure 1 of the Appendix A depicts the current groundwater monitoring well network while Figure 2 depicts the soil vapour probe network. A summary of each of these activities is presented in the following sections. At the end of each section a reference to the full report housed on the Suncor communications website is provided.

3.1 Groundwater Monitoring and Sampling

In 2020, Clifton completed one groundwater sampling event which began in 2019 and initiated and completed the field component of two other events. The first event which began in November 2019, was completed in January 2020. The second event was completed in May and June 2020, while third event started and was completed in November 2020. A report was released to the stakeholders documenting the November to January 2019/2020 event and the May and June 2020 sampling event. A report has not yet been generated for the third event. It is anticipated that a report documenting this event will be made available to all stakeholders by April 2021. These results will be summarized in the 2021 Annual Report.

The purpose of the on-going groundwater monitoring and sampling program is to assess/confirm whether the petroleum hydrocarbon (PHC) and volatile organic compounds (VOCs) plume is expanding, declining or remaining stable, and confirm whether the concentrations of the contaminants of potential concern (CoPC) are below the appropriate guidelines at the lateral extents of the plume. A further objective of the groundwater monitoring and sampling program is to obtain additional data to determine if there is evidence to support the processes of natural attenuation in certain areas of the plume and to determine whether or not liquid petroleum hydrocarbon (LPH) is present within the monitoring well network.

3.1.1 November to January 2019/2020 Groundwater Monitoring and Sampling Event

Between November 2019 and January 2020, Clifton completed a groundwater monitoring and sampling event which consisted of collecting samples from 110 monitoring wells throughout the Hounsfield Heights and North Hill Mall areas. Prior to the sampling, all wells were monitored for depth to the groundwater and the total depth of the well in addition to measuring the organic vapour concentration of the well and determining if LPH was present. Sampling of the wells was completed using either a dedicated disposable bailer or a HYDRASleeve and in some cases both methods were used on a single well for comparative purposes.

Samples were submitted for analysis of BTEX, PHC fractions F1 to F2, VOCs and routine chemistry (select wells).

Upon receiving the groundwater results, they were compared to the AEP 2019 Tier 1 and 2 Guidelines for either commercial land use or residential/parkland land use for coarse and fine-grained soil, depending on the sampling location.

A summary of the results is presented below.

3.1.1.1 Results Summary

The monitoring results from this event show the following inferred groundwater flow directions for each Unit:

- Unit 1: Southwest
- Unit 2: Southeast
- Unit 3: Southeast
- Unit 4: South/southeast
- Unit 5: South/southeast

The inferred groundwater flow directions were generally consistent with previous investigations.

No LPH was observed in any monitoring wells.

Samples were obtained from 110 monitoring wells and were submitted for laboratory analysis of BTEX and PHC fractions F1 and F2 and VOCs. Of the BTEX and PHC fractions F1 and F2, benzene was the most frequently detected and was the parameter which most commonly exceeded the AEP 2019 Tier 1 Guidelines. With respect to VOCs, 1,2-DCA was the most frequently detected VOC and most commonly exceeded the AEP Tier 1 Guidelines.

Benzene has been detected in concentrations in excess of the AEP 2019 Tier 1 Guidelines in thirty-two monitoring wells across Units 2 and 3. Concentrations of benzene ranged from below detection (<0.00040 mg/L) to a maximum of 3.6 mg/L in EX-7 (Unit 3). No exceedances of the Site-Specific Tier 2 Guidelines generated for the protection of human health through the vapor inhalation pathway for benzene, xylene(s) and PHC fraction F1 were observed.

1,2-DCA has been detected at concentrations greater than the AEP 2019 Tier 1 Guidelines in thirty monitoring wells across Units 1 through 4. Concentrations of 1,2-DCA on-site ranged from below detection (<0.001 mg/L) to 0.31 mg/L in EX-7 and BH1704 (Unit 3). One exceedance of the Site-Specific Tier 2 Guidelines generated for the protection of human health through the vapor inhalation pathway for 1,2-DCA was observed in extraction well EX-7. The groundwater in extraction well EX-7 was recorded at 11.81 m below ground surface.

3.1.1.2 Trend and Decay Rate Analysis: Benzene and 1,2-DCA

Clifton performed a Mann-Kendall Plume Stability Analysis (MK-PSA) to incorporate all monitoring wells across the entire Site that had been sampled at least four times and the most recent sampling event indicated an exceedance of the applicable guideline for either benzene or 1,2-DCA. In addition to this, Clifton performed a preliminary decay rate analysis for the parameters benzene and 1,2-DCA in wells which were showing a decreasing or probably decreasing trend and had a most recent concentration that exceeded the applicable guidelines. This analysis also excluded extraction wells currently in operation as they do not represent steady-state conditions (EX-4 to EX-7).

Based on the results obtained during the sampling event approximately 71% (78 of 110 wells) of the samples met the AEP 2019 Tier 1 Guidelines for benzene. Of the 32 monitoring wells which exceeded the AEP 2019 Tier 1 Guidelines, a M-K PSA was performed on 25. Of these 25 monitoring wells, 23 indicated either no trend, stable trend or decreasing trend and 2 wells indicated an increasing trend.

M-K PSA for Benzene	
Increasing	BH1910 and BH1944
Probably Increasing	None
No Trend	BH1906, BH1907 and EX-3
Stable	BH1904, BH1911, BH1928 and BH1943
Probably Decreasing	None
Decreasing	BH1905, BH1912, BH1915, BH1921, BH1924, BH1925, BH1929, BH1936, BH1939, BH1967, BH1971, BH1982, BH510A, BH1704, EX-1 and EX-2

A preliminary decay rate analysis was performed on select monitoring wells for benzene. The results indicate that 7 of the wells are predicted to meet the guidelines within a 5-year timeframe, 1 well within a 10-year timeframe, 1 well within a 15-year timeframe and 1 well is anticipated to take longer than 15 years to meet the applicable guidelines. There is a varying level of uncertainty associated with the estimated timeframes for each well which will potentially be further reduced by obtaining additional groundwater sampling data.

Based on the results obtained during the sampling event approximately 73% (80 of 110 wells) of the samples met the AEP 2019 Tier 1 Guidelines for 1,2-DCA. Of the 30 monitoring wells which exceeded the AEP 2019 Tier 1 Guidelines, a M-K PSA was performed on 22. Of these 22 monitoring wells, approximately 19 indicated either no trend, stable trend, probably decreasing trend or a decreasing trend and 3 monitoring wells indicated an increasing or probably increasing trend.

M-K PSA for 1,2 – DCA	
Increasing	BH1928
Probably Increasing	BH1910 and BH1971
No Trend	BH1921, BH1929, BH1939, BH1981, BH1982, BH510A and EX-3
Stable	BH1906, BH1911, BH1912, BH1974, BH1704 and EX-1
Probably Decreasing	BH1967
Decreasing	BH1905, BH1915, BH1925, BH1956 and BH1924

A preliminary decay rate analysis was performed on seven monitoring wells for 1,2-DCA. The results indicated that 4 of the wells are predicted to meet the guidelines within a 5-year timeframe, 2 wells within a 10-year timeframe and 1 well within a 15-year timeframe. There is a varying level of uncertainty associated with the estimated timeframes for each well which will potentially be further reduced by obtaining additional groundwater sampling data.

