



File: 26250-20/12301
SITE: 12301

February 22, 2018

Mr. John Driedger
Shell Canada Products
400 – 4th Avenue SW
Calgary, AB T2P 2H5

Dear Mr. Driedger:

**Re: Protocol 6 Approval Application for Relief from Vertical Delineation,
1108 Canyon Road (Hwy 23 North), Nakusp, BC; Shell Location Code: P00251**

This letter provides my decision on your July 21, 2017 application for approval under Protocol 6 for relief from the requirement to delineate the vertical extent of dissolved phase hydrocarbon contamination in groundwater at 1108 Canyon Road, Nakusp, BC (the Site) because it is not technically feasible or safe.

The Site is owned by Canyon Developments Ltd. and is further described as follows:

PID: 024-022-098

Legal Description: Lot 1, District Lot 397, Kootenay District Plan NEP 61024

A Site plan is attached in Attachment A for reference.

In reaching my decision I have relied on information provided in the following supporting documents:

- Supplemental information provided by emails – *RE: Site 12301 Nakusp – Additional Information Request*, Paul Embregts (SNC) to Julia Brooke (ENV), October 26, 2017 (two emails on this date); November 20, 2017; December 28, 2017; January 8, 2018; and January 29, 2018;

- Updated figures/data (hardcopy of attachments to December 28, 2017 email) received by ENV January 9, 2018; and
- *Protocol 6 Pre-Approval Application Pertaining to Delineation of Dissolved Phase Hydrocarbon Contamination in Fractured Bedrock 1108 Canyon Road (Hwy 23 North), Nakusp, BC; Shell Location Code: P00251; MoE Site ID: 12301, dated July 21, 2017, prepared by SNC-Lavalin Inc.*

The primary rationale and supporting information presented by SNC-Lavalin in the above documents is summarized below:

- *Investigations on the Site indicate the contamination is relatively old, likely sourced from original fueling facilities prior to 1990 (cardlock) and 1997 (bulk plant). The site was permanently decommissioned in 2008, therefore there has been no introduction of contaminants to the subsurface since this time.*
- *It is SNC-Lavalin's experience that the stability of hydrocarbon plumes (in particular LNAPL plumes) increases with the age of the plume.*
- *LNAPL has not spread beyond the original wells with LNAPL detected at MWs 02-1, 07-26(BR), 07-27(BR), 10-48(BR) and 10-57(BR).*
- *It is acknowledged that a small sub-set of wells (namely MWs 09-34D and 09-35D) may have an increasing concentration trend, however overall the monitoring data shows that the plume is attenuating or at a minimum is stable. (Mann-Kendall stability review provided.) The document "Toolkits for Evaluation of Monitored Natural Attenuation and Natural Source Zone Depletion, July 8, 2016, Golder Associates" recommends that an 80% threshold (i.e., number of results suggesting a certain trend) is sufficient to draw inferences as to plume stability (pg. 7 and 8 of Toolkit#2 – Monitoring and Prediction). Over 80% of the wells associated with this site have stable or decreasing concentrations.*
- *Monitored LNAPL thicknesses are not considered to be as good an indication of plume stability as the above indicators due to variations in groundwater levels that affect LNAPL thicknesses, as well as challenges in the field to obtain accurate and reproducible measurements. Measured LNAPL thicknesses have fluctuated at all of the wells, however there is no apparent increasing or decreasing trend at MWs 02-1, 07-26(BR), 10-48(BR) and 10-57 (BR). A potential increasing trend is noted for MW10-48(BR), however this is not considered to be an indication of a mobile NAPL plume for the reasons noted above.*
- *The groundwater (dissolved) plume is stable.*
- *LNAPL is vertically and laterally delineated and has not spread to any other wells.*
- *The historical groundwater monitoring satisfies requirements of Protocol 16 to confirm that LNAPL is not mobile (historical monitoring data with at least two years of groundwater monitoring results for a site has provided evidence that the LNAPL plume is stable).*

