

Aberdeen Groundwater Area Information Summary City of Kamloops

Current to: 2020 December 31



Canada's Tournament Capital

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INTRODUCTION

Purpose

Since 1995, the City of Kamloops (the "City") has received a large volume of documentary materials of a variety of descriptions and from a variety of sources pertaining to, broadly speaking, the issue of groundwater stability in the Aberdeen area of the City. From time to time, requests are made to the City for documentary information pertaining to the subject of "Aberdeen groundwater stability". Given the large volume of materials held by the City, it is not practical for the City to respond to such requests by providing a copy of its entire collection of documents relating to this subject.

The purpose of this Information Summary, therefore, is twofold:

1. To provide a historical summary of Aberdeen groundwater issues commencing in approximately 1995 and continuing to the date shown on the front (title) page of this document; and
2. To advise of the contents of the City's collection of such documents - a collection that is current to the date shown on the front (title) page of this document.

The City will endeavour to update this document from time to time, primarily to add updated reports to the listing in APPENDIX A, and to highlight significant events that may have occurred since the last update. The date of the most recent revision will be identified on the front cover of the report.

Disclaimer

This information summary provides an overview of the history of Aberdeen groundwater and slope stability issues. It should not be relied upon to answer specific questions about a given property or properties. By compiling this collection of documents the City hopes to assist persons, and the professionals they hire, to investigate ground stability issues in the Aberdeen area.

These documents were compiled over a number of years and any party reading them should be aware that:

1. Ground stability issues can vary over time;
2. Ground stability can be affected in a wide variety of ways, some of which may not have been considered in the enclosed summary report; and
3. **In providing these documents, the City of Kamloops is making no representations, nor providing any advice, assurances, warranties or guarantees of any kind with respect to current or future groundwater, slope stability, geotechnical or hydrological conditions, respecting lands in the Aberdeen area of Kamloops.**

Should you wish to have specific information about a specific property or properties regarding any of the matters mentioned above, you should consult a qualified, licensed professional experienced in geotechnical issues. You should not rely upon the enclosed information summary or consider it as advice from the City of Kamloops as to the suitability of any specific property located in the Aberdeen area. Specifically, without limiting the generality of what has been stated above, the City of Kamloops does not intend for the enclosed to be relied upon in any fashion or constitute any sort of representation as to the suitability of any property for:

- A. Purchase, sale, lease or any other transfer of an interest in property;
- B. The use or occupation of any property;
- C. Construction, renovation, subdivision or development of any kind.

If you require advice related to items "A", "B" or "C" above, you should contact a qualified professional.

Additional Document Requests

As noted above, the City maintains a collection of additional documents pertaining to Aberdeen groundwater stability. Part of the purpose of this Information Summary is to assist interested parties in accessing additional documents. These additional documents are listed in the Appendices to this Information Summary. Requests for additional documents must be made in writing to the City. Production of requested documents will be made at a cost of 25 cents per page to interested parties; or at the rate charged for Minutes of Council Proceedings as revised by City By-law.

HISTORY*

*This entire History section very strongly references a report on this subject prepared by Golder (2006 Stability Review, Aberdeen Development Area, Kamloops, BC, Golder Associates Ltd., September 21, 2007) and in many cases, text and figures for this report were taken directly from that document.

The 1995 Van Horne Slide

Development of the Aberdeen area of the City of Kamloops began in or about the late 1970s, mostly starting in the lower central area and spreading outward from there. The development was supported by extensive geotechnical work provided by Kohn Leonoff on behalf of Dominion Construction Properties Ltd. (the legal names of both these entities have since changed).

"On 29 March 1995, Golder Associates Ltd was asked to inspect and comment on pavement distress noted by City of Kamloops personnel on both Howe Road and Van Horne Drive, located just east of the intersection of those two roads within the Aberdeen District of Kamloops, BC" (Letter Report to City of Kamloops RE: Preliminary Geotechnical Summary Investigation of Ground Movement Van Horne Drive Kamloops, BC, Golder Associates Ltd., August 9, 1995).

In 1995, ground movement affected a cluster of homes over a limited area south of Howe Road and just east of the Howe Road-Van Horne Drive intersection, this movement being subsequently referred to as the Van Horne Slide. The approximate boundaries of the Van Horne Slide are identified on Figure 1.