3.1.1.3 Natural Attenuation Assessment

This monitoring and sampling event also marked the first event where routine chemistry analysis which includes select geochemical parameters which can be used as indicators of aerobic and anaerobic biodegradation, along with downhole dissolved oxygen readings were completed on select monitoring wells.

Based on a review of the measured dissolved oxygen concentrations, there did appear, on average, to be lower concentrations within the plume. This can be expected as the aerobic biodegradation occurring in areas with higher PHC concentrations would reduce the dissolved oxygen concentration within the groundwater. With respect to biodegradation, the primary mechanism will be through the aerobic pathway so long as there is sufficient dissolved oxygen content within the groundwater. A dissolved oxygen content of 0.5 mg/L or greater is generally sufficient to promote aerobic biodegradation as the primary mechanism of biological decay within the groundwater (EPA 510-B-17-003, October 2017).

All wells which were sampled contained a dissolved oxygen concentration greater than 0.5 mg/L, except for one monitoring well. However, petroleum hydrocarbons were not detected within this well. In addition to assessing downhole dissolved oxygen concentrations, measurements of other geochemical parameters

can also be used to perform an assessment of natural biodegradation within the groundwater. If anerobic biodegradation is occurring, we would expect to see a difference in the other geochemical parameters assessed. However, there was not sufficient data to determine if anaerobic biodegradation is occurring within the dissolved phase PHC plume. In-well comparisons, over time, will provide the best indicator of whether anaerobic biodegradation is occurring. This evidence will be able to provide additional insight on our assessment of plume stability .

This discussion only reflects biodegradation of PHCs (BTEX and PHC fractions F1 to F4) and does not fully represent the biodegradation of VOCs, particularly 1,2 – DCA. This VOC, like PHCs, will undergo aerobic and anaerobic biodegradation. However, the mechanisms vary and would require, in part, a separate detailed discussion. In addition to biodegradation, 1,2-DCA will also undergo abiotic transformation as a mechanism of attenuation. This is discussed in the report summary for the May and June 2020 sampling event.

3.1.1.4 Conclusions

The data collected during this sampling event is generally consistent with previous sampling events. This groundwater monitoring and sampling program is part of the inferred plume monitoring and risk management component of the Revised Remediation Plan (Version 2.0).

This was the first event where LPH was not detected within the monitoring well network on Site.

From a risk management perspective, only one well, for one parameter (1-2 DCA) exceeded the Tier 2 Site-Specific Guidelines for the protection of human health. The well is an extraction well, EX-7, which would be expected to have higher concentrations as a result of drawing contaminated groundwater and soil vapour towards it for extraction and discharge.

The trend analysis on select monitoring wells with exceedances of PHCs and VOCs show that most of the wells are displaying stable or decreasing trends. However, there are still monitoring wells showing increasing trends for both benzene and 1,2-DCA which will require further investigation and monitoring. In addition to this, a preliminary decay rate assessment on select monitoring wells demonstrated a predicted clean up time of less than 15 years for all wells with the exception of one. The well which exceeded the 15-year timeframe was located downgradient of the recently installed permeable reactive barrier and it may take some time for the effect of the barrier to be observed at this location. In addition, it is important to note that there is still considerable uncertainty around these predicted timeframe ranges, and more data is required to reduce this uncertainty and increase the accuracy of the predicted timeframes.

Lastly, an initial assessment of natural attenuation has shown that dissolved oxygen concentrations are potentially high enough to promote aerobic biodegradation. Additional data will be required to perform a more accurate assessment of anaerobic biodegradation through reduction of nitrate, sulphate, iron, and manganese across the Site.

A full presentation of all the data from the Fall/Winter 2019/2020 program can be found in the report titled *2019 Fall Groundwater Monitoring and Sampling Event, Hounsfield Heights and Mall Areas, Calgary, Alberta* (30 April 2020) which is located on the Suncor Communication Website at http://www.suncor.com/hounsfield-heights under the 2020 tab at the link titled April 2020 – Groundwater Monitoring Report – Part 1 & 2.

3.1.2 May and June 2020 Monitoring and Sampling Event

Between May and June 2020, Clifton completed a groundwater monitoring and sampling event which consisted of collecting samples from 110 monitoring wells throughout the Hounsfield Heights and North Hill Mall areas. Prior to the sampling, all wells were monitored for depth to the groundwater and the total depth of the well in addition to measuring the organic vapour concentration of the well and determining if LPH was present. Sampling of the wells was completed using either a dedicated disposable bailer or a HYDRASleeve and in some cases both methods were used on a single well for comparative purposes.

Samples were submitted for analysis of BTEX, PHC fractions F1 to F2, VOCs and routine chemistry (select wells).

Upon receiving the groundwater results, they were compared to the AEP 2019 Tier 1 and 2 Guidelines for either commercial land use or residential/parkland land use for coarse and fine-grained soil, depending on the sampling location.

A summary of the results is presented below.

3.1.2.1 Results Summary

The monitoring results from the May and June 2020 event show the following inferred groundwater flow directions for each Unit:

- Unit 1: Southwest and Southeast
- Unit 2: South
- Unit 3: Southeast
- Unit 4: South/Southeast
- Unit 5: South/Southeast

The inferred groundwater flow directions were generally consistent with previous investigations.

No LPH was observed in any monitoring wells for the second event in a row.

Samples were obtained from 110 monitoring wells and were submitted for laboratory analysis of BTEX and PHC fractions F1 and F2 and VOCs. Of the BTEX and PHC fractions F1 and F2, benzene was the most frequently detected and was the parameter which most commonly exceeded the AEP 2019 Tier 1

Guidelines. With respect to VOCs, 1,2-DCA was the most frequently detected VOC and most commonly exceeded the AEP Tier 1 Guidelines.

Benzene has been detected in concentrations in excess of the AEP 2019 Tier 1 Guidelines in 29 monitoring wells across Units 1, 2 and 3. Concentrations of benzene ranged from below detection (<0.00040 mg/L) to a maximum of 2.5 mg/L in EX-5 (Unit 3). No exceedances of the Site-Specific Tier 2 Guidelines generated for the protection of human health through the vapor inhalation pathway for benzene, xylene(s) and PHC fraction F1 were observed.

1,2-DCA has been detected at concentrations greater than the AEP 2019 Tier 1 Guidelines in 26 monitoring wells across Units 1 through 4. Concentrations of 1,2-DCA on-site ranged from below detection (<0.001 mg/L) to 0.14 mg/L in EX-7 (Unit 3). No exceedances of the Site-Specific Tier 2 Guidelines generated for the protection of human health through the vapor inhalation pathway for 1,2-DCA.