- *It is unlikely that any additional LNAPL will be introduced into the bedrock to further mobilize the LNAPL plume. As noted above, there has been no potential LNAPL release since 2008. With the exception of one well (02-1), LNAPL has not been present in any overburden well. LNAPL thicknesses fluctuate at 02-1, but are stable, therefore it is unlikely that it will infiltrate into bedrock (i.e., the LNAPL thickness is not sufficient to overcome the entry pressure required to migrate into the bedrock fractures.*
- *The bedrock hydraulic conductivity was found to be less than 10^{-6} m/s (geometric mean was 1.1×10^{-8} m/s), and a pump test could not maintain a yield of 1.3 L/min.*
- *Strong downward vertical gradients in bedrock and the measured low hydraulic conductivity (results ranged from 1.1×10^{-7} m/s to 1.1×10^{-9} m/s) suggests a relatively discontinuous fracture network which would impede lateral migration of contamination. This is supported by observations from coring and drilling programs. LNAPL contamination migration in bedrock in the source zone (former cardlock area) is primarily vertical which further supports a discontinuous fracture network.*
- *Lateral groundwater flow in shallow bedrock is radial from the cardlock area (the LNAPL source zone). Deeper groundwater flow in bedrock (below 15 m) appears to be southwards. All of the lateral delineation wells in bedrock are well positioned to intercept potential contamination in shallow and deep bedrock from the source area. With the exception of 09-37(BR), all PCOC concentrations in the lateral delineation wells were less than standards. Contamination at 09-37(BR) may have been caused by infiltration of contaminated overburden groundwater, however regardless, is delineated by other bedrock wells.*
- *Dissolved phase contamination in bedrock in the source area is undelineated below 30m, however concentrations should continue to decrease with depth. On this basis, concentrations would not be expected to increase below the deepest lateral delineation wells (roughly 20 m in each direction).*
- *Considering the above, and the fact that there are no contaminated bedrock wells in areas with clean overburden groundwater, SNC-Lavalin does not expect that contamination in bedrock would extend beyond the existing lateral well network of overburden and bedrock wells.*
- *There is a risk of mobilizing LNAPL to deeper depths if further vertical delineation is attempted in the source area.*
- *The cost for further deep delineation in bedrock could be in the order of \$300K for one additional round of drilling. There is a high likelihood that additional rounds of drilling would be required, and final costs could be in the order of \$500K (above what has been spent to date).*
- *Contamination is not anticipated to pose an unacceptable risk to terrestrial or aquatic receptors due to the lack of potential exposure (i.e., due to depth of contamination, and because contamination is considered laterally delineated and stable). This would be a very standard pathway elimination risk assessment when formalized, and we are certain of its conclusions.*

- *There are no bedrock drinking water wells within 500m of the Site with the exception of one well located 300 m northwest of the Site. Recharge for the bedrock aquifer in which this domestic well is installed is assumed to be locally from Kuskanax Creek, but also regionally from the mountain range situated to the northeast. Groundwater flow regime in deeper bedrock is assumed to reflect a similar distribution to the Site, which is well instrumented. The creek is expected to be a constant head source of recharge to bedrock, and flowing towards the lake; as such, the capture zone is extended in the direction of the creek. The capture zone analysis indicates that potential contaminated groundwater originating from the Site will not be captured by this drinking water well. Furthermore, Kuskanax Creek is expected to act as a hydrogeological divide.*
- *The capture zone analysis calculated a radius of 29 m using a base case pumping rate of 1.6 L/min (2270 L/day) based on provincial guidance, and the following parameters:*
 - *Bulk rock hydraulic conductivity of 2×10^{-8} m/s (based on Site hydraulic conductivity data for bedrock);*
 - *Saturated thickness of 112m based on static level for Well #80443 and a 400 ft. well; and*
 - *A hydraulic gradient of 0.1 m/m (based on Site data);*
- *A sensitivity analysis was performed, adjusting the following parameters:*
 - *5x the base case pumping rate, which calculated a radius of 147m. The 5x base case radius is shown on the sketches;*
 - *Hydraulic conductivity values two and four orders of magnitude higher;*
 - *A thinned saturated thickness for the aquifer; and*
 - *Double the hydraulic gradient;*
 - *The capture zone sensitivity showed that the pumping rate is the most sensitive parameter.*
- *The closest bedrock drinking water well southwest of Kuskanax Creek (on the Shell Site side of the Creek) is approximately 3km away. As such, bedrock groundwater is not currently being used for drinking water in the area of the Site.*
- *It is unlikely that a bedrock drinking water well would be installed in the area of the Site, southwest of Kuskanax Creek, as property owners would have the better option to connect to municipal water supply, or to install a drinking water well in the higher yielding overburden aquifer that overlies bedrock groundwater in the area of the Site.*
- *All registered drinking water wells within 3 km of the Site, and southwest of Kuskanax Creek, are overburden wells.*

