CKSO Road Development

Hydrogeological Assessment Proposed Lot Development City of Greater Sudbury, ON

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1 Executive Summary

EXP Services Inc. (EXP) was retained by Wicker Image Inc. ("the Client") to complete a hydrogeological assessment for a proposed subdivision development at the property located immediately east adjacent to CKSO Road, in the City of Greater Sudbury, Ontario; hereinafter referred to as the 'Site.' The development is to consist of seven (7) lots and, as such, a hydrogeological assessment for individual septic system loading was required. The Site extends south from the intersection between CKSO Road and Goodview Road and is west adjacent to a driving range area (**Drawing A-1**). In general, areas to the north and west are residential, while areas to the south and east are commercial. Based on site plans provide by the client, the property is approximately 1.722 ha (4.26 acres) in area and is undeveloped. Adjacent residences are serviced with municipal water; however, residences are serviced by individual septic systems.

As observed during the drilling program, hydrogeological conditions were fairly consistent across the Site, with silty overburden noted within drilling depths. In addition, a review of available well records suggest a thick clay/silt overburden in areas to the west and south of the Site, while areas to the north are characterized by thin overburden and bedrock at or near the surface. In addition, based on a review of available topographic and waterbody information, groundwater flow across the Site is assumed to be in the (generally) south direction, from areas of high elevation and bedrock elevation to areas of low elevation. Water level data from monitoring wells showed on-Site suggest groundwater flow exhibits a shallow gradient to the south.

Two (2) groundwater samples were collected from on-Site monitoring wells and submitted for nitrate/nitrite analysis. Results showed nitrate and nitrite concentrations were below detectable limits for both parameters. As such, septic systems can be utilized on the Site.

Nitrate loading predictions, as calculated based on methods outlined in Ontario D-5-4 recommendations, were performed for multiple scenarios (**Table 6.1**). **Scenario 1** predicted nitrate loading and resultant groundwater concentrations at the property boundary with the proposed 7-lot development. In addition, **Scenario 2** predicted nitrate loading in response to a 7-lot development and tertiary treatment applications, while **Scenario 3** assessed nitrate loading with a 3-lot development and no tertiary treatment applications. Results were as follows:

Scenario 1 – 7-lots with no tertiary treatment resulted in predicted nitrate levels exceeding D-5-4 criteria (10 mg/L) criteria.

Scenario 2 – 7-lots with tertiary treatment (minimum 43% nitrate load removal) resulted in predicted nitrate levels being below the 10 mg/L criteria.

Scenario 3 – 3-lots (the maximum number of lots that can be developed, while satisfying ODWS using D-5-4 calculations) with no tertiary treatment resulted in predicted nitrate levels being below 10 mg/L criteria.

Based on the above observations, development **Scenarios 2 and 3** *specifically* satisfy D-5-4 criteria; however, it should be noted that D-5-4 mass loading calculations assume absolute conservation of mass – that is, it does not consider natural attenuation from aquifer crossflow, biodegradation or other processes.

Environmental, hydrogeological and other observations suggest considerable natural attenuation and denitrification processes on and near the Site. This conclusion is based on the following:

- a. The presence of a shallow water table, which contributes to an oxygen poor (or anoxic) environment.
- b. The presence of a shallow hydraulic gradient, which increases contaminant residence times.
- c. A low conductivity silt/clay overburden layer, whereby a majority of the nitrate loading will likely occur.
- d. Background water quality with nitrate and nitrite concentrations below the detectable limit, suggesting minimal impacts from active septic systems on upgradient or cross-gradient lots.

As noted in points a to d, the combination of a shallow water table, shallow hydraulic gradients and relatively low conductivity within the overburden creates a relatively anoxic environment and retards contaminant movement. In both cases, this would

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enhance denitrification processes. In addition, due to the thickness of overburden noted at the Site and in adjacent areas to the west and south, it can be assumed that nitrate loading would be confined to relatively higher conductivity zones in the confined aquifer (coarser silt or sand seams), rather than migrating to the deep aquifer. Reported background water quality in the shallow aquifer also suggests limited nitrate/nitrite impacts, which further suggests limited impacts from up- or cross-gradient septic systems.

As it relates to human health, because the Site and adjacent areas are serviced by municipal water supplies, any nitrate loading is considered to have minimal risk.

Based on the above observations, it is assumed that nitrate loading (as described in D-5-4) is naturally reduced through attenuation and denitrification processes and, as such, tertiary treatment systems are not recommended. In addition, because municipal water supplies are present at the Site and adjacent areas, significant health impacts from elevated nitrate concentrations in potable groundwater supplies (if any) is not anticipated. Thus, a seven (7) lot development is not anticipated to have any significant impact on groundwater water quality or human health at or downstream from the Site.