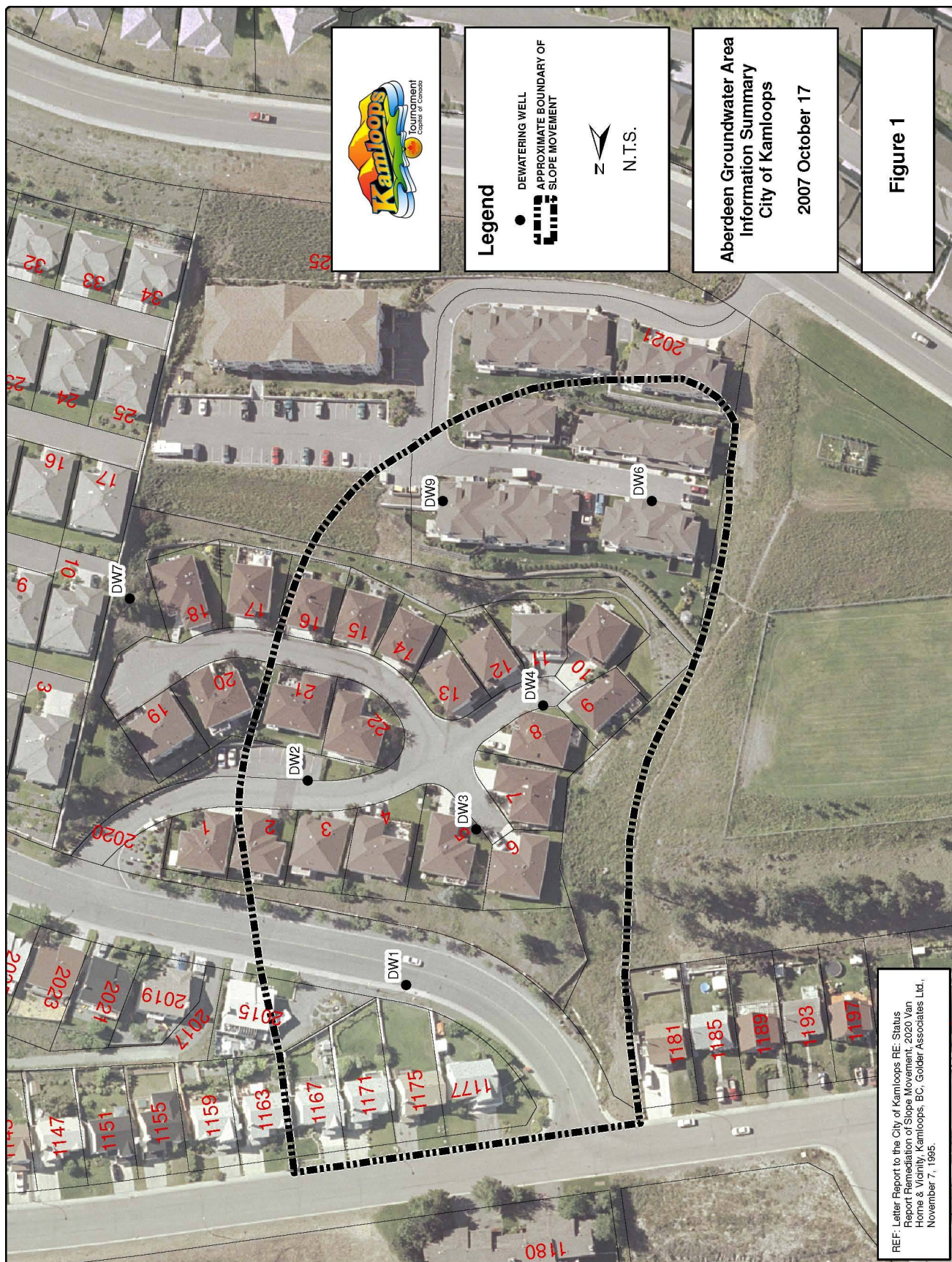
"Based on available physical evidence, the houses located either within the area affected by ground movement or at highest risk of being affected by ground movement now include the following units:

<i>Howe Road: 1167, 1171, 1175, 1177</i>
<i>2015 Van Horne</i>
<i>2020 Van Horne: Units 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22</i>
<i>2021 Pacific Way: Units 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12</i>

Houses which should be added to the area of observation due to their proximity to the identified zone of ground movement include:

<i>Howe Road: 1163 and 1181</i>
<i>2020 Van Horne: Units 1, 17, and 20</i>
<i>2021 Pacific Way: Units 13, 14, 15"</i>

(Letter Report to City of Kamloops RE: Updated Listings of Homes Affected by Slope Movement 2020 Van Horne and Vicinity Kamloops, BC, Golder Associates Ltd., September 29, 1995).



Emergency remedial treatment of the Van Horne Slide by Golder Associates Ltd. (Golder), acting for the City of Kamloops (the "City"), involved installation of 13 pumped wells. By early 1996, the Van Horne Slide had been effectively stopped.

The Provincial Emergency Program (PEP) compensated homeowners of affected properties damaged from the Van Horne Slide. Property owners were requested to follow the City of Kamloops building permit application process for building repairs and/or structural alterations. During the application process and following site inspections, structural alteration repairs resulted in restrictive covenants being prepared by the City of Kamloops Building Inspection Division. It was the responsibility of the property owner to have the covenant registered against the title at the Land Title Office.

1996 to 2012

In the post-1995 period, new developments in Aberdeen have largely consisted of in-fill construction within the existing developed areas, and new subdivisions to the south and upslope of the older existing developments.

The unexpected occurrence of the Van Horne Slide caused the City to seek detailed reassessment and confirmation of large scale ground stability in all parts of Aberdeen. From 1996 to 2004, Klohn Crippen Consultants Ltd. (Klohn), working on behalf of Bentall Real Estate Services, and in cooperation with the City, conducted a staged series of investigations and stability assessments starting with core areas and later expanding to the margins of the Aberdeen Development Area. The objective of the assessments was to evaluate the stability condition of each area (for large scale stability issues only), and to implement remedial treatment where required based on adopted stability objectives.

In October 2003, Klohn issued Stage 2 of the Perimeter Study (Klohn, 2003), and in December 2004, Klohn issued the 2002/2003 Stability Study (Klohn, 2004). Together these documents concluded that, for the evaluation period selected for each stability section (mostly either March to June 2002, or October 2002), the stability objectives had been achieved in the assessed areas. This finding demonstrated that it was possible, with diligent use of pumped wells for dewatering treatment of some areas, to achieve the stability targets in all the assessed areas. The assessed areas did not include Van Horne, which had been studied by Golder.