Based on the lines of evidence presented in the approval documents referred to above, I concur that further investigations to vertically delineate dissolved phase hydrocarbon contamination in fractured bedrock at 1108 Canyon Road (Highway 23 North), Nakusp, British Columbia are unwarranted for purposes of seeking Certificates of Compliance for the Site and adjacent parcels. I base this decision primarily on the following:

- The existing drinking water wells are outside the boundaries of the laterally delineated groundwater contamination in soil and bedrock. The single drinking water well in overburden is located approximately 250 metres southwest of the site and is drilled to a depth of approximately 35 m. Considering the age of the release and the apparent stability of the LNAPL and dissolved plumes, it is not anticipated this well will be impacted. In addition to this there are wells downgradient of those with identified contamination that are well situated to act as sentinel wells for any lateral contaminant migration. Again, this is unlikely given the age of the dissolved plume and the physical nature of the bedrock fracture network. Additionally, there appears to be no evidence that contamination has migrated laterally any significant distance to date. With regard to the drinking water well in bedrock that is located 300 m to the northwest and across the groundwater divide of Kuskanax Creek the capture zone analysis suggests there will be no impacts to this well. The intent is to risk manage the existing groundwater contamination at the Site through prohibition for DW use.
- The potential to gain further insight and benefit through additional deep delineation in bedrock is considered limited at best, and may in fact result in spreading the contamination both vertically and laterally. Given this primary concern, coupled with potentially significant costs associated with a continuing deep investigation program, and the limited potential risk to human health and the environment without further investigation, it is unwarranted to require additional delineation at this time.
- Site contamination is unlikely to worsen because the accessible LNAPL has been removed to the greatest extent practicable.
- The bedrock fracture network is relatively discontinuous and migration into bedrock is thought to be primarily vertical (therefore, lateral migration is not anticipated).


Therefore, I confirm my approval of your request under Item 1, Table 2 of Protocol 6 for relief from vertical delineation of dissolved phase groundwater hydrocarbon contamination in fractured bedrock at the Site located at 1108 Canyon Road (Highway 23 North) and adjacent parcels, Nakusp, BC.

This approval provides authorization to proceed with an application for contaminated sites legal instruments under the Protocol 6 review process. Aside from the specific relief granted above, it does not constitute review or acceptance by the director of any aspect of the submission requirements for such applications.

Please ensure that a copy of this letter is included in the CoC application made for the site and affected parcels.

This decision is based on the most recent information provided to the ministry regarding the above-referenced site. The ministry, however, makes no representation or warranty as to the accuracy or completeness of this information. The ministry expressly reserves the right to change or substitute different requirements where circumstances warrant.