3.1.2.2 Trend and Decay Rate Analysis: Benzene and 1,2-DCA

Clifton performed a Mann-Kendall Plume Stability Analysis (MK-PSA) to incorporate all monitoring wells across the entire Site that had been sampled at least four times and the most recent sampling event indicated an exceedance of the applicable guideline for either benzene or 1,2-DCA Two MK-PSA analyses were also completed on select permeable reactive barrier performance monitoring wells, pre and post barrier injection. In addition to this, Clifton performed an expanded decay rate analysis for wells which were showing a decreasing or probably decreasing trend and had a most recent concentration that exceeded the applicable guidelines. This analysis also excluded extraction wells currently in operation as they do not represent steady-state conditions (EX-4 to EX-7).

Based on the results obtained during the sampling event approximately 74% (81 of 110 wells) of the samples met the AEP 2019 Tier 1 Guidelines for benzene. A MK-PSA was completed on 32 monitoring wells for benzene. Of the monitoring wells not including the pre and post injection results, 24 of the 27 indicated either no trend, stable trend or decreasing trend. Three monitoring wells indicated an increasing trend. The trend analysis comparing pre and post barrier injection showed mixed results when compared to looking at the data as a whole. In some cases, a decreasing trend was observed before the injection. However, this was not observed after the injection; although concentrations after the injections were lower.

M-K PSA for Benzene	
Increasing	BH1910, BH1944, and BH2005
Probably Increasing	None
No Trend	BH1906, BH1907, BH1936 (before PlumeStop™ injections), BH1977, BH1929 (after

M-K PSA for Benzene	
	PlumeStop™ injections), and BH1936 (after PlumeStop™ injections)
Stable	BH1982 (after PlumeStop™ injections)
Probably Decreasing	BH1904, BH1911, BH1928 (before PlumeStop™ injections), and EX-3
Decreasing	BH1905, BH1912, BH1915, BH1921, BH1924, BH1925, BH1929 (before PlumeStop™ injections), BH1930, BH1939 (before PlumeStop™ injections), BH1956, BH1967, BH1971, BH1982 (before PlumeStop™ injections), BH510A, BH1704, EX-1, EX-2, EX-4, EX-5, EX-6, EX-7, and BH1939 (after PlumeStop™ injections)

Decay rate analysis was performed on 17 monitoring wells for benzene. Based on the results 8 of the wells are predicted to meet the guidelines within a 5-year timeframe, 2 wells within a 10-year timeframe, 3 wells within a 15-year timeframe and 4 wells are anticipated to take longer than 15 years to meet the applicable guidelines. There is a varying level of uncertainty associated with the estimated timeframes for each well which will potentially be further reduced by obtaining additional groundwater sampling data.

Based on the results obtained during the sampling event approximately 76% (84 of 110 wells) of the samples met the AEP 2019 Tier 1 Guidelines for 1,2-DCA. A M-K PSA was performed on 31 monitoring wells which showed an exceedance of AEP Guidelines in at least one of the four most recent sampling events. Of the monitoring wells not including the pre and post injection results, 24 of 26 indicated either no trend, stable trend or decreasing trend. Two wells showed a probably increasing or increasing trend. The trend analysis comparing pre and post barrier injection showed mixed results when compared to looking at the data as whole. In some cases, a decreasing trend was observed before the injection, however, this was not observed after the injection, although concentrations after the injections were lower.

M-K PSA for 1,2 – DCA	
Increasing	BH1910
Probably Increasing	BH2006

M-K PSA for 1,2 – DCA	
No Trend	BH1907, BH1928 (before PlumeStop™ injections), BH1929 (before PlumeStop™ injections), BH1937, BH1971, BH510A, EX-7, and BH1936 (after PlumeStop™ injections)
Stable	BH1906, BH1911, BH1912, BH1921, BH1981, BH1982 (before PlumeStop™ injections), BH1704, EX-2, and BH1982 (after PlumeStop™ injections)
Probably Decreasing	BH1939 (before PlumeStop™ injections), BH1967, EX-3, EX-5, and BH1929 (after PlumeStop™ injections)
Decreasing	BH1905, BH1915, BH1924, BH1925, BH1936 (before PlumeStop™ injections), BH1956, BH1974, EX-1, EX-4, EX-6, and BH1939 (after PlumeStop™ injections)

Decay rate analysis was performed on 10 monitoring wells for the compound 1,2-DCA. Based on the results of the 10 wells assessed, 4 are predicted to meet the guidelines within a 5-year timeframe, 5 wells within a 10-year timeframe, and 1 well is anticipated to take longer than 15 years to meet the applicable guidelines. There is a varying level of uncertainty associated with the estimated timeframes for each well which will potentially be further reduced by obtaining additional groundwater sampling data.

3.1.2.3 Natural Attenuation Assessment

The May and June 2020 monitoring and sampling event marked the second event where routine chemistry analysis along with downhole dissolved oxygen readings were completed on select monitoring wells to gather evidence to determine if natural attenuation through anerobic and aerobic biodegradation is occurring.

The concentrations of dissolved oxygen indicate that the conditions on Site are conducive to aerobic degradation which affects PHCs and 1,2-DCA. With the addition of ORC injections, the dissolved oxygen concentrations have been artificially increased to promote degradation in the area surrounding 11th Avenue NW and down-gradient. This may allow for the aerobic degradation of 1,2-DCA, which is not always possible as the dissolved oxygen demand of PHC degradation is high enough that little oxygen typically remains for the degradation of 1,2-DCA.

There is evidence that anaerobic degradation is occurring with the elevated concentrations of manganese and iron within the plume which is consistent with anaerobic manganese and iron reduction. However, the concentrations of nitrate were also greater within the plume which is inconsistent with anaerobic conditions and the concentrations of sulphate did not vary greatly between the extents of the plume and the plume

itself. Therefore, the available evidence as to whether the PHCs and 1,2-DCA may be undergoing anaerobic degradation is inconsistent.

With respect to biodegradation of PHCs and 1,2-DCA, it is important to note that not all parameters will degrade at the same rate. Biodegradation can happen through a number of different mechanisms and not all geochemical parameters will indicate strong correlations. Therefore, it will also be meaningful to provide an assessment of biodegradation by contaminant and use all evidence holistically. As presented in the Stability Analysis section of the report for this event, a trend assessment for benzene and 1,2-DCA was completed on some monitoring wells which were showing a decreasing trend. This assessment can be used as an additional line of evidence that under current conditions, and through the use of historical trends, the decay of the contaminants of concern is occurring as a result of natural attenuation. This will continue to be assessed in more detail as additional data is gathered.

3.1.2.4 Conclusions

The data collected during the May and June 2020 sampling event is generally consistent with previous sampling events. This groundwater monitoring and sampling program is part of the inferred plume monitoring and risk management component of the Revised Remediation Plan (Version 2.0).

This was the second event where LPH was not detected within the monitoring well network on Site.

From a risk management perspective, no wells for any parameters exceeded the Tier 2 Site-Specific Guidelines for the protection of human health. This was a decrease from the previous sample event where one well exceeded these guidelines for one parameter, 1,2-DCA.