2 Introduction

EXP Services Inc. (EXP) was retained by Wicker Image Inc. ("the Client") to complete a hydrogeological assessment for a proposed subdivision development at the property located immediately east adjacent to CKSO Road, in the City of Greater Sudbury, Ontario; hereinafter referred to as the 'Site.' The development is to consist of seven (7) lots and, as such, a hydrogeological assessment for individual septic system loading was required. The Site extends south from the intersection between CKSO Road and Goodview Road and is west adjacent to a driving range area (**Drawing A-1**). In general, areas to the north and west are residential, while areas to the south and east are commercial. Based on site plans provide by the client, the property is approximately 1.722 ha (4.26 acres) in area and is undeveloped. Adjacent residences are serviced with municipal water; however, residences are serviced by individual septic systems.

It is understood that groundwater wells are not to be used on the Site, as residences are serviced by the municipal water supply. Thus, a water quality, as it relates to Ontario Drinking Water Standards/Objectives, and water quantity assessment were not part of the scope of this report. However, residences are serviced by individual septic systems and, as such, an assessment of contaminant loading in response to septic systems is required for the property. As part of the contaminant loading investigation, borehole data from a geotechnical investigation was utilized. **Drawing A-2** shows the locations of boreholes, while **Drawing A-3** shows approximate proposed lot dimensions at the Site.

3 Scope of Work

EXP completed the following scope of work:

- Review existing information to characterize Site hydrogeological/geological conditions;
- Complete an on-Site septic system impact assessment, with consideration to the requirements of Ministry of Environment, Conservation and Parks (MECP) Procedures D-5-4;
- Complete a summary report that provides the findings, conclusions and recommendations.

4 Site Description

The Site is located immediately east adjacent to CKSO Road in the City of Greater Sudbury, ON (see **Drawing A-1**). The Site is largely undeveloped, while residential areas are noted to the north and west. Apparent institutional developments are noted to the south, while commercial developments (driving range) are noted to the east. Beyond noted developments to the west and south are vacant lands with minimal developments. Areas beyond the driving range to the east consist of institutional developments, while the Trans-Canada Highway is noted to the north.

Based on a review of available topographic maps, the Site is in an area of relatively low local relief, ranging from approximately 234 masl in north areas of the Site and 233 masl in south areas. As such, the property has a shallow gradient dipping to the

south. Topography in areas adjacent to the Site show similar topographic variations, whereby minimal local relief is observed. Topographic highs are noted in areas west and north of the Site, suggesting the Site exists within a low-lying "basin" area between elevated bedrock outcrops.

During the drilling program, boreholes noted relatively coarser silt materials near the surface, with progressively finer silt materials at depth. In addition, groundwater levels collected in March 2024 showed groundwater levels were between 0 to 0.2 m below ground surface, suggesting a very shallow groundwater table. The shallow groundwater may be due, in part, to melting snowfall during warm weather. Groundwater elevation data from March 2024 is provided in **Table 4.1**.

Well ID	Geodetic Elevation (masl)	WL (mbg)	Water Elevation (masl)
MW7	234.04	0.355	233.69
MW1	233.03	0.21	232.82

Table 4.1 Groundwater Elevation Data

A review of Ontario Geological Survey Quaternary Maps (Google Earth) suggest the Site is underlain by undifferentiated igneous and metamorphic rock, exposed at the surface or covered by a discontinuous, thin layer of drift. Similarly, a review of Ontario Geological Survey Bedrock Maps (Google Earth) suggest the Site is underlain by quartz-feldspar sandstone, argillite and conglomerates from the Huronian Supergroup, Hough Lake Group and Mississage Formation. In addition, a fault was noted spanning approximately east to west through south areas of the Site.

The proposed subdivision is to include seven (7) lots, as shown in **Drawing A-3**, with a total area of 1.722 ha. Proposed lots are arranged along CKSO Road, with individual lots ranging between 0.216 to 0.270 ha. Based on the observed topography, groundwater flow is assumed to be generally south towards low-lying topographic areas.

5 Well Records

To better characterize the Site, a review of nearby well records was completed. A total of eleven (11) well records were reviewed. Characteristics of the well records are summarized in **Table 5.1**

Well ID	Location (approximate)	Date Drilled	Well Type	Total Depth	Lithology
On-Site			•		
5902468	On-Site	1970	Overburden	145'	0 to 120' – sand and clay 120 to 135' – clay 135 to 145' – boulders and gravel
West of Site		•			
5902354	200 m, W	1970	Overburden	143'	0 to 20' – clay 20 to 138' – (fine) sand 138 to 143' – hardpan
5901995	200 m, WSW	1968	Overb590urden	58'	0 to 53' – clay and sand 53 to 58' – gravel
5905537	250 m, W	1987	Bedrock	310′	0 to 80' – sand and clay 80 to 85' – stone and silt 85 to 310' – grey granite
South of Site					
5904686	10 m, S	1982	Overburden	142'	0 to 138' – clay 138 to 142' - gravel
5904963	50 m, SW	1984	Overburden	167'	0 to 150′ – clay 150 to 167′ – sand (and gravel)
5904339	250 m, SW	1980	Overburden	146′	0 to 135' – clay 135 to 145' – sand