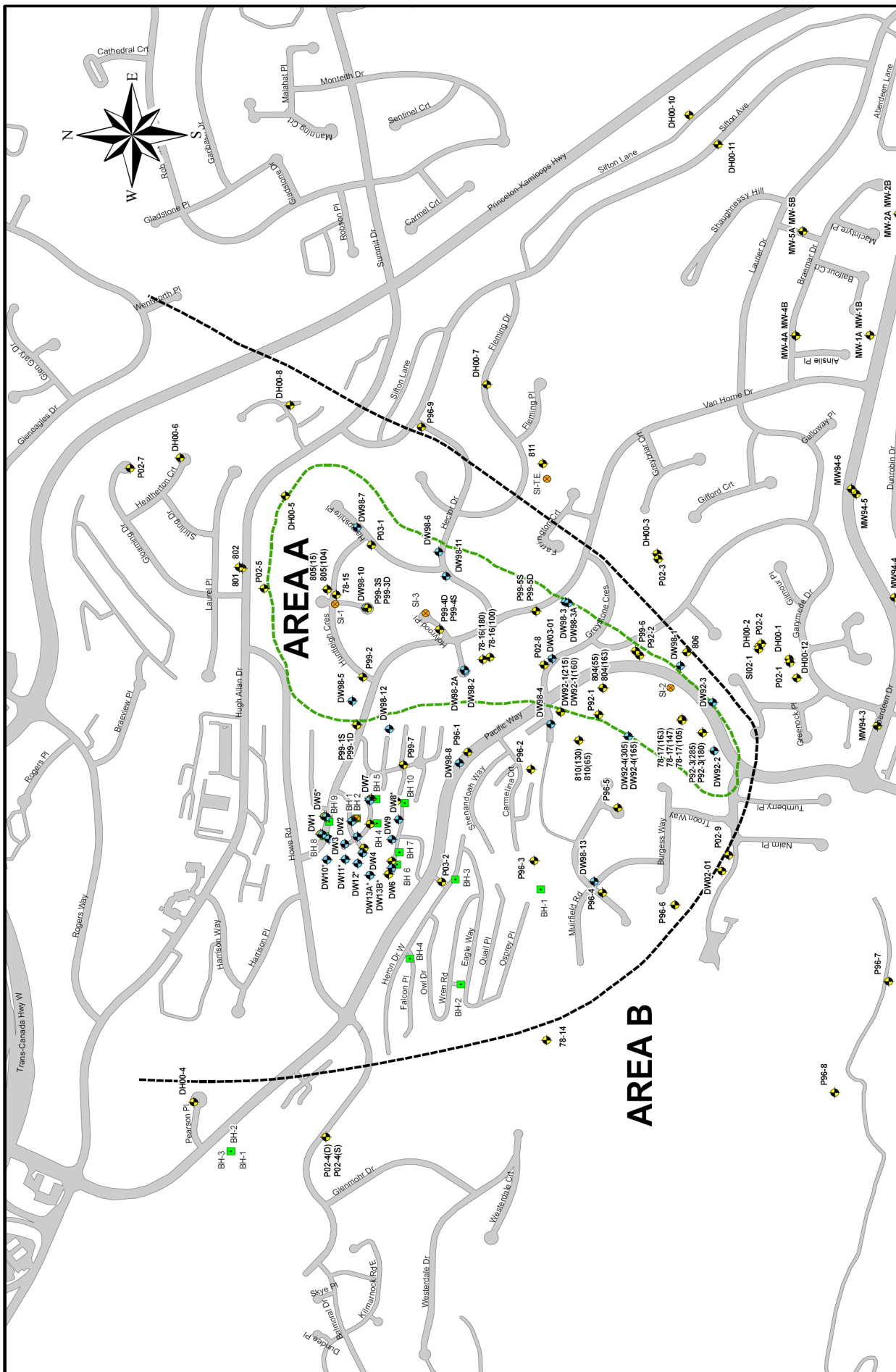
While the Klohn stability studies were in progress, Golder retained Geotex Consultants Ltd. (Dr. Peter Read) on behalf of the City to prepare geological mapping of the Aberdeen Development Area (Geotex, 1996). Golder also developed a regional hydrogeological model (numerical model) for the Aberdeen area (Golder, 2003). The geological mapping effectively defined the limits of the study area as only areas underlain by Tertiary (Eocene-age) Kamloops Group Bedrock that are considered susceptible to large scale instability under adverse conditions of slope, groundwater pressure and geology. As groundwater pressure is the key variable which may alter stability over time, the Golder groundwater model is a tool that can be used on a regional scale to assess the impact of past or future development and to investigate treatment options.

A large portion of Aberdeen is dependent on continuous effective treatment for maintaining stability. Should treatment stop, it is anticipated within several days of the

termination of treatment that the calculated driving and resisting forces will become about equal and the slope will be at incipient failure. Although proven effective at maintaining stability, the existing treatment system is complex, has limited redundancies and limited automated back-up systems. The treatment system requires continuing careful monitoring and constant maintenance.

Starting with 13 wells installed to stabilize the Van Horne Slide, the number of pumped wells used for stability treatment in Aberdeen has increased over time to 30, currently with 14 located in the Van Horne Slide area. The other wells are installed and operating at selected locations in Aberdeen within Area B with most of them completed in or around Area A. In addition to the dewatering wells, there are 103 piezometers distributed through the Aberdeen Area, with 25 additional piezometers in Van Horne. The piezometers and boreholes have provided detailed information on the local geology and hydrogeology and continue to provide information regarding piezometric (groundwater) pressures in the Aberdeen Area. Six slope indicator casings, used to monitor and measure movement of the slope, are installed and monitored within boreholes adjacent to the Van Horne Slide. The approximate boundaries of Areas A and B, and the approximate locations of dewatering wells, piezometers and slope indicators are shown in Figure 2.

While Area A is interpreted to be an ancient slide feature not known to have moved in recent times, Area B is simply a topographic expression which contains most of the areas of stability interest. Areas of stability interest and review which are located outside of Area B are commonly referred to as "Perimeter" areas. (2006 Stability Review Aberdeen Development Area - Golder Associates Ltd. - Sept 2007)



Legend

- ◆ De-watering Wells
- ◆ Inclinometer Casings (SI)
- Piezometers
- Boreholes
- Extent of Area A
- Extent of Area B

REFERENCE

Base mapping provided by City of Kamloops, GIS Department (2004).

AREAS A & B



PROJECT No.	06-1430-188
SCALE:	AS SHOWN
REV.	0
DRAWN	BL
CHECK	BB
REVIEW	NS
	Aug 10, 2007
	Sep 21, 2007
	Sep 21, 2007

FIGURE 2

2012-2020 Aberdeen Stability Reviews (Golder Associates)

Golder Associates Ltd. (Golder) has conducted a geotechnical review of ground stability in Aberdeen based on groundwater pressures recorded during the assessment period ending December 2019. Stability reviews are completed annually by Golder as part of the City of Kamloops Risk Management Plan for Aberdeen Ground Stability. The requirement to update the stability assessments for Aberdeen was based on the observation that, since 2002, groundwater pressures have increased in some parts of Aberdeen.