The trend analysis on select monitoring wells with exceedances of PHCs and VOCs show that most of the wells are displaying no trend, stable, and or decreasing trends. However, there are still a few monitoring wells that currently show increasing trends for both benzene and 1,2-DCA which will require further assessment and monitoring, and will be included in the remedial options analysis slated for 2021. In addition to this, a decay rate assessment on select monitoring wells for benzene demonstrated a predicted clean up time of less than 15 years for 13 of the 17 wells. For 1,2-DCA, nine of the 10 wells assessed had a predicted time to reach the applicable guidelines in less than 15 years. It is important to note that there is still considerable uncertainty around these predicted timeframe ranges, and more data is required to reduce this uncertainty and increase the accuracy of the predicted timeframes.

Lastly, an initial assessment of natural attenuation has shown that dissolved oxygen concentrations are potentially high enough to promote aerobic biodegradation of PHCs and VOCs. Some of the data collected also suggests that anaerobic biodegradation may be occurring, although results are inconsistent depending on the geochemical markers being assessed. Lastly, an assessment of the abiotic transformation of 1,2-DCA did not provide strong evidence for or against this as occurring.

As more data becomes available, a more robust comparison of the biodegradation indicators with decay rates over time can be completed. This comparison will provide more insight into the effect of biodegradation on contaminant decay. Due to the installation of the PRB and the potential changes in the plume extents south of 11th Avenue NW, the monitoring wells used to represent the extents of the plume and the concentrations within the plume should be re-evaluated regularly. Intra and inter well comparisons, over time, will provide the best indicator of whether biodegradation is occurring and if it is occurring at what rate. This evidence will be able to provide additional insight on plume stability, reduction, and the primary mechanisms responsible for this.

A full presentation of all the data from the May and June 2020 program can be found in the report titled *2020 May and June Groundwater Monitoring and Sampling Event, Hounsfield Heights and Mall Areas, 1620-14th Avenue NW, Calgary, Alberta* dated 20 November 2020, which is located on the Suncor Communication Website at http://www.suncor.com/hounsfield-heights under the 2020 tab at the link titled November 2020 – Groundwater Monitoring Report.

3.2 Soil Vapour Sampling Program

In 2020, Clifton completed two Soil Vapour Sampling Program events. The first event was completed in January and February 2020, while the second event was completed in November and December 2020. A report for the November and December 2020 event has not yet been released and should be available in April 2021. The results from that event will be summarized in the 2021 Annual Report. During 2020, in addition to the semi-annual soil vapour monitoring program, the Contingency Plan sampling which was previously triggered by an exceedance within SV-32 was on-going. A summary of the January and February 2020 program as well as the Contingency Plan sampling program are summarized in the following sections.

3.2.1 General Methodology

A bottom-up approach to soil vapour characterization was selected by Clifton for the Site. Deep, near-source vapour sampling was completed first to assess the need for sub-slab vapour and potentially indoor air sampling. High spatial and temporal variability in soil vapour concentrations were anticipated as part of the design of the soil vapour sampling program.

In addition to assessment of possible soil vapour intrusion in the Mall Area around Kal-Tire, soil vapour characterization was focused in the Hounsfield Heights Area south of 11th Avenue NW, based on the following reasons:

- Intermittent, thin, or missing clay stratum.
- Imperfectly understood soil stratigraphy.
- Shallow water table; and
- High number of underground utility corridors.

The proposed sampling frequency for collection of soil vapour samples was semi-annually. The semi-annual sampling program should capture temporal fluctuations as a result of seasonal changes in the water table, as well as changing temperatures and saturation of the soil and groundwater.

The indoor air quality of structures on-site was predicted using measured soil vapour concentrations and a vapour attenuation factor specific to the soil type, land use, depth to contamination, and contamination source. Indoor air concentration criteria were developed based on key receptors and expected exposure times.

3.2.2 January and February 2020

Clifton completed the first event in 2020 between 20 January 2020 and 07 February 2020. Clifton personnel collected samples of subsurface soil vapour from a total of 44 soil vapour probes. All samples were submitted for analysis of BTEX, PHC fractions F1 and F2, naphthalene, and 1,2-DCA. Selected samples were also submitted for fixed gases (oxygen, nitrogen, carbon dioxide, and methane), which can provide an indication as to the degree of biodegradation taking place in the subsurface.

The results from the soil vapour sampling program were compared to the site-specific soil vapour quality guidelines (SVQG) generated for the protection of human health through indoor air quality. All samples were below the site-specific SVQG, including SV-32 which had an exceedance of three parameters in the Winter 2019 sampling event.

It was recommended in this report that future soil vapour sampling be focussed on areas including and south of 11th Avenue NW. Furthermore, it was recommended that the previous exceedance observed in SV-32 be investigated further by advancing two groundwater monitoring wells and an additional four soil vapour probes within the area which is summarized in Section 3.6.

A full presentation of all the data from the January and February 2020 program can be found in the report dated June 9, 2020, and titled *Soil Vapour Monitoring Report, Winter 2019/2020, Hounsfield Heights and North Hill Mall Areas, Calgary, Alberta*, which is located on the Suncor Communication Website at http://www.suncor.com/hounsfield-heights under the 2020 tab at the link titled Soil Vapour Monitoring Report – Part 1 & 2.

3.2.3 Contingency Plan Sampling

As mentioned in the previous section, during the Winter 2019 Soil Vapour Sampling event an exceedance of the site-specific SVQG for the following parameters in Soil Vapour probe SV-32 was observed:

- PHC Aliphatic Sub-Fraction C6 to C8;
- Naphthalene; and
- 1,2 – Dichloroethane.

As a result of this exceedance, the contingency plan as presented in the approved *Revised Soil Vapour Monitoring Program (Update Fall 2016), Hounsfield Heights and North Hill Mall, Calgary, Alberta (*20 October 2016) was implemented.

The Contingency Plan includes the following protocols:

- Increase sampling frequency of the soil vapour probe which contained the exceedance to quarterly events;
- Contact all residents within a 15 m radius of the observed exceedance and request access to their property for additional investigation which may include one of the following options:
  - Installation of a sub-slab soil vapour sampling point, followed by concurrent sampling of indoor air.
  - Installation of at least one, ideally two, external sampling points between their structure and the location of the exceedance.
  - Complete stand-alone indoor air quality sampling.
- If sampling is approved on private residences, provide a letter reporting the results to the homeowner.
- Continue the Contingency Plan sampling until five consecutive events of results have concentrations below the site-specific SVQG.

It should be noted that indoor air sampling results can be influenced by the presence of common household items such as cleaning solutions and furniture finishes, and it is therefore not fully recommended as a standalone sampling approach. Additional measures related to the contingency plan are presented in the Revised Soil Vapour Monitoring Program (October 2016). Changes to this plan including the removal of indoor air sampling have been implemented into the Revised Remediation Plan (Version 3.0).

3.2.3.1 SV-32 Sampling Results

Since the original exceedance, soil vapour probe SV-32 has been sampled an additional seven times. The dates of the sampling events and whether exceedances were observed are provided below:

- 20 March 2019: exceedance
- 16 May 2019: non-exceedance
- 22 August 2019: non-exceedance
- 12 November 2019: non-exceedance
- 29 January 2020: non-exceedance
- 10 June 2020: exceedance
- 06 July 2020: exceedance
- 18 November 2020: non-exceedance

In order to cease the contingency sampling frequency, a requirement of five consecutive non-exceedance events are required to return to semi-annual soil vapour sampling of the probe which showed the original exceedance. On the fifth event an exceedance of SV-32 was again observed. This was confirmed in a

second sample taken on 06 July 2020. As a result, the contingency sampling program has been continued. The next sampling event took place in November 2020. A report has not been prepared for these results. However, SV-32 did not show an exceedance during this event.