Table 5.1 Well record summary

					145 to 146' – gravel
					0 to 15' – sand
5904018	350 m, SW	1978	Bedrock	400'	15 to 150' – clay
5904018	550 111, 500	1978	Deurock	400	150 to 189' – sand
					189 to 400' – grey granite
North of Site					
5904124	50 m, N	1979	Bedrock	75′	0 to 75' – white granite
5900465	70 m, NW	1965	Bedrock	50'	0 to 20' – boulders and clay
5900465		1905	Beulock	50	20 to 56' – red granite
					0 to 35' – clay
5905533	100 m, NW	1987	Bedrock	370′	35 to 40' – sand and gravel
					40 to 370' – grey granite

Based on observations in **Table 5.1**, areas north of the Site generally show thin to nil overburden at the reviewed well record locations. In north areas, overburden was noted to consist of both sand or clay. Oppositely, overburden was considerably thicker in areas south and west of the Site and generally consisted of thick clay units. As such, south and west areas of the Site likely exhibit hydraulic isolation between the deeper and shallower aquifer units, while north areas of the Site likely exhibit hydraulic connection between the surface and deep aquifer systems. Overall, overburden beneath the Site likely increases in thickness to the south and west, with a significant confining clay/silt unit atop a bedrock or sand/gravel water producing zone. Oppositely, a relatively thinner clay/silt layer likely characterizes areas north of the Site, which is atop the higher conductive sand/gravel or bedrock unit.

6 Contaminant Loading Assessment

6.1 Background Water Quality

Two (2) samples were obtained from on-Site monitoring wells to assess background nitrate/nitrite in local groundwater, whereby results from both monitoring locations showed nitrite and nitrate concentrations were below detectable limits.

6.2 Predictive Assessment

MECP Procedures D-5-4 describes a three-step procedure to assess the impacts of individual on-site sewage systems to groundwater:

- Step 1: Assess whether the average lot size is greater than 1 hectare (ha).
- Step 2: Demonstrate whether on-site individual sewage systems are hydraulically isolated from existing or potential water supply aquifers.
- Step 3: Examine potential contaminant loadings to groundwater from the proposed on-site sewage systems.

MECP Procedure D-5-4 stipulates that if lot sizes are greater than 1 ha, or if the average lot size is 1 ha with no lot less than 0.8 ha, a hydrogeological assessment may not be required. The Site is proposed to be developed into seven (7) lots, with lots ranging between 0.21 and 0.27 ha. Based on the proposed Site Plan (**Drawing A-3**) and property size, it is assumed lot sizes will be consistently less than 0.8 ha. In addition, based on the total property area of 1.722 ha, it is assumed the average lot size will be less than 1 ha (1.722 ha / 7 lots = 0.246 ha/lot). As such, an on-Site sewage system impact assessment was completed.

Although potable water is provided by the municipal water supply in adjacent areas, an assessment was completed to ensure subsurface aquifers would not be significantly impacted. MECP Procedures D-5-4 stipulates that individual on-site sewage systems may be deemed acceptable if it can be demonstrated that effluent from on-site sewage systems are hydraulically isolated from existing or potential supply aquifers in the vicinity. Based on a review of borehole data and grain size analyses, overburden largely consisted of silt, becoming finer with depth. In addition, trace to some clay was noted in all samples, with trace sand noted at shallower depths. During drilling, all seven (7) boreholes were extended to 17' and bedrock was not encountered at any borehole location. Due to the composition and thickness of overburden noted during drilling, it is assumed



the overburden aquifer system across the Site is *not* hydraulically isolated. In general, the Site is characterized by silt materials with varying amounts of sand and clay. Due to the potentially conductive properties of coarser silts and the unknown overburden depth, it is concluded that hydraulic isolation does not exist between potential on-site sewage systems and the overburden/shallow aquifer. Therefore, it is necessary to proceed to Step 3 of the procedure to assess the potential impacts of contaminant loadings of the on-site sewage systems on existing or potential supply aquifers. However, it should be noted that hydraulic isolation, as outlined by the MOE Design Guidelines for Sewage Works (2008), likely exists for the bedrock/deep aquifer system, which is consistently used for water supplies in historical well records.

EXP completed a predictive assessment of potential combined impacts from the on-site sewage systems to water supply sources at the Site boundaries, based on MECP Procedures D-5-4. The location of the proposed development in areas away from major waterbodies/receptors was also taken into consideration in the predictive assessment.