Golder's 2019 stability review replicated the 2018 stability calculations. Except where new data was available, the Golder stability review used the same stability assessment regions, stratigraphy, strength values, potential sliding surfaces, and calculation method, but included the 2019 groundwater pressure data.

Updates to the monitoring program have included:

- The installation of vibrating wire piezometers in 28 boreholes where piezometers had been subject to artesian pressures which prevented the acquisition of reliable groundwater pressure readings or to facilitate better access to data following development.
- Radio-read frequency water meters were installed in all dewatering wells in 2011. The new water meters allow for more accurate flow monitoring and more efficient data collection methods.
- Four dewatering well replacements in 2015/2016.

Calculated factors of safety from the 2019 stability analysis meet or exceed the stability targets for all assessed areas, except for Van Horne. Although Van Horne has been stabilized since 1996, the results of analysis indicate that Van Horne has never met the standard stability targets for Aberdeen since the 1995 slide, despite treatment by half of the pumped wells in Aberdeen. The stability of all sections, including Van Horne is reviewed annually.

Although the findings were of generally acceptable stability in the Aberdeen Area, those areas under treatment are dependent on continuous treatment to maintain margins of stability. Should treatment stop for an estimated five to ten days, it is anticipated that ground movement could result in some parts of Aberdeen currently under intensive treatment. This very preliminary estimate of five to ten days is not site specific and is based on the observation that the average time to 80 percent recovery in piezometers when adjacent wells are turned off is about five days, and that the average time to full recovery is about 15 days.

August 2007 - Moving Forward - Council Policy EDS-16

Council Policy EDS-16 Technical Criteria for Development Conditions in the Aberdeen Hills Neighbourhood, 1995 November 21 (as amended 2000 December 12) has been adopted in response to the conditions present in the Aberdeen area. This policy, included in Appendix B, provides development processes to be followed in the Aberdeen area. It has been the catalyst for many of the monitoring devices installed and used to

evaluate the ongoing stability of the Aberdeen area, numerous technical studies, and departmental procedures applied when approving development.

Technical studies required by Policy EDS-16 commonly result in covenants being applied to properties at the time of development. These covenants are typically applied at the time of Subdivision and are commonly (re-)enforced at the time of Building Permit. Examples of restrictions that have been registered against properties in Aberdeen are covenants that:

- Ensure cut and fill balances (i.e. no net change in the volume of soil) to maintain stability.
- Prohibit the installation of swimming pools.
- Ensure roof drainage connects directly to the City's municipal storm drainage system, preventing water from getting into the ground.
- Covenants restricting the amount of water used for irrigation.

Most recently, EDS-16 was applied to the Aberdeen Hills Development Corporation lands (AHDC) during development of the former Aberdeen Golf Course. To allow evaluation of the impacts of a proposed 50-60 ha development site in that area, an approximate 23 ha test area was defined. The test area was granted residential development approval before allowing full build out of the C5 zone under certain conditions and while undergoing strict requirements in terms of monitoring downslope groundwater and stability conditions. Conditions of the test area development site consisted of the installation of subsurface seepage collection systems, installation of monitoring devices in storm drains so that groundwater removal flows could be measured, installation of piezometers and monitoring of groundwater pressures. This allowed a comparison of conditions before and after development and a determination of impact on groundwater and slope stability. Satisfactory results of the test area (no assessed increase in downslope or on site piezo pressures), means that further development of the C5 zoned property west of the test area may be granted.

Capital Projects

When deemed necessary, projects are included in the City of Kamloops Five Year Financial Plan to address ground stability in the Aberdeen area. For example, approximately \$0.5 million is forecasted over the next five years for the installation of replacement dewatering wells.

Risk Management Plan

As part of the ongoing management and monitoring of groundwater and stability in the Aberdeen area, the City worked with Golder to develop a Risk Management Plan in 2008. The Risk Management Plan is a formalization of management practices and requirements that the City already undertakes, compiled into a concise and prescriptive format. It allows City staff to track data and conditions and ensures any required management activities are completed within set time periods. These activities include weekly monitoring, biannual testing, and annual stability studies.

To supplement the Risk Management Plan, the City installed a Genset (backup electrical power) in the Van Horne area in 2008. The Genset serves a cluster of dewatering wells

whose function is important to overall stability. If a large-scale power loss ever occurred in the Aberdeen area or in the City of Kamloops, this Genset will ensure these wells still have power to perform their duty. In addition, a contract to supply backup genset power to the remainder Aberdeen wells was secured in early 2011. All wells are now equipped with provisions for back up power via the onsite genset and electrical contract.

The first decade of the Risk Management Plan has been successful. The adopted RMP procedures allow for accurate tracking of data, maintenance records, and management activities. The Risk Management Plan is considered an integral component of the Aberdeen Groundwater Program.

Civic Operations Department

Operations and maintenance programs and procedures have been adopted by the City of Kamloops Civic Operations Department to monitor, operate, and maintain infrastructure associated with the groundwater and stability of the Aberdeen area.

Leak detection is performed by the Utility Services Division of the Civic Operations Department to identify leaks that may occur in the municipal domestic water supply system. A portion of the leak detection program includes checking the water distribution system in the Aberdeen area. The program is funded through the annual operating budget.

A groundwater de-watering well pump maintenance program is also a component of the Utility Services Division's annual operating budget. Technicians are on staff and contractors are available to facilitate the repair and/or replacement of de-watering pump systems.

A monitoring program which includes regular piezometer readings is also performed by the Civic Operations Department. The monitoring is performed by the Environmental Services Division and funded through their annual operating budget. Information gathered by this monitoring program is uploaded to the eFacility program described in subsequent sections of this report.

