

From: Knappett, Christine (MOECC) [<mailto:Christine.Knappett@ontario.ca>]
Sent: October-26-15 9:53 AM
To: sandra.green@hc-sc.gc.ca; peter.ross@hc-sc.gc.ca; roy.angelow@aandc-aadnc.gc.ca; Zora Crnojacki; Higgins, Glenn (MTO); kimberley.cameron@ec.gc.ca
Cc: Joyner, Dan (MOECC); Taylor, Peter (MOECC)
Subject: FW: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project, Review of Proposed Action Plans and Draft Groundwater Report

Good morning,

There has been significant discussion on the abandonment of the identified wells on Tyendinaga Mohawk Property related to the Union Gas pipeline drilling. In addition, in a site visit last week what appears to be drilling fluids (still needs to be confirmed) was observed within a ditch not far from 13 Gussy Lane (see attached emails).

I am forwarding you this information so you know the details and so that you are aware.

Please let me know, if you have any questions or would like to discuss further,

Christine

From: Joyner, Dan (MOECC)
Sent: October-26-15 8:22 AM
To: Al-Amry, Amry (AAIAmry@uniongas.com) (AAIAmry@uniongas.com); Veale, Lesley (lesley.veale@stantec.com)
Cc: Knappett, Christine (MOECC); Lusk, Warren (MOECC); Faaren, Greg (MOECC); Taylor, Peter (MOECC)
Subject: FW: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project, Review of Proposed Action Plans and Draft Groundwater Report

Hi Amry,

Please find Warren's review of the proposed action plan and the plugging of the well at 13 Gussy.

Talk to you at 10:30 during T/C.

Sincerely,

Dan Joyner
Senior Environmental Officer
Belleville Area Office
Ministry of the Environment and Climate Change
345 College St. East
Belleville, ON K8N 5S7
(613) 962-3641

From: Lusk, Warren (MOECC)

Sent: October-25-15 3:47 PM

To: Joyner, Dan (MOECC)

Cc: Knappett, Christine (MOECC); Taylor, Peter (MOECC); Yee, Kim (MOECC); Faaren, Greg (MOECC); Stephenson, Kyle (MOECC)

Subject: FW: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project, Review of Proposed Action Plans and Draft Groundwater Report

Hi Dan:

Having been to 13 Gussy Lane on October 24, 2015 to observe the abandoned well and having reviewed the below October 24, 2015 1:01pm Email from Ahmed Al-Amry of Union Gas (October 24, 2015 Union Gas Email), I offer the following comments:

Action Plan

October 24, 2015 Union Gas Email, I am of the opinion that Union Gas has an appropriate contingency plan to address a water well complaint in the study area and an appropriate notification contact list.

The October 24, 2015 Union Gas Email provides information on a possible source for the elevated metals in the well water samples for 13 Gussy Lane. For your consideration, you may wish to wait for Stantec Consulting Ltd.'s final report that has been signed off by Health Canada before agreeing to the action plan as I suggested in my October 22, 2015 Email.

The October 24, 2015 Union Gas Email provides information on the Michels Drilling operation using drilling mud (water and bentonite mixture) as the "drilling fluid". I understand the purpose of the "drilling fluid". The Union Gas Email, however, does not explain why switching to "air" or "water" would not work as a safer drilling fluid to use during situations where there is a substantial loss of drilling mud into the subsurface during the drilling operation. If the drilling mud and plugging "pills" will be lost into the formation as they were with the south to north drilling operation and potentially move through fractures in the bedrock to receptors, it makes no sense to continue drilling with drilling mud. For your consideration, the parties should re-consider the drilling approach further to help protect the environment

The October 24, 2015 Union Gas Email does not provide a fluid loss volume that would trigger the contingency plan. For your consideration, the parties should provide you with a fluid loss volume that would be used to trigger the contingency plan.

Plugging of Abandoned Well at 13 Gussy Lane

On October 22, 2015 I observed the plugging of the well from about 9 to 16 metres below the ground surface with gravel, bentonite and a properly mixed and placed cement plug. I have not had any reports that the upper portion of the well was not properly plugged to the consultants recommendations.

The October 24, 2015 Union Gas Email reported that the recently plugged abandoned well at 13 Gussy Lane began discharging clear groundwater from the top of the well through an approximately 1 centimetre (3/8 of an inch) hole through the bentonite material on or about October 23, 2015. The abandonment barrier material (bentonite and some cement) in the upper 2 metres of the well was removed from the well. Based on the clarity of the groundwater discharging from the well and the lack of drilling mud associated with the groundwater, Union Gas suspects the source of the flowing groundwater is a water bearing fracture zone located at about 5.3 metres below the ground surface (where a "minor flow" of groundwater was observed by Lotowater) and the cement in the well from 2.15 metres to 4.65 metres below ground surface has apparently failed to stop pressurized groundwater. However, Union Gas has not provided any observations of the quality of the upper cement plug.

I was aware that prior to the plugging of the abandoned well at 13 Gussy Lane, a very low flow of drilling fluid and groundwater was still coming out of the well. I was not aware that the groundwater coming out of the fracture at 5.3 metres below the ground surface was under flowing artesian pressure conditions. I was also aware that the well at 13 Gussy Lane was abandoned by the well owner because of its low yield and that it did not experience flowing artesian conditions. I also note that the nearby water supply well being used as a domestic supply by Ms. Green at 13 Gussy Lane is not experiencing flowing artesian conditions.

On October 24, 2015 I observed the abandoned well at 13 Gussy Lane. I observed a very slow flow of groundwater, containing what appeared to be a small amount of bentonite and sand textured material, discharging from the top of the well (possibly 0.25 litres per hour). I also observed gas bubbles associated with the groundwater coming out of the top of the well. I note my observations were taken after the upper abandonment barrier material was removed from the well on October 23, 2015. Using a calibrated water level meter, I measured the top of the abandonment barrier in the well as being 2.15 metres below the ground surface.

Based on my observations and the available information, I cannot rule out that the drilling mud and pills that have been discharged into the subsurface by Michels Drilling operation has pressurized any fluids and gas in the bedrock fractures of the subsurface creating flowing artesian groundwater conditions. Also, I cannot rule out that groundwater is discharging into the well through fractures above the upper cement plug in the well or that the cement has not properly set up due to a product defect.

Union Gas is still considering how to stop this upward low flowing artesian groundwater flow from the abandoned well. Based on my observations, it could be difficult to drill out the abandonment barrier materials in the well as the well is located within 0.3 metres of the residence. In considering how to properly seal this hole, for your consideration, the drillers and professionals should assess, including with the use of down the hole video equipment (if necessary), the upper open portion of the abandoned well to determine if groundwater is actually leaking through the upper 2.15 metre cement plug in the well or through the subsurface formation into the well. The parties should also consider the necessity of removing the existing casing (if possible) from the well and the installation of a temporary packer below the casing to verify that groundwater, gas and other material will stop discharging out of the top of the well.

Take care,

Warren

Warren Lusk P. Geo.
Provincial Officer # 634
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region
Ministry of the Environment and Climate Change
P.O. Box 22032, Kingston ON, K7M 8S5
Telephone: 613-540-6855
Email: warren.lusk@ontario.ca

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From: Al-Amry, Amry [AAIAmry@uniongas.com]
Sent: October 24, 2015 1:01 PM

To: Joyner, Dan (MOECC); Lusk, Warren (MOECC)
Cc: Veale, Lesley (lesley.veale@stantec.com); Simpson, Carl
Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project, Review of Proposed Action Plans and Draft Groundwater Report

Dan and Warren,

I am responding to the information and suggestions provided by Warren and the condition of the well at 13 Gussy Lane below. I am sending this email to you to ensure your recommendations are met prior to sharing them with the wider audience.