3.2.3.2 Supplemental Soil Vapour Probe Installation and Sampling

Following the initial implementation of the Contingency Plan, six residences were contacted to discuss potential access to their property for additional soil vapour investigation. Following the second exceedance of SV-32 in June/July 2020, residents which originally opted out of the Contingency Program sampling were once again contacted.

Only the original two homeowners who previously had soil vapour probes installed on their property chose to continue with the contingency sampling program. One of the residences who already had two probes within their property had one replaced in September 2020 as a result of landscaping changes to their property which required the abandonment of one of the previously installed probes.

Sampling has been completed in July 2020 and again in November 2020. Results from the private residences were below the Site-specific SVQG.

Individual reports were provided to the homeowners presenting the results of the sampling program completed on their property.

3.3 Dual Phase Vapour Extraction System Operation and Performance Testing

As part of the on-going remedial efforts at the Site, the continued operation of the DPVE system was recommended as a measure to reduce, to the extent practicable, any LPH within the community of Hounsfield Heights. A secondary objective of continuing to operate the DPVE is to remove contaminated groundwater and soil vapour from the subsurface, reducing the overall mass of PHCs within the subsurface.

The DPVE continues to operate on two extraction lines connected to four extraction wells (EX-4 to EX-7). Two of these extraction wells (EX-4 and EX-5) are located in close proximity to the only well (BH1704) on-Site which most recently showed the presence of mobile LPH accumulating in a monitoring well. No LPH has been observed within the monitoring well network since the Spring 2019 monitoring and sampling event. As part of the operations of the DPVE, monthly discharge reports are submitted to the City of Calgary. In 2020, a total of approximately 359,528 L of groundwater was extracted, treated and discharged to the City sanity sewer system.

During this time, an estimate of LPH removal based on a vapour equivalent was calculated as 1401 L between 13 February 2020 and 22 December 2020. It is important to note that these estimates rely on assumptions such as contaminant composition and density and external factors such as ambient pressures as well as data frequency and averaging which will have an impact on estimated volume removed.

Furthermore, these estimates assume all vapours are directly related to LPH when in fact they are also related to the dissolved phase PHCs and VOCs within the groundwater.

As a result, LPH removal is also gauged by observing the presence of it within the monitoring well network to determine if it is being reduced. In the Spring 2019 event an LPH thickness of 35 mm was observed in monitoring well BH1704. No LPH has been observed in any monitoring wells on Site in the three events since.

In February and March of 2020, Sequoia Environmental Remediation Inc. was retained to complete an assessment of the header network and pneumatic influence achieved by the system at select extraction wells.

The header network communication testing revealed the following highlights:

- Extraction line headers 1301,1303 and 1307, connected to extraction wells EX6/7, EX4/5 and EX1, respectively, are in sufficient condition to operate; and
- Extraction line header 1305 was in the worst condition, with moderate vacuum achieved at EX-3 and virtually no response at EX-2, suggesting a line break between EX2 and EX-3.

It is important to note that the system continues to operate on EX4 through EX7 where communication with the system appears sufficient to create an effective pneumatic influence. The damaged header line between extraction wells EX-2 and EX-3 will be repaired in 2021 along with any other recommended system adjustments/modifications/repairs which result from the LPH assessment and DPVE performance testing. Even though the operation of extraction wells EX1 through EX3 have currently not been deemed necessary, repairing this line will allow us to use EX-2 in the future, if required, along with EX-1 and EX-3.

The pneumatic influence testing completed by Sequoia revealed the following highlights:

- Approximate radius of influence of 42 m for EX-7, 34 m for EX-4 and 60 m for EX-3

In December 2020, Clifton initiated additional pneumatic testing to assess various operational modes of the DPVE system and drawdown testing associated with the operation of the DPVE to further evaluate the effectiveness of the system and areas for system performance optimization. This data along with a more in-depth summary of the Sequoia data will be used as part of the LPH assessment being completed in 2021 to determine the effectiveness of the DPVE and areas for optimization moving forward.

3.4 Revised Remediation Plan Finalization with AEP

Following the release of the Ministerial Order 09/2020 in February 2020, the previously accepted Revised Remediation Plan required updates.

In July 2020, the Revised Remediation Plan (Version 2.0) was submitted to AEP for acceptance. A summary of the changes to the Revised Remediation Plan (Version 2.0) from the previous version are as follows:

- Implementation of some of the Wyndham Report recommendations;
- Addition of remedial options analysis focused in Hounsfield Heights and Lion's Park;
- Updated communication strategy;
- Updated schedule of implementation; and
- Removal of indoor air sampling from Contingency Plan program.

In response to the submission of the Revised Remediation Plan (Version 2.0), AEP provided comments requiring additional information and updates in two separate letters, dated 23 September 2020 and 18 November 2020. A summary of the information request from AEP is as follows:

- Updated Conceptual Site Model (CSM) as per the Alberta Risk Management Plan Guide;
- Updated schedule for LPH assessment and remedial options analysis;
- Rationale provision for semi-annual groundwater monitoring and sampling;
- Clarification on Wyndham Report recommendations implementation; and
- Clarification on effective two-way communication strategy.

Clifton, on behalf of Suncor, responded to the AEP letters on 21 October 2020 and 04 December 2020. In February 2021, Suncor was contacted by AEP stating the responses provided satisfied their requirements and that the final remediation plan can be submitted for acceptance. The Revised Remediation Plan (Version 3.0) will be submitted to AEP for acceptance on 31 March 2021.

3.5 SV-32 Delineation

As a part of the Revised Remediation Plan (Version 2.0) a community-wide soil vapour sampling program has been carried out by Clifton since 2016. The sampling program is conducted in accordance with guidance provided in the Clifton prepared plan entitled *Sears Canada Inc., Revised Soil Vapour Monitoring Program (Update Fall 2016), Hounsfield Heights and North Hill Mall, Calgary, Alberta.* This Program was approved by AEP, utilizing an established network of soil vapour probes throughout the community.

Soil vapour inhalation is currently the only potentially active exposure pathway at the Site that could potentially lead to a deleterious effect for human health. Soil vapour sampling at the Site should thus continue until the exposure risk to the residents at the Site can be considered eliminated.

By the end of 2020, a total of eight community-wide sampling events had been executed at the Site providing data regarding soil vapour concentration distribution. There were no recorded exceedances for the investigated CoPCs in the soil vapour compared either to the Site-Specific SVQG protective of human health through indoor air quality, soil vapour remediation guidelines protective of indoor air quality for a

commercial building, or to the increased sampling frequency trigger values during these sampling events with the exception of the soil vapour probe SV32.