The contaminant attenuation model for the Site was based on the following assumptions:

- Dilution from infiltrating precipitation as the only mechanism for attenuation of contaminants;
- The approximate total size of the proposed lots is 1.722 ha so, collectively, an area of 17,220 m² is available for infiltrating precipitation;
- Utilization of precipitation data between 1971 and 2010 from Environment Canada for the Sudbury Station, which had an average annual precipitation of 903.3. Thus, the average annual precipitation at the Site was assumed to be 900 mm;
- Utilization of evapotranspiration data from Environment Canada and Statistics Canada (1981 to 2010) for the Great Lakes Area, which indicates an average annual evapotranspiration in the range of 500 mm to 600 mm;
- Estimation of infiltration based on site-specific conditions, including soils, topography, geology and impermeable surfaces (such as paved areas and bedrock if any): The entire moisture surplus is assumed available for infiltration within the infiltration areas. While some of the moisture surplus may become runoff, this is assumed to be a minimal amount;
- Based on these data, a conservative average annual moisture surplus of 200 mm is designated for the Site;
- Nitrate-nitrogen is the critical contaminant;
- A nitrate-nitrogen concentration of 0.5 mg/L has been designated for the infiltrating precipitation. This is considered conservative for precipitation in northern Ontario;
- A nitrate-nitrogen concentration of 40 mg/L was assumed in the effluent;
- The estimated daily effluent flow rate for the Site is 1000 L/lot/day. Assuming individual sewage systems for the seven (7) proposed lots, the combined effluent flow rate for the Site is estimated at 7,000 L/day.

The contaminant concentrations at the Site boundaries (C_T) were derived from the total mass loading of nitrate-nitrogen in input waters (M_T) divided by the total volume of the input waters (V_T):

$$C_T = M_T / V_T$$

 V_T is equal to the total volume of infiltrating precipitation (V_i) and the total volume of discharge from all on-site sewage systems (V_e). M_T is equal to the total mass of contaminant contained in both the infiltration precipitation (M_i) and the sewage effluent (M_e):

$$M_i = C_i \times V_i$$
$$M_e = C_e \times V_e,$$

Where C_i and C_e are the nitrate-nitrogen concentrations in infiltrating precipitation and sewage effluent, respectively.

The total predicted nitrate-nitrogen loadings to groundwater from the effluent sources at the Site are based on projected loadings from infiltrating precipitation and from sewage effluent discharges per the formulae defined above and as shown in

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Table 6.1. The predicted nitrogen-nitrate loadings to groundwater across the entire Site (~1.722 ha) with <u>no treatment</u> (**Table 6.1, Scenario 1**) indicate a concentration of approximately 17.0 mg/L at the Site boundary, which is above the D-5-4 10 mg/L criteria.

In addition, the predicted nitrogen-nitrate loadings to groundwater across the entire Site (~1.722 ha) with <u>43% nitrate-nitrogen</u> <u>removal</u> (**Table 6.1, Scenario 2**) indicate a concentration of approximately 9.8 mg/L at the Site boundary, which is below the 10 mg/L D-5-4 criteria. Similarly, D-5-4 criteria are met if the lot number is reduced to three (3), whereby the predicted nitrate loading showed a boundary concentration of 9.6 mg/L (**Table 6.1, Scenario 3**).

Note, additional consideration can be given to natural processes that can lead to attenuation and denitrification, which would further decrease contaminant concentrations at the property boundary.

Table 6.1 Generic Nitrate Loading Predictions

Basic Assumptions 1000 L/day effluent flow per hou Recharge = 0.20 m/yr (for silt, ve No groundwater crossflow, no e	egetation cover, flat topograp		
Calculation Scenario:	1 7 lots no treatment	2 43% removal treatment	3 3 lots no treatment
Number Houses	7	7	3
Effluent Volume per House (L/day)	1,000	1,000	1,000
Nitrate Mass in Effluent per House (g/day)	40	23	40
Recharge Area (m ²)	17,220	17,220	17,220
Recharge Rate (m/yr)	0.2	0.2	0.2
Total Mass Nitrate (g/yr)	102,200	58,765	43,800
Volume Effluent (m³/yr)	2,555	2,555	1,095
Volume Recharge (m ³ /yr)	3,444	3,444	3,444
Total Volume Water (m³/yr)	5,999	5,999	4,539
Resultant Nitrate Loading (g/m ³ or mg/L)	17.0	9.8	9.6



7 Data Assessment and Discussion

7.1 Background Water Quality

Two (2) samples were obtained from on-Site monitoring wells to assess background groundwater quality, as it relates to nitrate/nitrogen. Overall, results from both monitoring locations showed nitrite and nitrate concentrations were below the detectable limit. As such, this suggests minimal background nitrate/nitrite concentrations. Because the Site is in an area commonly serviced with septic systems, this suggests considerable natural attenuation and, possible, denitrification within areas adjacent to the Site.

7.2 Contaminant Loading

A review of contaminant loading suggests mass loading will exceed 10 mg/L at the property boundary. As shown in **Table 6.1**, **Scenario 1**, predictive assessments show a contaminant loading concentration of 17 mg/L, which is higher than the criteria of 10 mg/L. In **Scenario 2**, whereby 50% nitrate removal systems are applied, concentrations at the property boundary are reduced to levels less than 10 mg/L (8.5 mg/L). Similarly, if the lot number is reduced to three (3), this suggests mass loading would be 9.6 mg/L, which is less than the maximum 10 mg/L (**Scenario 3**).

7.3 Hydrogeological Conditions

A review of borehole logs on the Site suggest overburden largely consists of silt with varying minor amounts of clay and sand. As such, relatively higher conductivity layers may constitute an overburden aquifer system, while lower conductivity units (possibly at deeper depths) may act as a confining layer for a deeper sand or bedrock aquifer system. However, due to limited drilling depths completed during the geotechnical drilling program, definitive aquifer-aquitard depths could not be determined.