13 Gussy Lane – Water Quality Sampling (Stantec Response)

In total, four (4) samples were collected from 13 Gussy Lane including:

- A pre-construction sample on June 3, 2015 collected from the raw water tap at the pressure tank and considered representative of groundwater quality.*
- A mid-construction sampling on October 5, 2015 collected from the raw water tap at the pressure tank and considered representative of groundwater quality.*
- A post-seepage sample on October 9, 2015 that was collected at too high a purge rate, which resulted in flushing of the piping / pressure tank. The sample is not considered representative of groundwater quality due to influence from the piping.*
- A post-seepage sampling on October 13, 2015 collected from the raw water tap at the pressure tank and considered representative of groundwater quality.*

As noted, the post-seepage sample from October 13, 2015 was consistent with the pre-construction sample and the mid-construction sample. Additional sampling is at this time is not recommended. There will be post-construction sampling done at this location and likely on-going quarterly sampling for a 1 year period.

Also to note, Health Canada was aware of the water quality results from Oct 9, 2015 prior to their confirmatory sampling. They will have provided guidance to their tester regarding sampling requirements.

13 Gussy Lane – Well Abandonment (Stantec Response)

The following is an update regarding Well 1 at 13 Gussy Lane including a quick refresher and recent observations.

The well video/inspection on October 20 noted the following:

- well casing may extend to 1.3 m below ground surface (BGS)*
- Minor flow of water into the borehole was noted at about 5.3 m BGS.*
- larger fracture network at the base of the well at 16.2 to 17.3 m BGS*

Well abandonment was completed on October 22 and consisted of:

- *Gravel from 16 m to base of borehole;*
- *Bentonite chips from 15.7 m to 16 m BGS;*
- *Cement grout from 5.8 m to 15.7 m BGS;*
- *Bentonite chips from 5.4 m to 5.8 m BGS;*
- *Gravel from 4.95 m to 5.4 m BGS;*
- *Bentonite chips from 4.65 m to 4.95 m BGS;*
- *Cement grout from 1.5 m to 4.65 m BGS; and*
- *Bentonite chips from ground surface to 1.5 m BGS.*

On October 23, 2015, Union Gas noted water ponding around the abandoned well. The ponded water was clear and very different than the previous drilling fluid. Additional investigations were completed to determine the specific source of the water and rate of seepage.

Union Gas returned on Site at about 4:30 pm with a hydrovac and any water or bentonite mixture was removed from the cement casing and surrounding area. At this point, Union Gas observed a hole approx 3/8" in diameter running along the inside of the well casing creating a path for the groundwater to flow through the cement. It is expected that this path is continuous, although twisty, to about 5 m BGS. As the cement had not fully cured, the hydrovac truck with the aid of their pressure water system was able to loose and remove the upper cement down to 2.1 m BGS. The seepage rate over night was estimated at 0.05 USgpm (0.2 L/min) and the water was observed to be clear.

All observations suggest that the cement grouting of the lower borehole was successful and it is the surface grout that is leaking groundwater. Union Gas will be in discussion with Marathon Drilling confirming abandonment options. Preliminary thoughts are to pressure grout using a packer system so that flush out of cement grout would not occur again. Once the cement has cured, it would stop any seepage. We will continue to evaluate abandonment options over the weekend and monitor seepage rate. On Monday, once we have all the information, we would propose an abandonment method for the MOE to comment.

Below are further information provided regarding Drilling operations:

Drilling Operations

Drilling Fluid

The drilling fluid is primarily used to clean drill cuttings from the bore-hole as the down-hole cutters are advanced through the ground. The fluid also serves to cool the down-hole tools, stabilize the bore-hole, and reduce friction between the ground formation and the down-hole tools and also the product line during installation. The drilling fluid typically consists of a fresh water base with an inert additive (typically bentonite clay) mixed in to provide fluid properties desirable for use in directional drilling operations.

Circulation of the Drilling Mud

Depending on the porosity and permeability of the ground formation, a small percentage (typically less than 5%) of the fluid will be naturally absorbed by the formation. Drilling fluid lost from the bore-hole in this manner rarely migrates to the surface inadvertently and is not likely to come in contact with the surface. The fluid not absorbed by the ground will fill the annulus from the bottom of the bore-hole up and will circulate back to the surface via the annulus between the drill stem and the bore-hole wall. As long as the bore-hole remains open and a path of lesser hydraulic relief pressure is not encountered (i.e. formation fissure), circulation back to the surface will continue for the duration of the drilling and installation operations. Michels will utilize a drill head designed to bore a significantly larger diameter hole than the outer diameter of the drill stem to provide adequate space for the fluid to flow up the bore-hole annulus. The annulus will be monitored with an annular pressure monitoring device during the pilot-hole boring. All attempts will be made to maintain target annular pressure values during each phase of the drilling operation.

The absence of an open bore-hole conduit or the presence of a major formation fracture will typically lead to partial or possibly full loss of drilling fluid circulation. While it is impossible to determine the precise nature of this type of fluid loss, it is possible to accurately monitor for it by watching for a significant difference between the rate the fluid is being pumped down-hole and the rate it returns to the surface. The drilling fluid pumping rate and the rate of drilling fluid return to the surface is constantly monitored by the driller while the drill is progressing. The driller will know immediately if an unusually high volume of drilling fluid is being lost down-hole, depending on the ground conditions encountered in the crossing and taking into account the volume used to fill the bore-hole.

Surface Monitoring during drilling operations

Link Line and Michels Canada will conduct a continuous surveillance along the drill path once the drilling operations have begun. The surface monitoring will involve deploying drilling crews on foot and at the previously affected area

Contingency for Water Well Quality

If a complaint is received when drilling operation is in effect regarding the quantity or quality of the water wells in the vicinity of the drill path, the drilling operations will be ceased and an assessment of the complaint will be conducted by a qualified

professional geoscientist. The professional geoscientist observations will be shared with the Mohawk of Bay of Quinte Environmental Co-ordinator and their consultants.

Contingency for inadvertent release of drilling fluid to surface

Michels Canada and Link Line will immediately contact Union Gas Construction Manager in the event of an inadvertent release of drilling fluid to the surface is noted.

Union Gas Construction Manager will notify immediately:

- Union Gas will call Ontario Spills Action Center.
- MBQ Environmental Co-ordinator (Nicole Storms),
- the affected property owner if it occurs within his/her private property.
- MOECC Officer (Dan Joyner),
- Health Canada Officer (Sandra Green)

We can discuss further on the Monday Meeting scheduled at 10:30 am

Thank you,

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548



From: Joyner, Dan (MOECC) [<mailto:Dan.Joyner@ontario.ca>]

Sent: October-23-15 8:30 AM

To: Al-Amry, Amry

Cc: Veale, Lesley (lesley.veale@stantec.com); Knappett, Christine (MOECC); Faaren, Greg (MOECC); Taylor, Peter (MOECC); Lusk, Warren (MOECC); sandra.green@hc-sc.gc.ca; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Kaye, Brian (MOECC); todd.k@mbq-tmt.org; peter.b@mbq-tmt.org

Subject: FW: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project, Review of Proposed Action Plans and Draft Groundwater Report

Hi Amry,

Please review the information and suggestions provided by Warren as per the email below. The MOECC District Office supports and recommends that the information provided by Warren be reviewed and acted on as needed.