The soil vapour analytical laboratory results collected during the March 2019 and the June 2020 sampling events showed that vapour migration from groundwater or soil in the vicinity of soil vapour probe SV32 might be an active exposure pathway of concern for indoor vapour inhalation. Soil vapour probe SV32 is situated in the residential laneway between 15 and 14 Street NW close to the south east extremity of the Site. Based upon those findings, Clifton implemented the Risk Management and Contingency Plan, which included an additional environmental investigation focused on the potentially affected private properties near SV32.

Further to the implementation of the Risk Management and Contingency Plan, additional delineation in the areas surrounding SV-32 was also recommended. On 22 and 23 December 2020, Clifton supervised the advancement of 4 additional soil vapour probes and two additional groundwater monitoring wells in the vicinity of SV-32. Two of the vapour probes were installed to the north of SV-32, to a depth of 1.25 m, one directly within the ATCO gas utility corridor. The other two soil vapour probes were installed to the south of SV-32 at a depth of approximately 1 m. In addition to the soil vapour probes, two groundwater monitoring wells were installed within the laneway, one to the north and one to the south of SV-32 to determine if the potential source of the SV-32 exceedance was related to the vapours from the dissolved phase CoPCs within the area. A report documenting the installation of the additional soil vapour probes and groundwater monitoring wells has not yet been completed and should be available in April 2021.

The soil vapour probes and two new monitoring wells were first used in the March 2021 Contingency Program sampling event. The results from this investigation will be reported on in 2021 and a summary provided in the 2021 Annual Report.

3.6 Permeable Reactive Barrier (PlumeStop™) Performance Monitoring

Following completion of the full-scale application of the permeable reactive barrier (PRB) along 11th Avenue NW in December 2019, Clifton initiated a performance monitoring program. The performance monitoring program included bi-weekly sampling for the first quarter, followed by monthly sampling for the second quarter, followed by quarterly sampling for the remainder of the first year until returning to semi-annual sampling along with the existing monitoring well network.

Prior to injection, the following monitoring wells, located down-gradient of the injection location, were identifed as performance monitoring wells for the application of the PRB:

- BH1928, BH1929, BH1936, BH1937, BH1939, BH1954 and BH1982.

Four of these monitoring wells were used as performance wells during the previous two pilot studies, including BH1929, BH1937, BH1939 and BH1982. A performance monitoring program was initiated in January 2020 following the outline presented within the Revised Remediation Plan.

BH1939 and BH1982 had previously been the most consistent monitoring wells to have sample results exceed the Tier 2 Site-Specific Guidelines. These two monitoring wells have seen significant contaminant reduction following the pilot studies and full-scale application of the PRB. BH1939 results have now been below the AEP 2019 Tier 1 Guidelines for benzene for the last three sampling events. BH1982 still has results exceeding the AEP 2019 Tier 1 Guidelines for benzene and 1,2-DCA and BH1939 still shows exceedances for 1,2-DCA. The other five monitoring wells included in the program assessing the PRB effectiveness (BH1928, BH1929, BH1936, BH1937, and BH1954) currently show sample results below detection limits for benzene and 1,2-DCA with the exception of BH1954 which had a detectable concentration of 1,2-DCA, below the AEP 2019 Tier 1 Guideline value. Prior to the installation of the PRB, monitoring well BH1928, BH1929 and BH1936 all showed exceedances of the AEP 2019 Tier 1 Guidelines for benzene and 1,2-DCA.

The effectiveness of the PRB will continue to be assessed as part of the on-going groundwater monitoring and sampling program. A discussion of the performance of the PRB can be found in the report titled *2020 May and June Groundwater Monitoring and Sampling Event, Hounsfield Heights and Mall Areas, 1620-14th Avenue NW, Calgary, Alberta,* dated 20 November 2020, which is located on the Suncor Communication Website at http://www.suncor.com/hounsfield-heights under the 2020 tab at the link titled November 2020 – Groundwater Monitoring Report.

4.0 Data Gaps

Based on the work completed in 2020, the primary data gap is the extent of LPH within the community of Hounsfield Heights. Most recently, LPH has not been detected in any monitoring wells on site since Spring 2019. The wells which have historically contained LPH have either been decommissioned prior to the DPVE start-up or no longer show the presence of LPH. These wells are located directly adjacent to residential properties and therefore the LPH extent beyond the well locations beneath the properties to the south is currently unknown.

As part of the Revised Remediation Plan, and as referenced within the MO, a program to further define and delineate the LPH will be undertaken in 2021. This program will focus on drilling investigations within City of Calgary property in areas where LPH was previously identified, in addition to attempting to gain access to select private properties. The permitting process for wells to be advanced within City of Calgary property began in December 2020.

5.0 Future Work and Changes to Program

Based on the current Revised Remediation Plan (Version 3.0) as well as the requirements within the EPO and the MO, the following work in being proposed for 2021:

- Continued development of an effective two-way communication strategy between the parties and all stakeholders, particularly the residents of Hounsfield Heights;
- Continued use of the Suncor communication website which may be adjusted based on the developed communication strategy;
- Assessment of DPVE performance data and its effect on LPH;
- A delineation program for the presence of LPH within Hounsfield Heights;
- Completion of a Remedial Options Analysis;
- On-going groundwater monitoring, sampling and reporting as presented within the Revised Remediation Plan (Version 3.0);
- On-going soil vapour monitoring, sampling and reporting as presented within the Revised Remediation Plan (Version 3.0); and,
- Submission of an updated Revised Remediation Plan (Version 3.0) as per the MO.

Changes to program include:

- Focus of soil vapour sampling on areas south of 11th Avenue; and
- Removing MK-PSA, SourceDK and PRB performance from semi-annual groundwater reports and presenting this information within the subsequent Annual Reports to provide a more comprehensive review covering a larger data set.

The above scope of work follows the outlined approach presented within the Revised Remediation Plan (Version 3.0) as well as the requirements set forth in the EPO and MO. All technical work will be reported and made available to all stakeholders through the Suncor website.

6.0 Closure

This report was prepared by Clifton Engineering Group on behalf of Suncor Energy Products Partnership. It is intended for the sole use and exclusive use of and Suncor Energy Products Partnership, their affiliated companies and partners and their respective insurers, agents, employees and advisors (collectively known as Suncor). The material in it reflects Clifton Engineering Group best judgment available to it at the time of preparation. Any use that a third party makes of this report, or any reliance on or decisions to be made based on it, other than by Suncor, are the responsibility of such third parties. Clifton Engineering Group and Suncor accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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

No conclusions should be made based on this report regarding any concentrations of substances in other areas of the Site. Other Contaminants of Concern may be present at the Site in areas that were not investigated. Clifton Engineering Group accepts no responsibility for any deficiencies or inaccuracies in the information provided in this report that are the direct result of intentional or unintentional misrepresentations, errors or omissions of the persons interviewed, or information reviewed.

No environmental site investigation or remediation can wholly eliminate uncertainty regarding environmental conditions in connection with a property. This investigation is intended to reduce, but not eliminate the uncertainty regarding environmental conditions. Conclusions regarding the condition of the Site do not represent a warranty that all areas within the site and beneath structures are of the same quality as those sampled. Further, contamination could also exist in forms not indicated by the investigation.