SUMMARY OF ADDITIONAL INFORMATION

Considerable maintenance, monitoring, and analysis effort has been expended to address the Aberdeen Groundwater Area, and along with it, a very large compilation of data and information has accumulated over the years. Information has been separated between digital and hardcopy data. Hardcopy data refers to the paper version of the information gathered and stored; digital is that data stored using an electronic media. As a general rule the digital data are related to ongoing monitoring and maintenance while the hardcopy data are more associated with historical reports. The following is a basic summary of the information that has been gathered.

Digital Data

There are three primarily digital systems used by the City to capture and store data on the monitoring and dewatering facilities related to the Aberdeen Groundwater Program; eFacility™, GIS, and SCADA. The focus of these systems is the collection and storage of data for ongoing monitoring, operations and maintenance purposes. Additional information on these systems can be obtained by contacting the City of Kamloops Development, Engineering and Sustainability Department.

eFacility™

Implemented by the City in May 2006, eFacility™ is an extranet application developed to undertake the management of different types of spatial data associated with one or more facilities. A facility is any location where spatial data, GIS maps and documents come together; a facility can be a manufacturing plant, transport depot, landfill, gold mine or even a process. Data examples include environmental monitoring data from boreholes, air monitoring equipment and river sampling, data collected during asbestos surveys through to compliance and audit data collected across an organization's facilities.

Some of the capabilities of eFacility™ are listed below:

- The user interface features fully functional interactive maps (zoom, pan, select etc.) and/or aerial photographs, both from country level down to sub-facility level.
- All data are stored in and retrieved from a database. This allows an administrator to easily add new facilities, remove old ones, add documents, import survey data, etc., without having to update the code.
- The maps and graphs are generated as needed so any new data (site locations, sample locations, etc.) are automatically included and therefore viewable immediately after the database has been updated.
- The application features a searchable document management system to allow the user to locate and view electronic documents such as a facility's repair history or a survey report. The search can be by facility or across the whole dataset.

The City of Kamloops eFacility™ Management Centre is the primary web-based tool used by project Consultants and the City of Kamloops for recording and tracking information relating to the various boreholes, piezometers, and dewatering wells used within the City of Kamloops. This website provides the following type of information:

- Basic facility details and primary contact information;
- Interactive maps of the facility;
- Aerial photographs;
- Borehole information;
- Piezometric pressures;
- Dewatering flow rates and pump hours;
- Other sampling results; and
- Reports.

City of Kamloops GIS Mapping

Geographic Information System maintained by the City of Kamloops, with respect to the Aberdeen Groundwater Program is primarily a spatially referenced database of the various boreholes, piezometers, and dewatering wells installed within the City of Kamloops.

The layout plan for Aberdeen was created under the Capital Assets Management Program in February 2009, is updated regularly and reflects all City-owned wells and piezometers that are currently part of the groundwater monitoring program.

City of Kamloops SCADA

SCADA is the acronym for Supervisory Control and Data Acquisition, however the SCADA system related to the Aberdeen Groundwater Program is primarily a data acquisition system and has little to no supervisory control capabilities. Data are collected through this system for a limited number of wells near Van Horne Drive. The data collected is primarily pump run times.

Hardcopy Data

Hardcopy Data have been summarized in the Appendices. The information was collated through a search of City of Kamloops records. A reasonable effort has been made to ensure this list includes as many of the documents relevant to the Aberdeen Groundwater Area as possible; however, it should not be taken as an exhaustive list of all the information available to the City on this topic. For instance, Appendices A and B do not include information from: Civic Operation Department files, Engineering Records (Design Drawings) Division files, and filing systems at Development, Engineering and Sustainability Department such as Development Application Files, Subject Files and Address Files, to name a few.

Appendix A is a summary of reports compiled by the City of Kamloops that have some relevance to the Aberdeen Groundwater Program. The list is a compilation of listings from the City of Kamloops Development, Engineering and Sustainability Library, the City of Kamloops Legislative Services Library and the City of Kamloops digital record database (KRIMSON). Access to the documents in Appendix A may be obtained by

contacting the City of Kamloops Development, Engineering and Sustainability Department.

Council Meetings

On occasion, there are items on the Council Agenda of regular meetings that may have relevance to Aberdeen and the Aberdeen Groundwater Area. The Council Agenda and Council Minutes can be accessed at www.kamloops.ca, or by contacting City Hall at 250-828-3311, or info@kamloops.ca.

APPENDIX A

List of Reports - Aberdeen Groundwater Area

(Last Updated December 31, 2020)

KID.	Title	Author	Publication Date
210239	Aberdeen Estates General Development Plan	Urban Systems Ltd.	1984 January
204851	Aberdeen Hills Community, Development Guidelines	Don Vaughan and Associates	1979 October
210254	Aberdeen Hills Community, General Development Plan	Urban Systems Ltd.	1982 April
204854	Aberdeen Hills Community, Transportation and Access/Land Use Assumptions	Zoltan Kuun Associates	1979 October
204850	Aberdeen Hills - Revised Outline Plan - Preliminary	Dominion Construction	1977 September
204855	Aberdeen Hills Stage IV, Conceptual Plan and Proposed Zoning	Urban Systems Ltd.	1981
212292	Comprehensive Development Plan	City of Kamloops - Development Services Department	1990 January
204875	Crown Land Development Concept - Kamloops South - (Final)	Associated Engineering Services Ltd.	1974 September
204882	Crown Land Kamloops South - Development Concept Third Stage	Dunhill Development Corporation Ltd.	1975 August
204883	Crown Lands Kamloops South - Development Concept	Dunhill Development Corporation Ltd.	1975 April
205116	Southwest Sector Kamloops Outline Plan	Stanley Associates Engineering Ltd.	1970 February
205114	Southwest Sector Plan	City of Kamloops - Planning Department	1980 December
205115	Southwest Sector Plan	Stanley Associates Engineering Ltd.	1974 September
210852	Aberdeen Borehole Logs 1995 Investigatory and Remedial Drilling Program South of Howe Road and Van Horne Intersection	Golder Associates Ltd.	1996 March
214534	Aberdeen Drive Area - Standpipe Installations for Monitoring Groundwater Elevations	Golder Associates Ltd.	1993 November
210851	Aberdeen Groundwater Monitoring Record Investigatory and Remedial Drilling Program South of Howe Road and Van Horne Intersection	Golder Associates Ltd.	1996 March
210854	Aberdeen Groundwater Study - Evaluation of Data Collected in 1983, 1984 and 1985	Aquaterre Consultants Inc.	1985 December