Sincerely,

Dan Joyner
Senior Environmental Officer
Belleville Area Office
Ministry of the Environment and Climate Change
345 College St. East
Belleville, ON K8N 5S7
(613) 962-3641

From: Lusk, Warren (MOECC)
Sent: October-22-15 11:28 PM
To: Joyner, Dan (MOECC)
Cc: Knappett, Christine (MOECC); Taylor, Peter (MOECC); Faaren, Greg (MOECC); Yee, Kim (MOECC); Stephenson, Kyle (MOECC)
Subject: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project, Review of Proposed Action Plans and Draft Groundwater Report

Hi Dan:

It is my understanding that Union Gas agreed to the following action plan that I outlined in my October 13, 2015 Email to Jon Morrish and you:

For your consideration, prior to the commencement of any drilling, Union Gas and its consultants should provide you with a groundwater report that shows all sample interpretations and other observations and an interpretation of all water quality sample determinations from area wells compared to the contaminants of concern in the drilling mud and the "pill" additives. The groundwater report should also provide conclusions and any recommendations including temporary bottled water supplies and any well remediation.

For your consideration, prior to the commencement of any drilling, Union Gas and its consultants should develop an action plan for your review and approval:

- *to identify any other abandoned wells near the Union Gas hole (or tunnel) that remains to be drilled by Michaels Drilling and to determine what material was used to plug the abandon holes and the depth of the holes,*
- *to remove all permeable or low strength material from the abandoned wells, video the identified abandoned wells with a down the hole camera and properly seal the identified abandoned wells with a high strength material (e.g., cement with a density of no less than 1 kilograms per litre) to help prevent the holes from acting as a pathway for drilling mud from the Michaels Drilling operation,*

- *to identify any other discharge of drilling mud near the Union Gas hole (or tunnel) that remains to be drilled by Michaels Drilling,*
- *to drill the remaining of the Union Gas hole (tunnel) in a method that will not cause an adverse effect to the natural environment including the discharge of drill cuttings to any abandoned or in use well, and*
- *to identify how Union Gas and its agents will implement the recommendations in the groundwater report prepared by Union Gas and its consultants.*

Union Gas has provided a number of documents to address the action plan (attached) and took steps today to properly plug and seal identified open abandoned wells.

I have reviewed a draft October 19, 2015 Stantec Consulting Ltd. (Stantec) letter that, on page 3, states:

Based on the water quality results collected on October 9 and October 13, 2015, there is no indication of a change in groundwater quality within nearby residential wells following the observed seepage of drilling fluid. There were no exceedances of the ODWS MAC for any testing health related parameter at any location, with the exception of bacteriological parameters. The bacteriological detections are not considered a function of Union Gas activity.

As such, it appears that recommendations for water well remediation work do not appear to have to be part of the action plan. I note that the draft October 19, 2015 Stantec Consulting Ltd. (Stantec) letter has not been released to the public and is still being reviewed by Health Canada and other parties. I will wait until I review the final report or letter from Stantec before confirming my comment that no remediation work is necessary.

On page 3 of the draft October 19, 2015 Stantec Consulting Ltd. (Stantec) letter, the following is stated regarding a sample from RW12:

The post-seepage results from October 9, 2015 indicated higher concentrations of lead, copper, iron and zinc compared to previous measurements. These higher concentrations were a result of the higher purge rate of the well and resulting flushing of the piping / pressure tank and are not considered representative of groundwater conditions. As noted, the post-seepage sample from October 13, 2015 was consistent with the pre-construction sample. As such, no effects on water quality were noted at this location.

For your consideration, the consultant or other party might wish to verify if the elevated metals are due to the plumbing by obtaining a water sample of the groundwater directly from the well after properly purging the well and having the sample analyzed for metals at a licensed laboratory.

I reviewed a "Summary of Michels Canada Contingency Planning for Mitigating and Monitoring inadvertent Release of Drilling Mud" (undated and unsigned). The "Fracture Contingency and Mitigation Strategy" (paragraph 2, page 1) indicates that should pressures reach unsatisfactory levels, corrective action will be taken to reduce the back to normal operating level. Further, the strategy provides procedures to be implemented if a loss of drilling fluid circulation is detected. The strategy, however, does not provide information as what is considered "unsatisfactory" with respect to a drilling fluid loss. For your consideration, the parties should provide a minimum amount of drilling fluid loss that would be considered an unsatisfactory level.

The strategy does not provide a contingency for a water well quantity or quality complaint. For example, will drilling stop and a qualified professional engineer or professional geoscientist assess the complaint, make observations and make recommendations and will Union Gas implement those recommendations? Also, will a temporary water supply be provided to the well owner during the assessment? For your consideration, the parties should consider adding a water well complaint contingency into the action plan.

The strategy does provide a contingency of having materials and methods to contain any drilling fluids and other additives that may discharge at the ground surface including the use of Daylighting equipment at the ready.

The strategy does not have a response notification list when a drilling fluid loss including the MOECC, Health Canada, the Territory and any relevant property owners and when the parties on the notification list should be notified (e.g., immediately) . For your consideration, a notification list and response time to notify the parties should be drafted as part of the action plan.

I also reviewed an October 13, 2015 Union Gas letter regarding Bay of Quinte Replacement Project - Updated Horizontal Directional Drill (HDD) Execution Plan. The October 13, 2015 Union Gas execution plan recommends stopping the drilling from the south to the north. Instead drilling is proposed to commence from the north entrance of the proposed tunnel (along Highway 49 at Seros Road) and directionally drill to the end of the existing drill hole (tunnel) located about 50 metres below the ground surface and about 200 metres south of the north entrance. The plan indicates that the drilling fluid will not exert as much pressure during the drilling process because the return path for the drilling fluids from the drill machine to the drill bit and back to the drill machine area is lower in the proposed 200 metre distance of drilling from the north to the south compared to the 1.3 kilometre distance of drilling from the south to the north. The plan to drill from the north to the south with a smaller drill machine should help to reduce the risk of a large release of drilling fluids into upper bedrock fractures that may be connected to any improperly abandoned and in use wells until the large bedrock fractures are eventually encountered.

Based on the bedrock fractures observed by Lotowater at about 16 to 17 metres below the ground surface found in the bottom of an identified open abandoned well at 13 Gussy Lane, I suspect that there will be a release of drilling fluid into subsurface bedrock fractures once the Michels Drilling Operation drills into the bedrock somewhere at a similar elevation as the bottom of the identified abandoned well at 13 Gussy Lane or as the operation proceeds closer to the end of the south to north tunnel (hole) located at about 50 metres below the ground surface. As long as the identified abandoned wells were properly abandoned as recommended by Stantec, the release of drilling fluid to the ground surface and to other areas of the subsurface should be reduced to help to prevent an adverse effect to the natural environment. There is no guarantee; however, that the drilling fluid will encounter other in use wells or unidentified improperly abandoned wells. As such, monitoring in the study area when a drilling fluid loss occurs and having a spill and complaint response should be part of the action plan.

If a loss of drilling fluid is encountered during drilling, Michels Drilling only appears to offer options of drilling with thicker drilling fluids or placing "pills" in the hole. These were similar options that had already been used by Michels Drilling during the construction of the hole (or tunnel) from south to north. For your consideration and to help protect any water wells that may be in the same bedrock fracture system connected to the gas pipeline hole (or tunnel), once the drilling machine encounters an initial loss of drilling fluids, Michels Drilling and Union Gas should assess the option of drilling with "air" or "potable and clean water" being used as a "drilling fluid" instead of a "water and bentonite mixture". If either option is feasible, then switching drilling fluids should be considered as part of the action plan. If feasible, the air or water drilling fluid option may reduce the amount of bentonite drilling fluid and additives being discharged into the bedrock fracture system that could work its way into a possible well supply.

If you require further information or clarification please contact me.