The work was based in part upon the environmental quality guidelines and regulations in effect when the work was begun. Future regulatory changes may require reassessment of the findings of this investigation.

Copying or distributing this report or use of or reliance on the information presented within it, in whole or part, other than by Suncor, is not permitted without written consent from Clifton Engineering Group.

Reference List

Alberta Environment and Parks. 2019. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*.

Clifton Associates Ltd. 20 October 2016. *Revised Soil Vapour Monitoring Program (Update Fall 2016), Hounsfield Heights and North Hill Mall, Calgary, Alberta.*

Clifton Associates Ltd. 09 June 2020. *Soil Vapour Monitoring Report, Winter 2019/2020, Hounsfield Heights and North Hill Mall, Calgary, Alberta.*

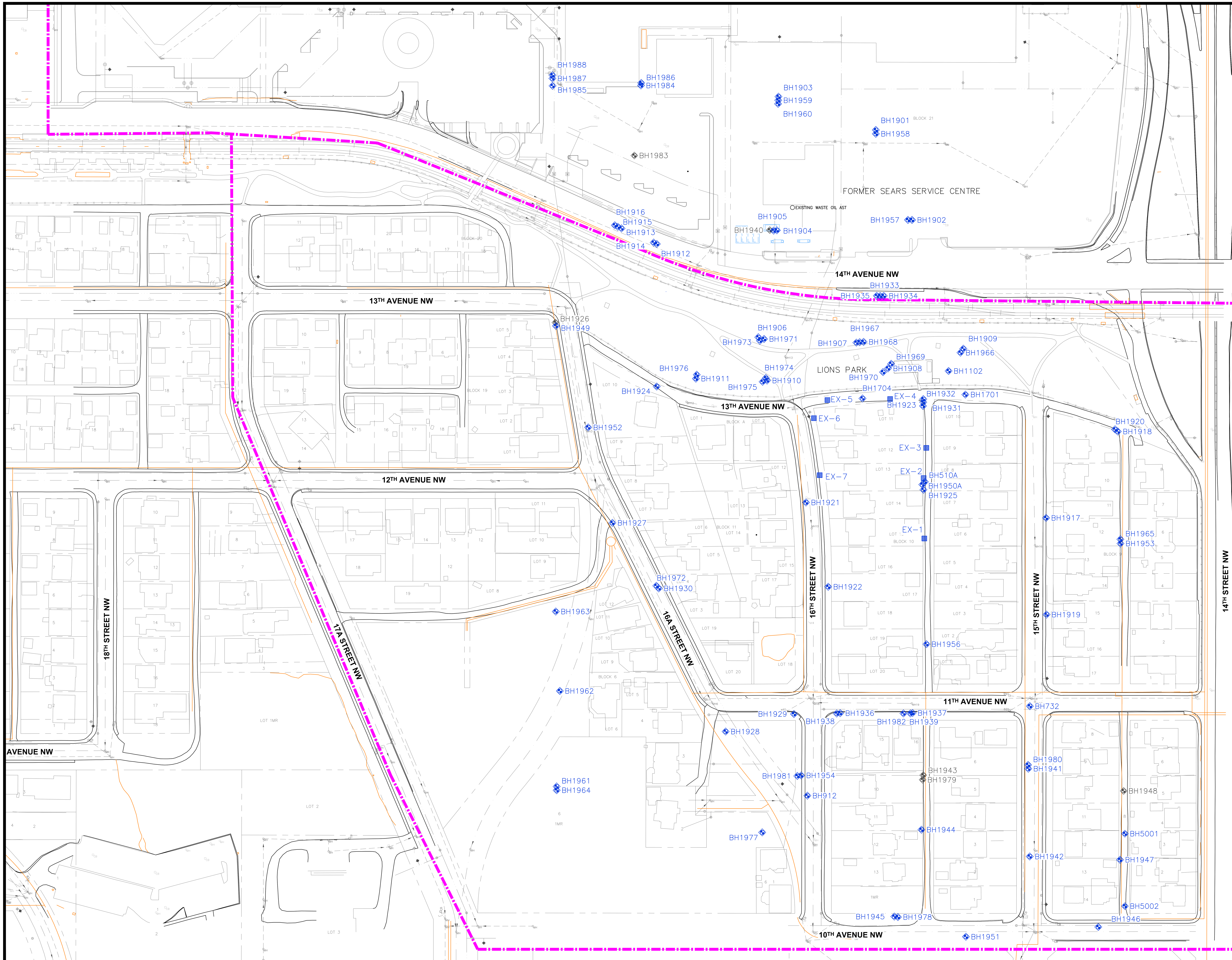
Clifton Associates Ltd. 30 April 2020. *2019 Fall Groundwater Monitoring and Sampling Event, Hounsfield Heights and Mall Areas, Calgary, Alberta.*

Clifton Associates Ltd. 23 November 2020. *2020 May and June Groundwater Monitoring and Sampling Event, Hounsfield Heights and Mall Areas, 1620-14th Avenue NW, Calgary, Alberta.*

Clifton Associates Ltd. 31 July 2020. *Revised Remediation Plan (Version 2.0), Hounsfield Heights and North Hill Mall, Calgary, Alberta.*

Appendix A
Figures

Clifton



LEGEND

- SITE BOUNDARY
- EXTRACTION WELL
- LRT TRACKS
- FENCE LINE
- LEGAL LINE
- FORMER FACILITY/FEATURE
- BUILDING
- GROUNDWATER MONITORING WELL
- BOREHOLE
- DECOMMISSIONED / MISSING MONITORING WELL

UTILITY LINES & SYMBOLS

- NATURAL GAS LINE
- SANITARY SEWER
- STORM SEWER
- WATER
- CATCH BASIN
- FIRE HYDRANT
- LIGHT STANDARD
- MANHOLE
- UTILITY POLE

NOTES:

1 DRAWING COMPILED FROM PLANIMETRIC FILES SUPPLIED BY THE CITY OF CALGARY (INCLUDING U/G UTILITIES) & FROM SITE ASSESSMENT INFORMATION. ADDITIONAL REFERENCES FROM SEACOR ENVIRONMENTAL ENGINEERING INC., DRAWINGS 149-5A11.DWG, 149-5A6.DWG.