KID.	Title	Author	Publication Date
211716	Aberdeen Hills Subdivision, Guerin Creek Storm Drainage Investigation	Stanley Associates Engineering Ltd.	1979 April
214649	Aberdeen Hills Surface Drainage System Study	Urban Systems Ltd.	1981 February
211720	Aberdeen Subdivision Groundwater Seepage Investigation	Aquaterre Consultants Inc.	1983 August
210853	Aberdeen Subdivision Groundwater Seepage Investigation	Aquaterre Consultants Inc.	1983 December
212075	Groundwater and Soil Sampling Procedures, Recommended	Environment Canada	1976 June
212076	Guerin Creek Basin Drainage Study	Watson Engineering Ltd.	1979 September
212086	Guerin Creek Master Drainage Plan	Dayton and Knight Ltd.	1983 February
211999	Guerin Creek Proposed Geotechnical Detention Pond Design and Slope Stabilization	Golder Associates Ltd.	1983 October
217234	Aberdeen Drive at Van Horne Drive - Proposed Booster Station Soil Investigation	Golder Associates Ltd.	1982 December
217236	Aberdeen Hills Development Flexible Pavement Evaluation - Soil Conditions	Klohn Leonoff Consultants	1977 May
210753	Aberdeen Hills Development, Recommendations for Phase 4, Stage 1, Review of Stability	Klohn Leonoff Consultants	1980 April
217238	Aberdeen Hills Development Review Reports and Geotechnical Data	Klohn Leonoff Consultants Ltd.	1977 May
217239	Aberdeen Hills Development Site Stability	Klohn Leonoff Consultants Ltd.	1977 August
217241	Aberdeen Hills Seepage and Runoff Control Measures	Klohn Leonoff Consultants Ltd.	1978 April
217242	Aberdeen Hills Seepage Cut-off Trench, Additional Piezometer Installations and Test Pits	Klohn Leonoff Consultants Ltd.	1978 September

KID.	Title	Author	Publication Date
210752	Aberdeen Hills Slope Depressurization Project Implementation of Piezometers and depressurization wells	Klohn Leonoff Consultants Ltd.	1992 October
210830	Hector and Hampshire Drives, Aberdeen Hills Community - Geotechnical Study	Golder Associates Ltd.	1984 July
284347	Highway 5 Extension - Differential Movement - Soil Investigation	Golder Associates Ltd.	1983 June
79729	Aberdeen Hill Outline Plan	Dominion Construction	1974 May
204850	Aberdeen Hills Revised Outline Plan, Preliminary	Dominion Construction	1977 September
297248	Aberdeen Estates Water Line (Versatile Line) - Corrosion Investigation Survey	Caproco Corrosion Prevention Ltd.	1983 September
297429	Aberdeen Hills Properties Water Supply Report	Domco Engineering	1976 September
297426	Aberdeen Hills - Report on Water Supply and Sanitary Sewerage	Stanley Associates Engineering Ltd	1974 January
297430	Aberdeen, Proposed 2480 Reservoir - Geotechnical Investigation	Golder Associates Ltd.	1982 December
299375	Southwest Sector Hydraulic Model	Stanley Associates Engineering Ltd.	1995
297717	Southwest Sector Servicing Study	Stanley Associates Engineering Ltd.	1981 October
297719	Southwest Sector Water Line - Cathodic Protection Installation and Adjustive Survey Report	Commonwealth Seager Group	1978 July
297739	Southwest Sector Water System - Phase II, Aberdeen Hills Component - Pre-design Brief	Stanley Associates Engineering Ltd.	1977
212230	Aberdeen Subdivision Guerin Creek Storm Drainage Investigation	Domco Engineering	1979 April
282600	Preliminary Geotechnical Summary Investigation of Ground Movement Van Horne Dr	Golder Associates Ltd.	Aug 1995

KID.	Title	Author	Publication Date
337151	Updated Listing of Homes Affected by Slope Movement 2020 Van Horne & Vicinity	Golder Associates Ltd.	Sept 1995
212777	Bedrock and Surficial Geology - Aberdeen Hills District Kamloops, BC	Geotech Consultants Ltd. - Peter B. Read	1996 Dec
212232	Greystone Crescent Drainage Study and Recommendations	R. D. Lewis and Associates	Dec-97
225929	Hugh Allan Drive Drainage Study and Recommendations	R. D. Lewis and Associates	Dec-97
212237	Investigation of Groundwater Chemistry Region of Ground Movement South of Intersection of Howe Road and Van Horne Drive Kamloops, BC	Golder Associates Ltd.	Aug-98
210831	Aberdeen Hills 1997 Stability Study	Klohn-Crippen	Feb-98
217247	Soils Investigation Road Settlement By Aberdeen Mall Kamloops, BC	Golder Associates Ltd.	March 1982
211720	Groundwater Seepage Investigation Aberdeen Subdivision Kamloops , British Columbia	Aquaterre Consultants Inc.	Aug-1983
214391	Installation of Three Piezometers Ravenwood and Sierra Vista Stability Sections	Golder Associates Ltd.	Sept 2013
331549	Aberdeen Hills Stage 2 Slope Stability Along Guerin	Golder Associates Ltd.	June 1978
284387	Aberdeen Hills Perimeter Study	Geotex Consultants Limited	Dec 2000
210845	Drainage and Stability of Old Slide Area Aberdeen Hills	Klohn Leonoff Consultants Ltd.	March 1991
210844	Aberdeen Hills Development Geotechnical Report	Klohn Leonoff Consultants Ltd.	Aug 1981
210842	Seismic Refraction Study of Aberdeen Hills Development	Klohn Leonoff Consultants Ltd.	July 1977
284384	Brief on the Aberdeen Heights Development	Klohn Leonoff Consultants Ltd.	May 1977
302113	An Evaluation of Residential Irrigation	David S. Chanasyk, Ph.D., P.Eng.	March 2000