A review of nearby well records was completed to better assess hydrogeological conditions on and near the Site. In general, shallow overburden was noted in areas north of the Site, while thicker overburden was noted in areas to the west and south. In general, overburden largely consisted of clay or sandy clay, suggesting a significant aquitard layer in areas south and west of the Site. As observed during drilling, this aquitard layer likely extends beneath the Site, which consists of lower conductivity silt and/or clay layers. A review of well records also suggests water was found at considerable depths within deep aquifer systems – that is, significant water supplies were found within deep sand and gravel or bedrock aquifers. These observations suggest a confining aquifer system throughout the area of the Site which, historically, has been utilized for water supply.

A review of groundwater elevations across the Site also suggests a shallow gradient towards the south, which is consistent with both topographic variations and the presence of waterbodies. As mentioned previously, the Site appears to exist in a low-lying topographic area, as indicated by significant topographic highs to the north and west. In addition, shallow groundwater elevations and gradients suggest the Site is not in an area with significant groundwater movement, but may be better characterized as an area with minimal flow rates.

As it relates to nitrate loading into the subsurface across the Site, shallow groundwater tables and silty materials provide ideal conditions for denitrification. This is due to the adsorption capabilities of silt particles, which increases the amount of time available for chemical denitrification by microbes. In addition, a high water table corresponds to a larger percentage of pore space being filled with water, rather than oxygen. In these anoxic (or oxygen poor) conditions, where dissolved oxygen is depleted, this favors the use of nitrate and nitrite as terminal electron acceptors, thereby leading to denitrification in the groundwater.

Overall, the shallow groundwater flow system is hindered by both a shallow gradient and a low conductivity within the silt. However, other factors, such as the presence of natural microbes, anoxic conditions and low flux rates can support the denitrification of nitrates and nitrites across the Site. The absence of nitrates and nitrites in background water quality, despite the presence of septic systems in adjacent areas, suggests natural attenuation and biodegradation is efficient at reducing nitrate and nitrite concentrations in the shallow groundwater system.



8 **Conclusions and Recommendations**

Based on observations in the hydrogeological assessment and in consideration to D-5-4 procedures, the following conclusions were made:

- 1. Based on nitrate/nitrogen loading prediction calculations **with no treatment**, predicted nitrate concentrations at the property boundary were 17.0 mg/L, which is above D-5-4 criteria (10 mg/L);
- 2. Based on nitrate/nitrogen loading prediction calculations **with treatment** (43% nitrate removal), predicted nitrate concentrations at the property boundary were 9.8 mg/L, which is below D-5-4 criteria (10 mg/L);
- 3. Based on nitrate/nitrogen loading prediction calculations with a maximum three (3) lots, predicted nitrate concentrations at the property boundary were 9.6 mg/L, which is below D-5-4 criteria (10 mg/L);
- 4. Based on observations noted during drilling, this suggests nitrate loading would likely be confined to higher conductivity layers within the thick overburden;
- 5. Historically, groundwater supplies have been obtained from deep bedrock or sand and gravel aquifer systems. In upgradient areas to the north, bedrock is close to surface with minimal overburden cover. In south and west areas of the Site, bedrock is at deeper depths with considerable clay/silt overburden cover;
- 6. Despite septic systems being present in upgradient directions from the Site, noted background nitrate and nitrite concentrations in shallow groundwater on Site suggest considerable natural attenuation and denitrification, resulting in nitrate and nitrite in groundwater falling below the 10 mg/L limit; and
- 7. The Site and adjacent properties are serviced by municipal water supplies and, as such, it is unlikely that groundwater would be used on or near the Site as a potable water source. In addition, based on a review of well records, if wells were to be used it is very unlikely that wells will be installed in the shallow, unconfined aquifer system. Due to the presence of a relatively thick confining layer in downgradient areas to the south and west, this suggests water supply wells (if any) within the deep aquifer system would have nil to minimal impacts on the water supply due to septic systems at the Site.

Based on the above conclusions, the following recommendations are provided:

- 1. Septic beds should be placed as far from adjacent property boundaries as planning will allow (minimum 3 m from property lines and 15 m from residential wells, if present);
- Based on a preliminary nitrate loading calculation for the proposed 7-lots, as outlined in Table 6.1, Scenario 1, nitrate loading would lead to exceedances at the property boundary, as it relates to the D-5-4 criteria of 10 mg/L for nitrate loading. To specifically satisfy a maximum of 10 mg/L nitrate concentration at the property boundary), the following recommendations can be implemented:
 - a. If seven (7) lots are to be developed, tertiary treatment would have to be utilized, such that effluent concentrations can be reduced to levels below 10 mg/L. As outlined in **Table 6.1, Scenario 2**, this can be achieved through removal of (at minimum) 43% of nitrate mass from effluent.
 - b. If tertiary treatment is not desired, reducing the number of lots to three (3) can also be proposed, as predicted nitrate loading would lead to boundary concentrations less than 10 mg/L (**Table 6.1, Scenario 3**)
- 3. However, counter to **recommendations 1 and 2**, environmental and hydrogeological conditions suggest considerable natural attenuation and denitrification processes occur on and near the Site. This conclusion is based on the following:
 - a. The presence of a shallow water table, which contributes to an oxygen poor (or anoxic) environment.
 - b. The presence of a shallow hydraulic gradient, which increases contaminant residence times.
 - c. A low conductivity silt/clay overburden layer, whereby a majority of the nitrate loading will likely occur.

d. Background water quality with nitrate and nitrite concentrations below the detectable limit, suggesting minimal impacts from active septic systems on upgradient or cross-gradient lots.