0 10 20 30 40 50 m

PLOT SIZE 22x34

ENGINEER

Clifton

CLIENT

SUNCOR ENERGY PRODUCTS PARTNERSHIP

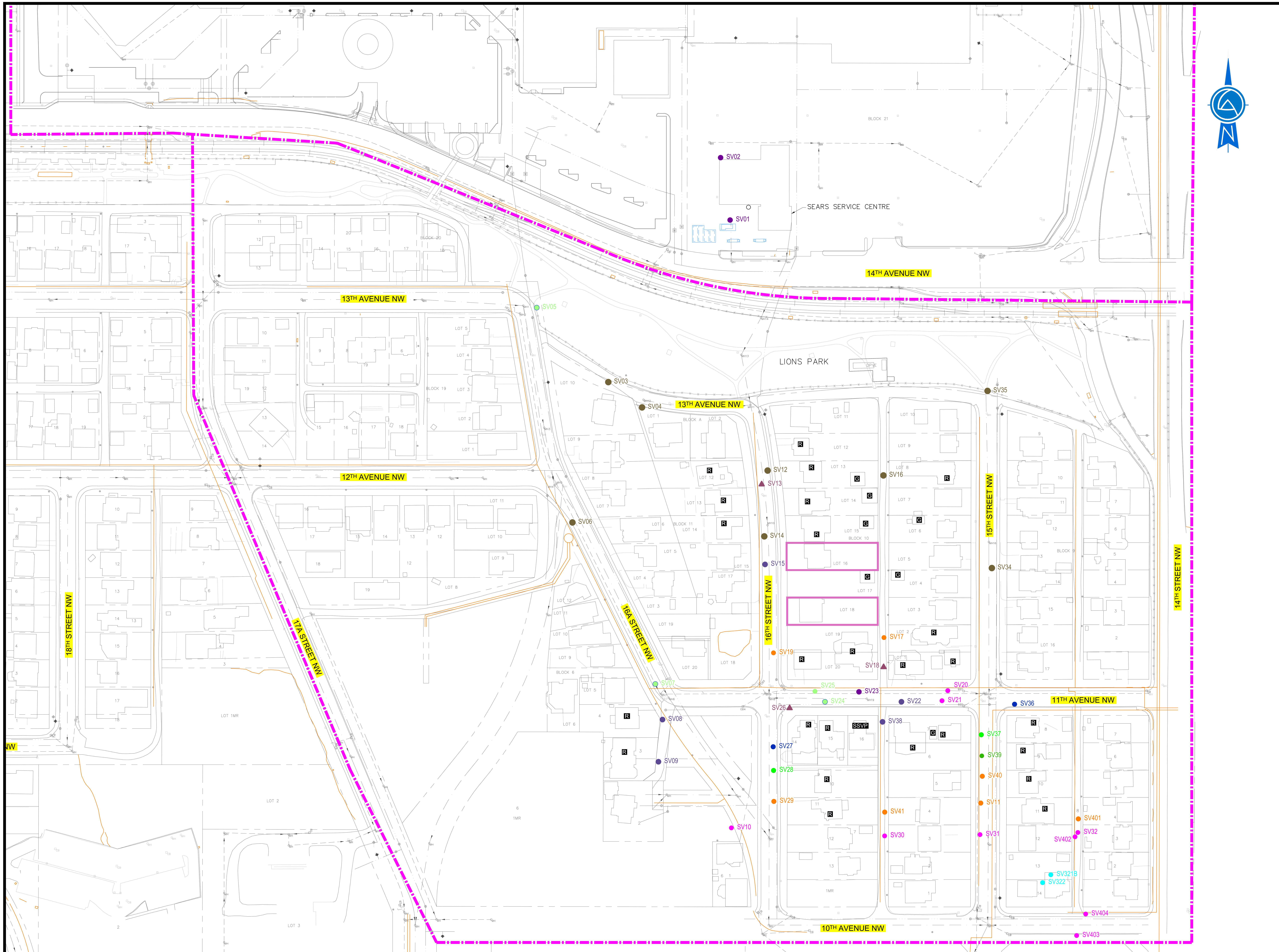
PROJECT

ANNUAL SUMMARY REPORT-2020
FORMER SEARS RETAIL SITE AND ADJACENT HOUNSFIELD HEIGHTS AREAS
1620 14th AVENUE, CALGARY, ALBERTA

TITLE

MONITORING WELL LOCATION PLAN

DESIGNED	SCALE	DATE
	1:1000	2021-03-31
DRAWN CC	PROJECT NO. CG3418-014	FIG. 1
CHECKED SDA	FILE NO. CG3418-014-01	



LEGEND

SITE BOUNDARY	
LRT TRACKS	
FENCE LINE	
LEGAL LINE	
FORMER FACILITY/FEATURE	
BUILDING	
SOIL VAPOUR PROBES INSTALLED AT 1.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 1.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 2.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 2.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 3.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 3.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 4.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 4.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 5.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 5.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 6.0 mbgs	SV#
NESTED SOIL VAPOUR MONITORING POINT	SV#
ADDITIONAL SOIL VAPOUR MONITORING POINTS INSTALLED IN MAY 2019	SV#
RESIDENTIAL STRUCTURES WITH REPORTED UNUSUAL FEATURES (EARTHEN FLOORS)	
RESIDENTIAL	R
DETACHED GARAGE	G
SUB-SLAB SOIL VAPOUR POINT	SSVP

UTILITY LINES & SYMBOLS

- NATURAL GAS LINE
- SANITARY SEWER
- STORM SEWER
- WATER
- CATCH BASIN
- FIRE HYDRANT
- LIGHT STANDARD
- MANHOLE
- UTILITY POLE

NOTES:

1 DRAWING COMPILED FROM PLANIMETRIC FILES SUPPLIED BY THE CITY OF CALGARY (INCLUDING U/G UTILITIES) & FROM SITE ASSESSMENT INFORMATION. ADDITIONAL REFERENCES FROM SEACOR ENVIRONMENTAL ENGINEERING INC., DRAWINGS 149-5A11.DWG, 149-5A6.DWG.

0 10 20 30 40 50 m

PLOT SIZE 22x34

ENGINEER

Clifton

CLIENT

SUNCOR ENERGY PRODUCTS PARTNERSHIP

PROJECT

ANNUAL SUMMARY REPORT-2020
FORMER SEARS RETAIL SITE AND ADJACENT HOUNSFIELD HEIGHTS AREAS
1620 14th AVENUE, CALGARY, ALBERTA

TITLE

SOIL VAPOUR PROBE LOCATION MAP

DESIGNED	SCALE 1:1000	DATE 2021-03-31
DRAWN CC	PROJECT NO. CG3418-014	FIG. 2
CHECKED SDA	FILE NO. CG3418-014-02	

W:\CG3418\!CURRENT DRAWINGS\CG3418-014\CG3418-014-02.dwg, 03/31/2021 2:26:11 PM

Clifton

Vancouver Office
#230, 171 West Esplanade
North Vancouver, BC
V7M 3J9
T (604) 283-9822

Calgary Office
2222 – 30th Avenue NE
Calgary, AB T2E 7K9
T (403) 263-2556
F (403) 234-9033

Edmonton Office
#101, 9636 – 51st Avenue NW
Edmonton, AB T6E 6A5
T (780) 432-6441
F (780) 432-6271

Lloydminster Office
#10, 6309 – 43rd Street W
Lloydminster, AB T9V 2W9
T (780) 872-5980
F (780) 872-5983

Regina Office
340 Maxwell Crescent
Regina, SK S4N 5Y5
T (306) 721-7611
F (306) 721-8128

Saskatoon Office
#4, 1925 – 1st Avenue N
Saskatoon, SK S7K 6W1
T (306) 975-0401
F (306) 975-1076

North Battleford Office
#2, 9802 – 27th Avenue
North Battleford, SK S9A 1K5
T (306) 445-1621
F (306) 937-3731

www.clifton.ca