Sincerely,

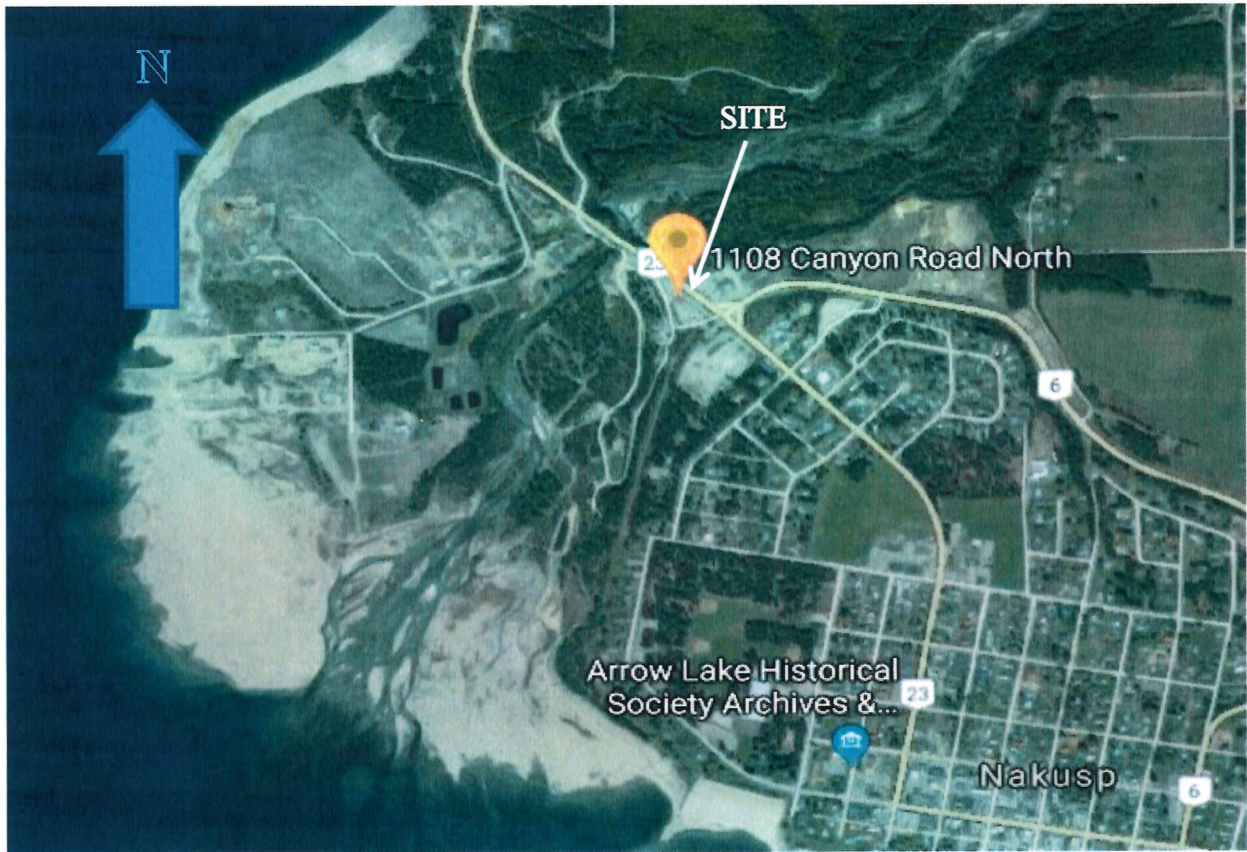


Peter Kickham
for Director, Environmental Management Act

Attachments (2)

cc: Paul Embregts, SNC-Lavalin, Kelowna, BC
Catherine Schachtel, CSAP Society, Vancouver, BC
Lucy Hewlett, Ministry of Environment, Victoria, BC
District Manager, Ministry of Transportation and Infrastructure
4th Fl. 310 Ward Street, Nelson, BC V1L 5S4
Bob Murphy/Barb Murphy, Canyon Development Co. Ltd.
761 Highway 6 South, Nakusp, BC V0G 1R0
Ben Bruneau, Nakusp Land Holding Ltd.
Box 840, Nakusp, BC V0G 1R0
Dustin Raskob, North Road Enterprises Ltd.
87 – 2nd Avenue South, Nakusp, BC V0G 1R0

**Attachment A
Site Plan**



Location Plan



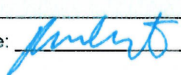
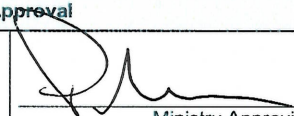
Attachment B Signed Protocol 6 Preapproval Application

Version 2.0

	PROTOCOL 6 PREAPPROVAL APPLICATION	Land Remediation Section PO Box 9342 Stn Prov Govt Victoria B.C. V8W 9M1 Telephone: (250) 387-4441 Fax: (250) 387-8897 E-mail: site@gov.bc.ca
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Submission of this form is required to obtain preapproval for any of the items listed in Table 2 of section 4.6 of Protocol 6, "Eligibility of Applications for Review by Approved Professionals" under the *Environmental Management Act*. If a preapproval is required under Protocol 6, it must be submitted with any Approved Professional application for the issuance of a Contaminated Sites Legal Instrument under the *Environmental Management Act*.