As noted in points a to d, the combination of a shallow water table, shallow hydraulic gradient and low conductivity within the overburden suggests a relatively anoxic environment and retarded contaminant movement. In both cases, this would enhance denitrification processes. In addition, due to the thickness of overburden noted at the Site and in adjacent areas to the west and south, it can be assumed that nitrate loading would be confined to relatively higher conductivity zones in the confined aquifer (sand seams), rather than migrating to the deep aquifer. Reported background water quality in the shallow aquifer suggest limited nitrate/nitrite impacts, which further suggests limited impacts from up- or cross-gradient septic systems. Based on the noted observations, it is assumed that nitrate loading (as described in D-5-4) is naturally reduced through attenuation and denitrification processes and, as such, treatment systems are not recommended for septic systems.

- 4. To further support **recommendation 3**, the use of municipal water supplies on Site and in adjacent areas suggests minimal risk to human health, as it relates to nitrate loading into groundwater. In addition, the depth of historic water supply wells also suggests minimal potential impacts from nitrate loading at the surface. As such, nitrate treatment systems are not recommended for septic systems.
- 5. If groundwater wells are to be installed at the Site, rather than connecting to the municipal water supply, all new water supplies should be tested for water quality to determine required treatment systems (in general, this should include particle filters for turbidity, softeners and microbial treatment); and
- 6. Prior to use as a residential water supply, all groundwater water supplies should be tested to ensure treated water does not exceed Ontario Drinking Water Standards and Objectives.

As noted in **recommendations 3** and **4**, the use for septic treatment systems at the Site is not anticipated, but they can provide added protection to reduce the risk of groundwater contamination. There are a number of available nitrate treatment systems, including the POINTTM system, the Waterloo Biofilter and the Premier Tech Environment Ecoflow Biofilter. Many of the readily available nitrate treatment systems are capable of consistently removing 40% of nitrogen compounds from the effluent. Typically, these systems require smaller field bed areas compared to conventional systems.

Available information, including case studies, suggests Waterloo Biofilter systems can consistently remove the following total nitrogen compounds:

- Single-Pass Waterloo System 25 to 35% total nitrogen removal.
- Double-Pass Waterloo System 50 to 65% total nitrogen removal.

9 General Limitations

The information presented in this report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the subject property. The conclusions and recommendations presented in this report reflect Site conditions existing at the time of the investigation.

More specific information with respect to the conditions at individual lots, including the groundwater quality and well yields (if used), may become apparent during site development operations.

The environmental investigation was carried out to address the intent of applicable provincial and municipal Regulations, Guidelines, Policies, Standards, Protocols and Objectives administered by the Ministry of Environment.

It should also be noted that current Regulations, Guidelines, Policies, Standards, Protocols and Objectives are subject to change, and such changes, when put into effect, could alter the conclusions and recommendations noted throughout this report. Achieving the study objectives stated in this report has required us to arrive at conclusions based upon the best information presently known to us. No investigative method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level. Professional judgment was exercised in gathering and analyzing the information obtained and in the formulation of the conclusions. Like all professional persons rendering advice we do not act as absolute insurers of the conclusions we reach, but we commit ourselves to care and competence in reaching those conclusions.

Our undertaking at **EXP**, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession. It is intended that the outcome of this investigation assist in reducing the client's risk associated with environmental impairment. Our work should not be considered 'risk mitigation'. No other warranty or representation, either expressed or implied, is included or intended in this report.

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10 Closure

We trust this summary report is satisfactory for your purposes. If you have any questions regarding our submission, please do not hesitate to contact this office.

Yours truly,

EXP Services Inc.