KID.	Title	Author	Publication Date
302119	An Assessment of The Irrigation Regime Used At The Aberdeen Golf Course, Kamloops, BC	David S. Chanasyk, Ph.D., P.Eng.	Feb 2000
211517	Makaoo Lake/Guerin Creek Drainage Analysis	Dayton and Knight Ltd.	Aug 2000
284391	Addendum 11 Evaluation of Impacts of Additional Recharge In The New Development Area On Area B and Perimeter Areas of Aberdeen Kamloops, BC	Golder Associates Ltd.	Feb 2005
212834	Aberdeen Hills Depressurization Program 2002/2003 Stability Study	Klohn-Crippen	April 2002
284378	Aberdeen Hills Depressurization Program Task 6 Perimeter Study Stage 1	Klohn-Crippen	Nov 2001
73064	Spring 2006 Aberdeen Perimeter Inspection Report	Golder Associates Ltd.	Nov 2010
284393	Aberdeen Hills Depressurization Program 2001 Stability Study	Klohn-Crippen	Dec 2001
284399	Aberdeen Hills 2002 Well Installation Areas A and B	Klohn-Crippen	Oct 2002
210848	Aberdeen Hills 2003 Well Installation	Klohn-Crippen	Aug 2003
284404	Aberdeen Hills Depressurization Program Well Installation and Testing	Klohn-Crippen	Aug 2001
284399	Aberdeen Hills 2002 Well Installation Areas A and B	Klohn-Crippen	Oct 2002
284406	Aberdeen Hills Soil Corrosivity Assessment	Golder Associates Ltd.	Jan 2001
284413	Slope Depressurization Project Implementation of Piezometers and Depressurization Wells	Klohn-Crippen	Oct 1992
284411	Assessment of Howe Road Corridor Stability West of Pacific Way Kamloops, BC	Golder Associates Ltd.	Sept 2005

KID.	Title	Author	Publication Date
73143	Summary of Geotechnical Reports, Investigation of Ground Movement, Van Horne Drive, Kamloops, BC– (City of Kamloops Compilation)	Golder Associates Ltd	
284412	Installation and Testing of Additional De-watering Wells, 2020 Van Horne Area, Kamloops, BC	Golder Associates Ltd.	June 2007
284415	2006 Stability Review, Aberdeen Development Area	Golder Associates Ltd.	Sept 2007
229405	2007 Aberdeen Stability Review a Supplement to 2006 Stability Review (Revised)	Golder Associates Ltd.	Sept 2009
73063	Efficacy of Sand Fracturing DW06-1 and DW06-2 Wells in Van Horne, Kamloops, BC	Golder Associates Ltd	Oct 2007
284421	Assessment of Piezometers and Drainage Well Conditions at Aberdeen Hills Community Development	Klohn-Leonoff	Aug 1990
246899	Risk Management Plan, Aberdeen Ground Stability, Kamloops, BC	Golder Associates Ltd.	Jan 2016
214333	Aberdeen Perimeter Inspection Compendium	Golder Associates Ltd.	
229334	Preliminary Assessment of Impact of Residential Development on the Aberdeen Golf Course on Piezometric Pressures in the Aberdeen Area	Golder Associates Ltd.	July 2008
211692	Aberdeen Golf Course, Hydrogeological Impacts of Golf Course Rezoning	Golder Associates Ltd.	June 2009
229334	Preliminary Assessment of Impact of Residential Development on the Aberdeen Golf Course on Piezometric Pressures in the Aberdeen Area	Golder Associates Ltd.	July 2008
285940	Addendum I to Regional Scale Hydrogeological Investigation (1998-2000): Local Scale Groundwater Flow Model Aberdeen Development Area	Golder Associates Ltd.	Oct 2008

KID.	Title	Author	Publication Date
303774	Aberdeen Plan Creating Community Together	City of Kamloops	Nov 2008
229629	Interim Report of Geophysical Results from Nov 2010 Field Investigation of Well Casing Corrosion at Aberdeen	Golder Associates Ltd.	May 2011
215223	Numerical Groundwater Model 2171 Van Horne Dr	AMEC Earth & Environmental Ltd	April 2011
214748	Rehabilitation of Dewatering Well DW98-5	Golder Associates Ltd	Jan 2010
214836	Hydrogeological Design of Subdrainage Systems Proposed Upper Aberdeen Soccer Pitches	Golder Associates Ltd	March 2012
282631	Rehabilitation of Dewatering Wells DW98-10, DW98-11, DW98-4, DW98-7 and DW06-1	Golder Associates Ltd.	May 2012
214837	Rehabilitation of Dewatering Wells DW-1, DW98-12 and DW06-2	Golder Associates Ltd.	Dec 2012
308908	Rehabilitation of Dewatering Wells DW98-13, DW7, DW98-1 and DW92-3	Golder Associates Ltd.	Jan 2016
310956	Review of Impacts of Development on Groundwater Conditions	Golder Associates Ltd.	Feb 2019
302835	Value Analysis Study for the City of Kamloops – Aberdeen Groundwater Area	Value Management Consulting Inc.	May 2009
282912	Hydrogeological Assessment Talbot Place Development Aberdeen	Golder Associates Ltd.	April 2017
229406	2008 Aberdeen Stability Review a Supplement to 2006 Stability Review (Revised)	Golder Associates Ltd.	Sept 2009
229575	2009 Aberdeen Stability Review	Golder Associates Ltd.	Jan 2011
282625	2010 Aberdeen Stability Review	Golder Associates Ltd.	March 2011
282716	2011 Aberdeen Stability Review	Golder Associates Ltd.	Oct 2012