Take care,

Warren

Warren Lusk P.Geol.
Provincial Officer # 634

Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region
Ministry of the Environment and Climate Change
P.O. Box 22032, Kingston ON, K7M 8S5
Telephone: 613-540-6855
Email: warren.lusk@ontario.ca

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From: Veale, Lesley [lesley.veale@stantec.com]
Sent: October 22, 2015 3:46 PM
To: Lusk, Warren (MOECC)
Cc: Joyner, Dan (MOECC); Al-Amry, Amry <AAIAmry@uniongas.com> (AAIAmry@uniongas.com)
Subject: FW: Water Quality Summary Letter - DRAFT for comment

Warren

The following is some additional information regarding water quality within nearby private wells.

From my e-mail on Oct 21, 2015, the following is an update of actions taken to date:

- Pre-construction and post-seepage sampling has been completed at ten (10) nearby wells as determined in consultation with MBQ and their consultant Intrinsik and Health Canada
- A draft summary letter has been prepared by Stantec is currently under review by MBQ, Intrinsik and Health Canada.
- Health Canada has completed their own sampling and will be reviewing that data as well.
- Preliminary data from Stantec has not indicated any water quality concerns or changes in water quality due to Union Gas drilling. However, Chief and Council have requested that Health Canada provide the official response to MBQ.
- MBQ, Intrinsik, Stantec and Health Canada are in discussion of how and when this message will be passed to the residents.

And please see below my e-mail from October 20, 2015 regarding the draft water quality letter. We have not yet received comments on the draft letter, but I am expected to hear from Intrinsik/MBQ by end of day today.

Please give this document a read and hopefully it will provide the additional background data that you are looking for.

I believe you will be reading these documents this evening. If you have any questions, don't hesitate to call my cell (519) 242-8554.

Thanks
Lesley

From: Al-Amry, Amry [AAIAmry@uniongas.com]
Sent: October 22, 2015 11:36 AM
To: Joyner, Dan (MOECC)
Cc: Veale, Lesley (lesley.veale@stantec.com); Knappett, Christine (MOECC); Faaren, Greg (MOECC); Taylor, Peter (MOECC); Lusk, Warren (MOECC); sandra.green@hc-sc.gc.ca; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Kaye, Brian (MOECC); toddtk@mbq-tmt.org; peterb@mbq-tmt.org; Simpson, Carl; Grochmal, Tom
Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Hi Dan,

Please, find attached an executive summary of the execution plan and Michels Contingency planning for the drilling operations.

Thank you,

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548



From: Joyner, Dan (MOECC) [<mailto:Dan.Joyner@ontario.ca>]
Sent: October-21-15 3:53 PM
To: Al-Amry, Amry
Cc: Veale, Lesley (lesley.veale@stantec.com); Knappett, Christine (MOECC); Faaren, Greg (MOECC); Taylor, Peter (MOECC); Lusk, Warren (MOECC); sandra.green@hc-sc.gc.ca; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Kaye, Brian (MOECC); toddtk@mbq-tmt.org; peterb@mbq-tmt.org
Subject: FW: Proposed Well Abandonment - Additional Details

Hi Amry,

Warren has provided his support to the abandonment plan within the email below. He hopes to attend the well abandonment if it goes ahead tomorrow morning.. Please let Warren and I know when the well plugging and sealing is to commence. We will be in contact with Peter Brant

and/or Todd Kring to confirm our availability to visit the Tyendinaga Mohawk Territory during this work.

Sincerely,

Dan Joyner
Senior Environmental Officer
Belleville Area Office
Ministry of the Environment and Climate Change
345 College St. East
Belleville, ON K8N 5S7
(613) 962-3641

From: Lusk, Warren (MOECC)
Sent: October-21-15 3:31 PM
To: Joyner, Dan (MOECC)
Cc: Yee, Kim (MOECC); Stephenson, Kyle (MOECC); Taylor, Peter (MOECC); Faaren, Greg (MOECC); Knappett, Christine (MOECC)
Subject: FW: Proposed Well Abandonment - Additional Details

Hi Dan:

I have reviewed the below October 21, 2015 1:02 PM and October 21, 2015 2:13 pm emails from Stantec Consulting Ltd. (Stantec) over additional plugging details (Emails shown below my Email).

Based on the Emails I determined the following for the identified open abandoned well at 13 Gussy Lane:

- Stantec proposes to have a daylighting machine clean out any remaining debris from the well including drill fluid prior to initiating the plugging and sealing operation by Marathon on the well.
- Stantec received information from Lotowater that Lotowater identified a large bedrock fracture system near the bottom of the well and another small bedrock fracture at about 5.3 metres below the ground surface.
- Stantec proposes to have Marathon place a clean gravel material in the large fractured zone at the bottom of the well and a layer of bentonite chips on top of the gravel to help prevent any cement "washouts" out of the well.
- Using a tremie pipe, Stantec proposes to have Marathon place a 9.9 metre cement grout plug at a density of at least 1.9 kilograms per litre above the bentonite chips.
- Further layers of bentonite chips, gravel and bentonite are proposed to be placed in the remainder of the well in accordance with the Wells Regulation to help plug and seal the well.
- As there is a danger to the stability of the adjacent residence to the well, Stantec proposes to leave the existing well pit structure and casing in place.

- Stantec is proposing to mix the cement with potable water to create a cement grout with a density of 1.9 kilograms per Litre and provide verification of the cement grout's density.
- Stantec staff will be on site observing the plugging and sealing operation and prepare a report on its success.

If the cement grout is properly mixed, placed, allowed to properly cure and bond to the side of the open bedrock wall of the well, the cement should be able to withstand extremely high pressures and have a low permeability to help prevent the vertical movement of drill fluids and other potential in the abandoned well at 13 Gussy Lane.

Based on the information provided by Stantec and the Wells Regulation, I support the plan to plug and seal the abandoned well at 13 Gussy Lane.

For the identified open abandoned well at 53 Gussy Lane, Stantec received information from Lotowater that Lotowater identified small bedrock fracture systems in the abandoned well. Stantec proposes to plug and seal the well in a similar fashion as the well at 13 Gussy Lane. For example, Stantec proposes Marathon to place gravel in the abandoned well at the same elevations as the identified open fractures, place bentonite layers above and below the gravel and place cement grout plugs between layers of the bentonite. If the cement grout is properly mixed and allowed to properly cure and bond to the side of the open bedrock wall of the well, the cement should be able to withstand extremely high pressures and have a low permeability to help prevent the vertical movement of drill fluids and other potential in the abandoned well 53 Gussy Lane.

Based on the information provided by Stantec and the Wells Regulation, I support the plan to plug and seal the abandoned well at 53 Gussy Lane.

If the abandonment plugging and sealing operations are approved by the parties including you, the plugging and sealing takes place tomorrow and if I am invited, I can observe some of the abandonment operations at the study area from anytime very early in the morning to about 10:30AM.

Based on the October 21, 2015 1:02 PM Stantec email, it appears that the consultant is proposing to create a hydrogeological report once the Michels Drilling operation is completed. In my October 13, 2015 Email to you, I believe I suggested that the action plan submitted to you (and prior to commencement of Michels Drilling Operation) should have a groundwater report that shows all sample interpretations and other observations and an interpretation of all water quality sample determinations from area wells compared to the contaminants of concern in the drilling mud and the "pill" additives (The groundwater report should also provide conclusions and any recommendations including temporary bottled water supplies and any well remediation) and should identify how Union Gas and its agents will implement the recommendations in the groundwater report prepared by Union Gas and its consultants.

Take care,

Warren

Warren Lusk P.Geo.
Provincial Officer # 634
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region
Ministry of the Environment and Climate Change
P.O. Box 22032, Kingston ON, K7M 8S5

Telephone: 613-540-6855
Email: warren.lusk@ontario.ca

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From: Veale, Lesley [<mailto:lesley.veale@stantec.com>]
Sent: October-21-15 2:13 PM
To: Al-Amry, Amry
Subject: RE: Review of October 20, 2015 Well Abandonment and Contingency Planning Quinte Pipeline Replacement, Union Gas Ltd by Stantec and Supplementary Emails

Amry

I just spoke with Mr. Warren Lusk at the MOECC who requested clarification on key items from our e-mail this morning.
Additional details are provided below – please forward to all.