Jamie Batten, GIT. Hydrogeologist, Earth & Environmental Northeastern Ontario

Delwar Ahmed, P. Geo. Sr. Reviewer/Hydrogeologist, E & E



Appendix A – Drawings





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The second	LEGEND
	🔶 EXP BOREHOLE
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11	 NOTES – 1) The boundaries and soil types have been established only at Test Hole locations. Between Test Holes, they are assumed and may
-	be subject to considerable error. 2) Do not use Test Hole elevations for design purposes.
×	 Soil samples will be retained in storage for 3 month and then destroyed unless client advises that an extended time period is required.
	 Quantities should not be established from the information provided at the Test Hole locations.
	 This drawing forms part of the report, project number as referenced, and should be used only in conjunction with this report.
Т	
	MARCH 2024 NTS DWG NO. A-1

Appendix B – Well Logs



	Log of	f Borehole BH	-1	
Project No.	<u>SUD-23015629-A</u> 0		Figure No.	B-2
Project: Location:	CKSO Road Residential Developm Sudbury, Ontario	nent	Sheet No.	_1_ of _1_
	503323E; 5141981N	-	Combustible Vapour Reading	
Date Drilled:	January 22, 2024	Auger Sample 🛛 🖾	Natural Moisture	×
Drill Type:	CME 55 Track Mount	Dynamic Cone Test	Plastic and Liquid Limit Undrained Triaxial at	——O ⊕
Datum:	Geodetic (Hand Held GPS)	Shelby Tube _ Field Vane Test S	% Strain at Failure Penetrometer	↓
S		D N Value	Combustible Vapour Reading (pp	m) S

	S			₽			N١	/alue			Combustible 25	Vapo 50	our Reading (p 0 75	pm) (Spm) (S	A	
G W L	Μ.	Soil Description	ELEV.	DEPTH	L	20	40	60	80		Natural	Moistu	re Content % (% Dry Weigl	N	P	Sample
	SY MBOL		m	H		Shear Strengt			kPa	a				opm) S A N ht) L	È.	Number
		TOPSOIL , ~ 250 mm thick	242.00	0-	\pm		50		100		10	20	0 30		s	
	$\tilde{\boldsymbol{\gamma}}$	-	241.8 241.64		\mathbb{H}											
		SILT, some clay, trace to some sand, brown to grey, moist to wet, compact	241.04		\mathbb{A}					+			× –	ΞĪ	$\langle $	AS1
		brown to grey, moist to wet, compact		-	∄					+				<u></u>	\mathbb{A}	AST
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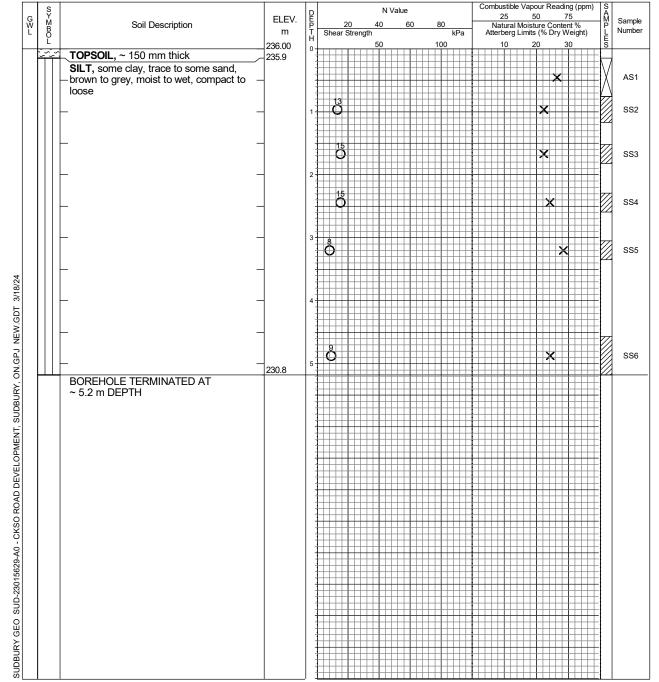


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Borehole data requires interpretation assistance from EXP before use by others.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion Mar. 6, 2024	Drý 0.36	Öpen

	Log of	Borenol	е вн-	-2		
Project No.	<u>SUD-23015629-A</u> 0			Figure No.	B-	-3
Project: Location:	CKSO Road Residential Developme Sudbury, Ontario	ent		Sheet No.	_1_ of	f _1
Date Drilled:	503317E; 5142017N January 22, 2024	Auger Sample		Combustible Vapour Reading	, □ ×	
Drill Type:	CME 55 Track Mount	SPT (N) Value Dynamic Cone Test Shelby Tube		Plastic and Liquid Limit Undrained Triaxial at % Strain at Failure	O ⊕	
Datum:	Geodetic (Hand Held GPS)	Field Vane Test	s.	Penetrometer	A	





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Borehole data requires interpretation assistance from EXP before use by others.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Ďrý	3.9

	Log	of Borehol	e BH	-3		
Project No.	<u>SUD-23015629-A</u> 0			Figure No.	B-4	
Project: Location:	CKSO Road Residential Develop Sudbury, Ontario	oment		Sheet No.	_1_ of	1
	503320E; 5142045N			Combustible Vapour Readir	na 🗖	
Date Drilled:	January 22, 2024	Auger Sample		Natural Moisture	×	
Drill Type:	CME 55 Track Mount	SPT (N) Value Dynamic Cone Test	0 🛛	Plastic and Liquid Limit Undrained Triaxial at	⊢O ⊕	
Datum:	Geodetic (Hand Held GPS)	Shelby Tube Field Vane Test	*	% Strain at Failure Penetrometer	▲	
s		N Value	5	Combustible Vapour Reading (ppm) S	