Section I Ministry Use			
Application number: Preapproval Application form		Associated Service Application form	
Section II Land Description			
Site ID Number (if known)	12301		
PID	024-022-098	or	PIN
Legal Description	Lot 1, District Lot 397, Kootenay District Plan NEP 61024		
Latitude	Degrees 50	Minutes 14	Seconds 57.30
Longitude	Degrees 117	Minutes 48	Seconds 40.10
Site Civic Address	Street 1108 Canyon Road (Highway 23 North)		
	City Nakusp	Postal Code	
Section III Applicant			
Name	Shell Canada Products		
Address	Street 400 - 4 th Avenue, PO Box 100, Stn M		
	City Calgary	Province/State AB	
	Country Canada	Postal /Zip Code T2P 2H5	
Phone	604-936-3166	Fax	604-936-7166
Section IV Property Owner and/or Operator (if applicable)			
Name	Canyon Developments Ltd		
Address	Street 761 Highway 6 South		
	City Nakusp	Province/State BC	
	Country Canada	Postal /Zip Code V0G 1R0	
Phone	Fax		
Section V Billing Contact			
Name	SNC-Lavalin Inc. (Paul Embregts, paul.embregts@snclavalin.com)		
Address	Street 100 - 1358 St. Paul Street		
	City Kelowna	Province/State BC	
	Country Canada	Postal /Zip Code V1Y 6B7	
Phone	250-861-9070	Fax	250-862-9070

Section VI Preapproval Requested	
Check the applicable preapproval being sought under Table 2, section 4.6 of Protocol 6:	
<input checked="" type="checkbox"/> 1. If the applicant for a contaminated sites legal instrument is a responsible person for the source parcel and has not delineated and/or remediated the entire area of contamination including contamination at a parcel and contamination which has migrated from that parcel to neighbouring parcels.	
<input type="checkbox"/> 2. If, under the application, local background substance concentrations in surface water, sediments or vapour were derived by any methods.	
<input type="checkbox"/> 3. If the application refers to a parcel currently subject to a preliminary or detailed site investigation order (excluding an order in response to the submission of a site profile under section 7.1 of the Contaminated Sites Regulation), remediation order, pollution prevention order or pollution abatement order under the Act.	
<input type="checkbox"/> 4. If the application is for an Approval in Principle under which remediation is not be expected to be completed within five years of the anticipated date of issuance of the Approval in Principle.	
<input type="checkbox"/> 5. If the application refers to a parcel where risk-based standards were or would be applied under a risk assessment and the parcel has or requires a hazardous waste in situ management facility authorization.	
<input type="checkbox"/> 6. If the application is based on a risk assessment that includes any of the following:	
<input type="checkbox"/> (a) probabilistic analysis;	
<input type="checkbox"/> (b) toxicity testing of materials (soil, water, sediment), or organisms obtained at or from the parcel;	
<input type="checkbox"/> (c) de novo modification of toxicity reference values;	
<input type="checkbox"/> (d) derivation or use of a site-specific risk-based concentration.	
Section VII Rationale and Supporting Information (attach additional information if insufficient space below)	
Please see attached letter report.	
Section VIII Applicant Signature	
Name: <u>Paul Embregts</u> print name	Signature: <u></u> Date: <u>July 21, 2017</u> mm/dd/yyyy
I am acting as agent for the applicant <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Telephone 250-861-9070 Fax 250-862-9070	
Email paul.embregts@snclavalin.com	
Section IX Ministry Approval	
<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Not Approved	<u></u> <u>2018-02-22</u> Ministry Approving Authority Date

For further information regarding preapprovals under Protocol 6, please e-mail us at site@gov.bc.ca.