Clarification on Casing Removal

According to O.Reg 903, the well casing and pit should be removed, when reasonably possible, to a minimum depth of 2 m BGS, at the time of abandonment.

At 13 Gussy Lane, based on the proximity of the well to the residence, it is recommended that the concrete pit and casing remain in place. We do not want to excavate this area and cause any damage to the house.

At 53 Gussy Lane, the metal casing will be cut off below ground surface. The exact depth will be confirmed with the homeowner as the active water supply line runs very close to this old well. The resident may have specific requests regarding excavation.

Surface Grout

At both locations, the borehole from ground surface to 1.5 m BGS will be abandoned using bentonite chips. The rest of the abandonment depths are as detailed in the previous e-mail.

Clarification on General Abandonment Method

At Well 1 at 13 Gussy Lane, immediately prior to abandonment, the fluid within the casing will initially be removed. Based on well diameter and depth, it is expected that up to 300 L of fluid will be removed. All abandonment material will be installed within the well through a tremmie pipe and will displace the fluid currently in the well. The driller will contain and dispose of material vertically pushed out of the well.

I trust that this addresses the MOE questions/comments.

Lesley Veale

Senior Hydrogeologist
Stantec
49 Frederick Street Kitchener ON N2H 6M7
Phone: (519) 585-7377
Cell: (519) 242-8554
Fax: (519) 579-4239
lesley.veale@stantec.com



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From: Veale, Lesley [<mailto:lesley.veale@stantec.com>]
Sent: October-21-15 1:02 PM
To: Al-Amry, Amry
Subject: RE: Proposed Well Abandonment - Additional Details

Amry

The following e-mail addresses the MOE comments and details proposed well abandonment. Please forward accordingly.

Marathon is a licensed well contractor. Their license number is 6894. The work will be completed by Terry Wright (Well Technician 0715) and Jeff DuPerron (Assistant Well technician 2833). Marathon has confirmed that they will use Trillum GU type 1 cement, which will be mixed using potable water. Marathon will have a scale to document density and Stantec will record measurements and take photos of the scale. The density of the cement grout will meet the requirement of 1.9 kg/L.

53 Gussy Lane

Based on the well video, the following features were noted:

- Fractures at 5.74 m and 8.79 m BGS (see attached photos) (We do not have copies of the well video at this time. It will be forwarded to the MOE upon receipt)
- Well bottom at 9.58 m BGS

Stantec is recommending the following abandonment:

- Bentonite chips from 9 to 9.58 m
- Gravel from 8 to 9 m
- Bentonite chips from 7.7 to 8 m
- Cement grout from 6.3 to 7.7 m
- Bentonite chips from 6 to 6.3 m
- Gravel from 5 to 6 m
- Bentonite chips from 4.7 to 5 m
- Cement grout from 4.7 to ground surface (It is noted that the MOE requires a layer of 0.5 metres to 1.5 metres of bentonite chips, pellets, granules powder to be placed in the upper 2.0 metres of the abandoned well.)

The bentonite chips are required above and below the cement grout to reduce the potential for the grout to flow into the gravel.

Well 1 at 13 Gussy Lane

Based on the well video, acoustic log and caliper log, the following features were noted:

- Fracture with minor water flowing into the well at 5.3 m BGS, but not considered a significant flow.

- Based on the acoustic log, a lower fracture is estimated at 16.2 to 17.3 m and it is expected that this is the main fracture in the well (see attached log).
- Well bottom at 17.4 m

Stantec is recommending the following abandonment:

- gravel from 17.4 to 16 m
- Bentonite chips from 16 to 15.7 m
- Cement grout from 15.7 to 5.8 m
- Bentonite chips from 5.8 to 5.5 m
- Gravel from 5.5 to 5 m
- Bentonite chips from 5 to 4.7 m
- Cement grout from 4.7 to ground surface (It is noted that the MOE requires a layer of 0.5 metres to 1.5 metres of bentonite chips, pellets, granules powder to be placed in the upper 2.0 metres of the abandoned well.)

The proposed abandonment will be reviewed by Marathon and any additional comments noted.

Well 2 at 13 Gussy Lane

Despite best efforts by Union Gas, including metal detector, historical photo, excavation at 2 locations, this well could not be located. The resident then thought that the well may have been abandoned. During drilling activities, Union Gas will have a hydrovac truck permanently at 13 Gussy Lane. The property at 13 Gussy Lane will be regularly inspected by Union Gas staff, who will also patrol all along Gussy Lane.

General Details

The cement will be installed using positive displacement method in stages of known volume. The levels within the well will be measured to document no loss of cement.

The proposed abandonment method includes lowering a tremie pipe to the base of the well and slowing filling with cement grout using positive displacement methods. Any water or drilling fluid within the borehole will be displaced and will be pushed up and out of the well. Marathon will contain and remove all fluid at ground surface. Union Gas has a hydrovac truck on stand-by for this purpose. This proposed abandonment method, is the same method as would be proposed for any typical mud-rotary borehole being abandoned. The density of the cement will remove any remaining drilling fluid within the well. No other action is required.

Water Quality Monitoring

The following is an update of actions taken to date:

- Pre-construction and post-seepage sampling has been completed at ten (10) nearby wells as determined in consultation with MBQ and their consultant Intrinsik and Health Canada
- A draft summary letter has been prepared by Stantec is currently under review by MBQ, Intrinsik and Health Canada.
- Health Canada has completed their own sampling and will be reviewing that data as well.
- Preliminary data from Stantec has not indicated any water quality concerns or changes in water quality due to Union Gas drilling. However, Chief and Council have requested that Health Canada provide the official response to MBQ.
- MBQ, Intrinsik, Stantec and Health Canada are in discussion of how and when this message will be passed to the residents.

Hydrogeological Report

Following completion of the investigation, Stantec will prepare a report detailing the Union Gas borehole drilling, observed seepage, hydrogeologic conditions, groundwater monitoring and well testing,

abandonment of unused wells and recommendations for post construction monitoring. This report will be provided to applicable agencies for review and comment. Timing of this report has not been confirmed.

We trust that this response adequately addresses your questions and comments. Please feel free to contact me if you have any questions.

Lesley

Lesley Veale

Senior Hydrogeologist

Stantec

49 Frederick Street Kitchener ON N2H 6M7

Phone: (519) 585-7377

Cell: (519) 242-8554

Fax: (519) 579-4239

lesley.veale@stantec.com



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From: Lusk, Warren (MOECC)

Sent: October-21-15 1:14 AM

To: Joyner, Dan (MOECC)

Cc: Knappett, Christine (MOECC); Taylor, Peter (MOECC); Yee, Kim (MOECC); Faaren, Greg (MOECC); Stephenson, Kyle (MOECC)

Subject: Review of October 20, 2015 Well Abandonment and Contingency Planning Quinte Pipeline Replacement, Union Gas Ltd by Stantec and Supplementary Emails

Hi Dan:

I have reviewed my [October 13, 2015 10:55 pm](#) Email to Jon Morrish and you, the October 20, 2015 Well Abandonment and Contingency Planning, Quinte Pipeline Replacement, Union Gas Ltd. letter by Stantec Consulting Ltd. (October 20, 2015 Stantec letter) and October 20, 2015 Emails provided by Amhed Al-Amry, P. Eng. of Union Gas.