KID.	Title	Author	Publication Date
215087	2012 Aberdeen Stability Review	Golder Associates Ltd.	May 2013
214351	2013 Aberdeen Stability Review	Golder Associates Ltd.	March 2014
230041	2014 Aberdeen Stability Review	Golder Associates Ltd.	Sept 2015
308911	2015 Aberdeen Stability Review	Golder Associates Ltd.	April 2016
318580	2016 Aberdeen Stability Review	Golder Associates Ltd.	June 2017
318578	2017 Aberdeen Stability Review	Golder Associates Ltd.	May 2018
318576	2018 Aberdeen Stability Review	Golder Associates Ltd.	July 2019
230233	2009 Piezometer Inspection and Maintenance	Golder Associates Ltd.	Jan 2010
214682	2010 Piezometer Inspection and Maintenance	Golder Associates Ltd.	Jan 2011
230260	2011 Piezometer Inspection and Maintenance	Golder Associates Ltd.	Nov 2011
230262	2012 Piezometer Inspection and Maintenance	Golder Associates Ltd	Jan 2013
214349	2013 Piezometer Inspection and Maintenance	Golder Associates Ltd	March 2014
317028	2014 Piezometer Inspection and Maintenance	Golder Associates Ltd	Feb 2015
310967	2015 Piezometer Inspection and Maintenance	Golder Associates Ltd	Feb 2016
318070	2016 Piezometer Inspection and Maintenance	Golder Associates Ltd	July 2017
318071	2017 Piezometer Inspection and Maintenance	Golder Associates Ltd	March 2018
318073	2018 Piezometer Inspection and Maintenance	Golder Associates Ltd	May 2019
282627	2009 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	June 2011
282628	2010 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	Aug 2011
214833	2011 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	March 2012
214350	2012 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	March 2014
214350	2013 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	March 2014
223330	2014 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	Jan 2015

KID.	Title	Author	Publication Date
318061	2015 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	Nov 2015
308896	2016 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	Dec 2016
318062	2017 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	Dec 2017
318063	2018 Report on Slope Inclinator Monitoring Results	Golder Associates Ltd.	Feb 2019
318064	2019 Report on Slope Inclinator Monitoring	Golder Associates Ltd.	July 2019
230235	Review of Aberdeen Piezometer Data Jan 1 to Aug 8, 2009	Golder Associates Ltd	Jan 2010
230234	Review of Aberdeen Piezometer Data Aug to Dec, 2009	Golder Associates Ltd	Jan 2010
230242	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2010	Golder Associates Ltd	Jan 2011
230261	Review of Aberdeen Piezometer Data Jan 1 to June 30, 2011	Golder Associates Ltd	Aug 2012
214343	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2012	Golder Associates Ltd.	Aug 2013
214348	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2013	Golder Associates Ltd.	Feb 2014
223335	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2014	Golder Associates Ltd.	July 2015
311014	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2015	Golder Associates Ltd.	April 2016
318070	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2016	Golder Associates Ltd.	July 2017
318071	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2017	Golder Associates Ltd.	March 2018
318073	Review of Aberdeen Piezometer Data Jan 1 to Dec 31, 2018	Golder Associates Ltd.	May 2019
310962	Dewatering Well Replacement	Golder Associates Ltd	Aug 2016
318584	Aberdeen Dewatering Well Rehabilitation DW2	Golder Associates Ltd	July 2019
318582	Sensitivity Analysis of the Aberdeen Stability Sections	Golder Associates Ltd	Nov 2018
318583	Aberdeen Dewatering Well Rehabilitation 2018 DW98-2A and DW98-4	Golder Associates Ltd	Dec 2018
303135	Aberdeen Groundwater Monitoring System	-	Sept 2018

APPENDIX B
Council Policy EDS-16



SUBJECT:	TECHNICAL CRITERIA FOR DEVELOPMENT CONDITIONS IN THE ABERDEEN HILLS NEIGHBOURHOOD	NO. EDS-16
FUNCTION:	ENVIRONMENTAL DEVELOPMENT SERVICES	
DATE:	1995 November 21 (as amended)	

Policy

1. The Chief Building Inspector/Manager shall require a covenant to be registered against the title of the property which details the conditions of Council's Policy EDS-16 and shall ensure that the conditions of this policy are fulfilled prior to the issuance of a building permit for each new home or building (except minor additions or accessory buildings) on vacant land as shown on Appendix "A"; and
2. Major rezoning applications for vacant land south of Hugh Allan Drive and west of the Merritt Highway will require professional reports which conclude that the resulting development will not negatively impact the ground stability and ground water conditions on other properties.
3. A professional assessment that, in consideration of hydrogeological and water balance conditions, the proposed development as designed will not result in a negative impact on downslope ground water conditions, must be provided prior to development.
4. A professional assessment that the site is currently stable and will continue to be stable following construction must be provided prior to development. The assessment should include factual information regarding soil and bedrock stratigraphy at the site, identification and detailed descriptions of Tertiary Age Kamloops Group bedrock deposits (where present), installation of multiple piezometers and monitoring for a sufficient period of time to assess natural variations in ground water pressures in the overburden and bedrock, and stability analysis.

Amended:

1996 October 29
2000 December 12



CITY OF KAMLOOPS

SUBJECT: TECHNICAL CRITERIA FOR DEVELOPMENT CONDITIONS IN
THE ABERDEEN HILLS NEIGHBOURHOOD



UNDEVELOPED LOTS AFFECTED BY POLICY