Based on the October 20, 2015 Stantec letter and October 20, 2015 Emails provided by Amhed Al-Amry, Union Gas is providing you with items in the agreed action plan to you that deal solely with identifying and sealing a number of improperly abandoned wells. It is my understanding that further materials from Union Gas will be forthcoming to you to address the other items I have outlined for an action plan.

Based on an October 20, 2015 3:42PM Email provided by Amhed Al-Amry, apparently Union Gas wishes, and Stantec Consulting Ltd. (Stantec) has recommended, to plug and seal at least two of the abandoned

wells (13 and 53 Gussy Lane) on October 21, 2015 pursuant to an action plan found in section 2.0 of the October 20, 2015 Stantec letter.

Abandoned Wells

Based on the information provided in the October 20, 2015 Stantec letter and the October 20, 2015 3:42 pm Email by Amhed Al-Amry:

- Stantec has identified three improperly abandoned wells (a dug well on Sero Road, an improperly abandoned well at 53 Gussy Lane and an improperly identified well at 13 Gussy Lane) in the study area, and
- could not locate another possible abandoned well at 13 Gussy Lane in the study area.

Stantec assessed well records and interviewed residences near the proposed tunnel (or hole) for the new gas pipeline along Highway 49 and north of the Bay of Quinte. Based on the available information, I believe Stantec has identified the closest improperly abandoned wells to the Michels Drilling operation for the Union gas pipeline.

34 Sero Road

Based on the information provided in the October 20, 2015 Stantec letter, one of the abandoned wells is a shallow dug well located at 34 Sero Road or about 140 metres northwest of the end of the proposed gas pipeline tunnel (or drill hole). Stantec is of the opinion that the abandoned dug well is not located on the borehole route and there are drilled wells in between the dug well and the end of the pipeline. Based on the location of the large fracture zones identified about 15 to 17 metres below the ground surface, I am of the opinion that the shallow dug well is likely not located within the large fracture zone in the bedrock encountered by Michels Drilling operation below Highway 49 and should not be impacted by drill cuttings and drilling fluids from further Michels Drilling operations. Large diameter dug wells that have not been properly abandoned, however, can be pathways for contaminants to enter groundwater resources and are serious safety hazards for humans and animals. For your consideration, the well owner could be contacted with representatives of the Territory and explained the importance of proper abandonment to at least the minimum requirements in the Wells Regulation [R.R.O. 1990, Regulation 903 (Wells) as amended made under the Ontario Water Resources Act, R.S.O. 1990, c. O. 40] to help prevent groundwater contamination and to help protect humans.

53 Gussy Lane

Based on the information provided in the October 20, 2015 Stantec letter, one of the abandoned wells identified by Stantec in the study area is a drilled well located at 53 Gussy Lane. Based on the information in an October 20, 2015 3:51 pm Email provided by Amhed Al-Amry, Lotowater has assessed the abandoned drilled well at 53 Gussy Lane with down the hole video equipment. Lotowater determined that the abandoned well is about 9.9 metres deep with some fractures located in the bedrock at unknown depths. Lotowater is apparently preparing a report on the video assessment of the well.

Based on the information provided in the October 20, 2015 Stantec letter, Stantec proposes to have Marathon Drilling properly abandon the well at 53 Gussy Lane in accordance with the Wells Regulation, using cement as an abandonment barrier material and using a positive displacement method to place the cement in the well. Stantec will inspect the abandonment operation. Based on the information provided in the October 20, 2015 Stantec letter, there is a paucity of information on the methods used to mix and place the cement in the abandoned well at 53 Gussy Lane. It is important that the cement placed in the abandoned well has a high strength and low permeability to help prevent the abandoned well from acting as a pathway for Michels Drilling operation's drilling fluids to reach the ground surface and the area's groundwater resources. It is also important that Stantec understands the open bedrock fractures (identified by Lotowater) that the well has encountered to prevent "washouts" of cement in the well.

In my [October 13, 2015 10:55 pm Email](#) to Jon Morrish and you, I suggested, as part of an action plan, that abandoned wells should be sealed with a high strength material (e.g., cement with a density of no less than 1 kilograms per litre) to help prevent the holes from acting as a pathway for drilling mud from the Michaels Drilling operation. I note that I should have reported a density of cement of no less than **1.9 kilograms** per litre (that is consistent with Oil, Gas and Salt Resources of Ontario - Provincial Operating Standards", version 2.0, dated January 24, 2002 and published by the Ministry of Natural Resources. I apologize for the confusion.

For your consideration and prior to abandonment of the well at 53 Gussy Lane, Stantec should identify the type of cement that will be used, the type of water that will be used to mix with the cement to create a cement grout, how the cement will be mixed with water, how the density of the cement grout will be verified and photographed (e.g., using a common mud balance), and the type of positive displacement method that will be used to place the cement in the hole to ensure a "washout" does not occur at the bedrock fracture locations in the well (e.g., the type of grouting technique using a tremie pipe and will a clean gravel or sand be placed in the fracture zone(s) of the well, identified by Lotowater, to prevent the cement from flowing into large bedrock fractures). For your consideration, Stantec should provide a copy of Marathon's the well contractor licence and a copy of the well technician licence of the individual who will be working at the abandonment of the well. For your consideration, Stantec should also be made aware that a layer of 0.5 metres to 1.5 metres of bentonite chips, pellets, granules powder is required to be placed in the upper 2.0 metres of the abandoned well pursuant to paragraph 8 of subsection 21.1 of the Wells Regulation.

I note that assessing the Lotowater findings and providing recommendations for well abandonment before proceeding with the plugging of the improperly abandoned well is consistent with Stantec's own proposed action in section 2 of the October 20, 2015 Stantec letter - Stantec will provide the MOECC with an update based on the well video and recommendations for well abandonment.

Once Stantec has completed its abandonment recommendations, a written document should be provided to you from Stantec and Union Gas outlining the recommendations and addressing my above-noted concerns prior to any plugging and sealing of the abandoned well. I will review any new Stantec document and be available for any call to assist Union Gas and Stantec in completing the abandonment work at the drilled well.

13 Gussy Lane

Based on the information provided in the October 20, 2015 Stantec letter, there are two abandoned wells located at 13 Gussy Lane. One of the abandoned wells allowed the drilling fluid from Michels Drilling operation to reach the ground surface. A second abandoned well could not be located by the parties on the property as it is buried. There is a possibility that the second abandoned well may have already been plugged and sealed.

Based on the information in an October 20, 2015 3:51 pm Email provided by Amhed Al-Amry, Lotowater failed to assess the identified abandoned drilled well at 13 Gussy Lane with down the hole video equipment due to additional drill fluid in the hole. Lotowater used an acoustic televue log and a caliper log to identify bedrock fractures in the identified abandoned drilled well. The results of the logs have not been finalized for the identified abandoned drilled well.

Based on the information provided in the October 20, 2015 Stantec letter, Stantec proposes to have Marathon Drilling properly abandon the well at 13 Gussy Lane in accordance with the Wells Regulation, using cement as an abandonment barrier material and using a positive displacement method to place the cement in the well. Stantec will inspect the abandonment operation. Based on the information provided in the October 20, 2015 Stantec letter, there is a paucity of information on the methods used to mix and place the cement in the abandoned well at 13 Gussy Lane. It is important that the cement placed in the hole has a high strength and low permeability to help prevent the abandoned well from acting as a

pathway for Michels Drilling operation's drilling fluids to reach the ground surface and the area's groundwater resources. It is also important that Stantec understands the size and locations of bedrock fractures encountered by the identified abandoned well at 13 Gussy Lane to help prevent "washouts" and to help prevent large volumes of cement grout from entering the fracture system(s) instead of properly sealing the well.

As with the abandoned well at 53 Gussy Lane, for your consideration and prior to abandonment of the identified abandoned well at 13 Gussy Lane, Stantec should identify the type of cement that will be used, the type of water that will be used to mix with the cement to create a cement grout, how the cement will be mixed with water, how the density of the cement grout will be verified and photographed (e.g., using a common mud balance), and the type of positive displacement method that will be used to place the cement in the hole to ensure a "washout" does not occur at the bedrock fracture locations (e.g., the type of grouting technique using a tremie pipe and will a clean gravel or sand be placed in the fracture zone(s) of the well, identified by Lotowater, to prevent the cement from flowing into large bedrock fractures). For your consideration, Stantec should provide a copy of Marathon's the well contractor licence and a copy of the well technician licence of the individual who will be working at the abandonment of the well at 13 Gussy Lane. For your consideration, Stantec should also be made aware that a layer of 0.5 metres to 1.5 metres of bentonite chips, pellets, granules powder is required to be placed in the upper 2.0 metres of the abandoned well pursuant to paragraph 8 of subsection 21.1 of the Wells Regulation.

As Lotowater has identified drill fluid is still present in the identified abandoned well, for your consideration, Stantec should be reminded that paragraph 2 of subsection 21.1(1) of the Wells Regulation requires debris, including drilling fluid, be removed during the proper abandonment of a well. It is important to remove all debris from the identified abandoned well to help prevent the debris from reacting with the abandonment barrier material (cement grout) and to help the abandonment material from bonding to the sides of the well. For your consideration, Stantec should also explain how Marathon will be removing the debris from the well.

I note that assessing the Lotowater findings and providing recommendations for well abandonment before proceeding with the plugging of the improperly abandoned well is consistent with Stantec's own proposed action in section 2 of the October 20, 2015 Stantec letter - Stantec will provide the MOECC with an update based on the well video and recommendations for well abandonment.

Once Stantec has completed its abandonment recommendations, a written document should be provided to you from Stantec and Union Gas outlining the recommendations and addressing my above-noted concerns prior to any plugging and sealing of the abandoned well. I will review any new Stantec document and be available for any call to assist Union Gas and Stantec in completing the abandonment work at the drilled well.

Further, as long as abandonment is happening tomorrow, I will attend the site to observe part of the abandonment operations.

It is unclear if Stantec plans to continue looking for the top of the second abandoned well at 13 Gussy Lane and determine if it is improperly or properly abandoned or if Stantec will propose some other strategy to deal with the well during Michels Drilling operation.

Remainder of Action Plan Items

I look forward to reviewing the rest of the action plan items that should at least include what I provided in my October 13, 2015 Email to you, including:

- a groundwater report that shows all sample interpretations and other observations and an interpretation of all water quality sample determinations from area wells compared to the contaminants of concern in the drilling mud and the "pill" additives (The groundwater report

should also provide conclusions and any recommendations including temporary bottled water supplies and any well remediation),

- the further actions that will be taken at the site of the unidentified abandoned well at 13 Gussy Lane,
- the drilling of the remaining of the Union Gas hole (tunnel) in a method that will not cause an adverse effect to the natural environment including the discharge of drill cuttings to any abandoned or in use well, and
- the actions to identify how Union Gas and its agents will implement the recommendations in the groundwater report prepared by Union Gas and its consultants.

I note that some of the above items, including the groundwater report, are not mentioned in the "Proposed Actions" found in the October 20, 2015 Stantec letter. For your consideration, you might wish to remind Stantec of the items in the agreed action plan.

Take care,

Warren

Warren Lusk P.Geo.
Provincial Officer # 634
Hydrogeologist
Water Resources Unit
Technical Support Section
Eastern Region
Ministry of the Environment and Climate Change
P.O. Box 22032, Kingston ON, K7M 8S5
Telephone: 613-540-6855
Email: warren.lusk@ontario.ca

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From: Al-Amry, Amry [AAIAmry@uniongas.com]
Sent: October 20, 2015 3:51 PM
To: Joyner, Dan (MOECC)
Cc: Veale, Lesley; Lusk, Warren (MOECC)
Subject: 53 Gussy Lane

Hi Dan,

The well video was successfully completed within the drilled well at 53 Gussy Lane. The static video was clear and no issues noted. The full video was completed with downhole view and side view. Results indicated a total depth of 9.9 m BGS, some fractures were noted in the video and a proper summary will be provided to the MOECC by the end of the week.

Due to the success of the well video, additional testing is not required at this location.

Stantec is recommending that the drilled well at 53 Gussy Lane be abandoned as per the action plan. Abandonment is proposed for tomorrow morning (October 21).

If you have any questions or concerns, please call and we can discuss.

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548

From: Joyner, Dan (MOECC)
Sent: October 20, 2015 3:46 PM
To: Lusk, Warren (MOECC); Faaren, Greg (MOECC)
Cc: Knappett, Christine (MOECC); Taylor, Peter (MOECC)
Subject: FW: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Hi Warren, Greg,

Any comments on the information below?

Thanks,
Dan.

From: Al-Amry, Amry [<mailto:AAIAmry@uniongas.com>]
Sent: October-20-15 3:42 PM
To: Joyner, Dan (MOECC)
Cc: Veale, Lesley; Lusk, Warren (MOECC)
Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Hi Dan,

The following is a brief summary based on preliminary results, full details of the results will follow by the end of the week.

Prior to the well video, the borehole was hydrovaced to remove fluid within the well.

The video indicated that the well casing may extend to 1.3 m below ground surface (BGS)

Minor flow into the borehole was noted at 1.5 m BGS

Visibility became poor at 9.1 m BGS due to presence of drilling fluid

Base of the borehole was measured at 17.4 m BGS, similar to the interpreted well log of 18.3 m BGS

Due to the poor visibility during the well video, Stantec and Lotowater completed an acoustic televue log and caliper log which both operate within drilling fluid. The results of these logs will be processed this evening following site work – preliminary data is not available. The logs will indicate fracture zones and may help confirm bedrock material. It is our opinion, that all reasonable testing has been completed at this location to document conditions.

It is also noted that a continuous core borehole log is available from the 2014 geotechnical borehole drilled approximately 50 m to the northeast of Well 1 at 13 Gussy Lane. A copy of this log will be provided to the MOECC with the well testing results at the end of the week. The geotechnical log indicates limestone bedrock with frequent weak shale layers with thin fractures noted at 2.2 m BGS, 4.2 m to 5.9 m BGS and 11.3 m BGS. Results from Well 1 at 13 Gussy Lane will be compared to the geotechnical borehole. (To note, the geotechnical borehole was cement grouted immediately after drilling)

Stantec is recommending that Well 1 at 13 Gussy Lane be abandoned as per the action plan. Abandonment is proposed for tomorrow morning (October 21).

If you have any questions or concerns, please call and we can discuss.

Thank you,

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548



From: Al-Amry, Amry
Sent: October-20-15 3:37 PM
To: 'Joyner, Dan (MOECC)'

Cc: 'sandra.green@hc-sc.gc.ca'; 'Taylor, Peter (MOECC)'; 'Knappett, Christine (MOECC)'; 'Lusk, Warren (MOECC)'; 'Faaren, Greg (MOECC)'; 'danb@mbq-tmt.org'; 'toddk@mbq-tmt.org'; 'roy.angelow@aandc-aadnc.gc.ca'; 'peter.ross@hc-sc.gc.ca'; 'kimberley.cameron@ec.gc.ca'; 'Yee, Kim (MOECC)'; Thebeau, Michele; Grochmal, Tom; Khoshaien, Shawn; Grochmal, Tom; Simpson, Carl; Bonin, John; 'Veale, Lesley'; 'Zora.Crnojacki@ontarioenergyboard.ca'; 'peterb@mbq-tmt.org'; 'nicoles@mbq-tmt.org'; 'Crystal Maracle'; Dumouchelle, Norm (NPDumouchelle@uniongas.com)

Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Dan,

Please find attached the Union Gas action plan and timelines with respect to the agreed upon recommendations regarding sealing the abandoned wells along the drill design path, prior to commencing with the drilling operations.

Per our preliminary discussion, my understanding is that you have no concerns conceptually to proceed with the plan to take the video and seal the identified abandoned wells along the drill path.

Following the completion of sealing the identified abandoned wells, we will provide a summary letter detailing the results of the well video/inspection and the method of the abandonment.

Thank you,

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548



From: Al-Amry, Amry

Sent: October-16-15 6:12 PM

To: 'Joyner, Dan (MOECC)'

Cc: sandra.green@hc-sc.gc.ca; Taylor, Peter (MOECC); Knappett, Christine (MOECC); Lusk, Warren (MOECC); Faaren, Greg (MOECC); danb@mbq-tmt.org; toddk@mbq-tmt.org; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Yee, Kim (MOECC); Thebeau, Michele; Grochmal, Tom; Khoshaien, Shawn; Grochmal, Tom; Simpson, Carl; Bonin, John; Veale, Lesley; Zora.Crnojacki@ontarioenergyboard.ca; peterb@mbq-tmt.org; 'nicoles@mbq-tmt.org'; 'Crystal Maracle'

Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Hi Dan,

Union Gas will ensure compliance with your recommendations below prior to commencing with the drilling operations.

We will provide the MOECC with an action plan and timelines with respect to the agreed recommendations in a timely manner. Union Gas will work with Crystal Maracle (MBQ Health Representative) regarding the abandoned wells.

The removal of the any permeable or low strength materials found in the wells and sealing of the identified abandoned wells will be executed by Marathon drilling. The video of the inside the wells will be completed by Lotowater.

A Horizontal Directional Drilling (HDD) contingency planning will be provided.

Thank you,

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548



From: Joyner, Dan (MOECC) [<mailto:Dan.Joyner@ontario.ca>]

Sent: October-16-15 3:57 PM

To: Al-Amry, Amry

Cc: sandra.green@hc-sc.gc.ca; Taylor, Peter (MOECC); Knappett, Christine (MOECC); Lusk, Warren (MOECC); Faaren, Greg (MOECC); danb@mbq-tmt.org; todd@mbq-tmt.org; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Yee, Kim (MOECC); Thebeau, Michele; Grochmal, Tom; Khoshaien, Shawn; Grochmal, Tom; Simpson, Carl; Bonin, John; Veale, Lesley; Zora.Crnojacki@ontarioenergyboard.ca; peterb@mbq-tmt.org

Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Hi Amry, Thank you!

As the project continues the MOECC would like to see a detailed action plan and timelines with respect to the agreed upon recommendations. Please note that our original report (attached) as provided to the Mohawks of the Bay of Quinte on Oct 25, 2015 included a number of other recommendation that should be considered as Union Gas moves forward with this project.

This needs to include verification of the licensed well driller and documentation to verify the removal of any permeable or low strength materials found in the wells, a video of the inside of

the well from top to bottom which shows the geological structure/features, documentation showing the material used to seal the wells is a high strength material that meets a density of at least 1 kilogram/litre and a final report detailing the sealing of the wells.

In addition, the MOECC would like to see written contingencies that will be initiated during the drilling to ensure that any abnormal loss of drilling fluid is quickly and effectively dealt with. In developing the contingencies you should consider triggers that require the shutdown of the drilling operation; whether additional equipment is needed on site to contain and/or remediate any observed impacts from lost drilling fluids and how to monitor for impacts to land or water.

We would also appreciate an update on the well survey and door to door well information gathered by Stantec.

It is recommended that you provide the MOECC with the requested information prior to the commencement of the pipeline drilling.

If you have any questions please let me know.

Sincerely,

Dan Joyner
Senior Environmental Officer
Belleville Area Office
Ministry of the Environment and Climate Change
345 College St. East
Belleville, ON K8N 5S7
(613) 962-3641

From: Al-Amry, Amry [<mailto:AAIAmry@uniongas.com>]

Sent: October-16-15 1:15 PM

To: Joyner, Dan (MOECC)

Cc: sandra.green@hc-sc.gc.ca; Taylor, Peter (MOECC); Knappett, Christine (MOECC); Lusk, Warren (MOECC); Faaren, Greg (MOECC); danb@mbq-tmt.org; todd@mbq-tmt.org; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Yee, Kim (MOECC); Thebeau, Michele; Grochmal, Tom; Khoshaien, Shawn; Grochmal, Tom; Simpson, Carl; Bonin, John; Veale, Lesley

Subject: RE: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Importance: High

Hi Dan,

Union Gas will fully comply with the MOECC two recommendations in the email below prior to proceeding with any drilling operations.

Union Gas will notify MOECC immediately when both requests below are completed and prior to commencing with the drilling operations.

Thank you,

Ahmed M. Al-Amry

P.Eng.

Project Engineer, Engineering Construction
Union Gas Limited | A Spectra Energy Company
50 Keil Drive North | Chatham, ON N7M 5M1
Tel: 519.436.4600 ext 5002882 Cell: 226.229.9548



From: Joyner, Dan (MOECC) [<mailto:Dan.Joyner@ontario.ca>]

Sent: October-16-15 9:51 AM

To: Al-Amry, Amry

Cc: sandra.green@hc-sc.gc.ca; Taylor, Peter (MOECC); Knappett, Christine (MOECC); Lusk, Warren (MOECC); Faaren, Greg (MOECC); danb@mbq-tmt.org; todd@mbq-tmt.org; roy.angelow@aandc-aadnc.gc.ca; peter.ross@hc-sc.gc.ca; kimberley.cameron@ec.gc.ca; Yee, Kim (MOECC)

Subject: Resumption of Drilling - Highway 49 - Union Gas pipeline relocation project.

Hi Amry,

I will not be able to join the teleconference at 10 AM; please accept my apologies.

The MOECC has quickly reviewed your proposal to resume the drilling project along Highway 49. There are concerns that the proposal does not address the current environmental concerns prior to the resumption of drilling. The following actions are highly recommended prior to the start-up of the drilling operation and represent only a few of which we have recommended to the Mohawks of the Bay of Quinte:

- *to identify any other abandoned wells near the Union Gas hole (or tunnel) that remains to be drilled by Michels Drilling and to determine what material was used to plug the abandon holes and the depth of the holes,*
- *to remove all permeable or low strength material from the abandoned wells, video the identified abandoned wells with a down the hole camera and properly seal the identified abandoned wells with a high strength material (e.g., cement with a density of no less than 1 kilograms per litre) to help prevent the holes from acting as a pathway for drilling mud from the Michels Drilling operation,*

The MOECC feels the above steps provide a reasonable approach to ensure that undue environmental risk to the quality of the natural environment. Proceeding with the drilling without the decommissioning of an abandoned well in this area represents an undue risk to the natural environment. Currently the abandoned wells 13 Gussy Road have not be reviewed to determine whether there are additional aquifers that could be at risk if the drilling commences.

As previously mentioned the Permit to Take Water (# 5477-9X5J33) issued for this project stipulates that "the permit holder shall ensure that the taking of water under the authority of the Permit does not result in an adverse effect on area waters". Proceeding without the assurance that the known pathway is sealed does not seem to satisfy the intent of this condition of the permit.

In summary, the MOECC does not recommend that the drilling resume until the company can reasonable assure that the natural environment including the water resources for the area is protected.

If you have any questions about our position please contact me to discuss.

Sincerely,

Dan Joyner
Senior Environmental Officer
Belleville Area Office
Ministry of the Environment and Climate Change
345 College St. East
Belleville, ON K8N 5S7
(613) 962-3641

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