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G W L	SY M B O L	Soil Description	ELEV.	DEPTH			20		40	60)	80			Natur	al Moi	sture	75 Content Dry We	%		Sample
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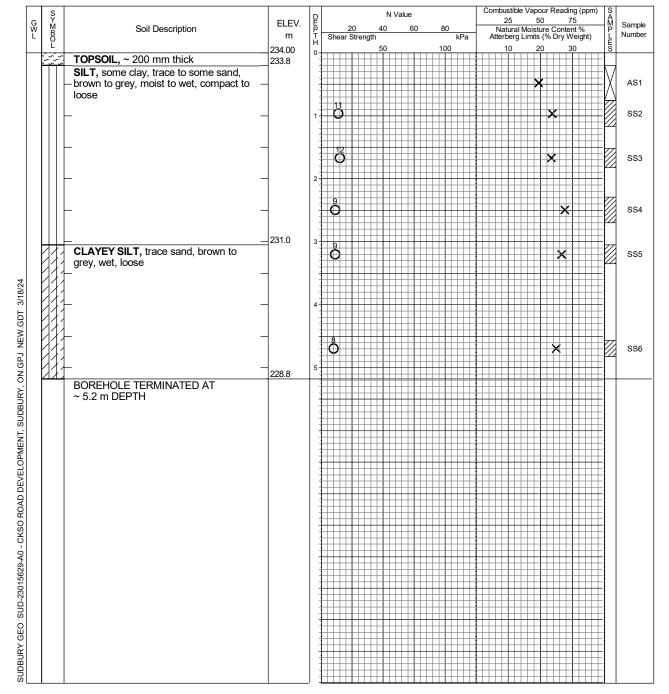


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Borehole data requires interpretation assistance from EXP before use by others.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion Mar. 6, 2024	Drý 0.20	Öpen

	LOG OI	Borenol	ввн	-4			
Project No.	<u>SUD-23015629-A</u> 0				Figure No.	B-5	5
Project: Location:	CKSO Road Residential Developm Sudbury, Ontario	ent			Sheet No.	<u>1</u> of	_1
	503326E; 5142073N			Combustible	e Vapour Readin	a 🗆	
Date Drilled:	January 22, 2024	Auger Sample SPT (N) Value	O ⊠	Natural Mois Plastic and L	sture	×	
Drill Type:	CME 55 Track Mount	Dynamic Cone Test		Undrained Tr % Strain at F	riaxial at	•	
Datum:	Geodetic (Hand Held GPS)	Shelby Tube Field Vane Test	S	% Strain at F Penetromete			





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Borehole data requires interpretation assistance from EXP before use by others.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Ďrý	3.7

	Log of	t Borehol	е вн	-5			
Project No.	<u>SUD-23015629-A</u> 0				Figure No.	B-6	3
Project:	CKSO Road Residential Developm	nent			Sheet No.	_1_ of	_1_
Location:	Sudbury, Ontario						
	503331E; 5142104N	_		Combustible	Vapour Reading	g 🗆	
Date Drilled:	January 22, 2024	Auger Sample — SPT (N) Value	O ⊠	Natural Mois		X	
Drill Type:	CME 55 Track Mount	Dynamic Cone Test Shelby Tube		Plastic and L Undrained Tr % Strain at F	riaxial at	0 ⊕	
Datum:	Geodetic (Hand Held GPS)	_ Field Vane Test	ŝ	Penetromete			
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Borehole data requires interpretation assistance from EXP before use by others.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion Mar. 6, 2024	Drý 0.0	Öpen

	Logo	of Boreho	іе вн	l-0			
Project No.	<u>SUD-23015629-A</u> 0				Figure No.	B-7	,
Project:	CKSO Road Residential Develop	oment			Sheet No.	_1_ of	1
Location:	Sudbury, Ontario						
	503323E; 5142144N			Combustib	le Vapour Readin	۹П	
Date Drilled:	January 22, 2024	Auger Sample		Natural Mo	•	×	
Drill Type:	CME 55 Track Mount	SPT (N) Value Dynamic Cone Test Shelby Tube		Plastic and Undrained % Strain at		——O ⊕	
Datum:	Geodetic (Hand Held GPS)	Field Vane Test	Š	Penetrome			
ş		D N Valu	le	Combustible	Vapour Reading (p	pm) S	

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G W L	SYMBOL	Soil Description	ELEV. m	DEPT H	Shear	20 Streng	4(th	60	80	kPa	Com I At	nbust 25 Natur terbe 10	al Moi: rg Limi	pour Rea 50 sture Cor its (% Dry 20	ading (ppm) 75 ntent % y Weight) 30	SAZPLES	Sample Number
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SUDBURY GEO SUD-23015629-A0 - CKSO ROAD DEVELOPMENT, SUDBURY, ON GPJ NEW GDT 3/18/24		BOREHOLE TERMINATED AT ~ 5.2 m DEPTH															



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Borehole data requires interpretation assistance from EXP before use by others.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	Ďrý	¥.6

	Logo	of Boreho	іе вн	l='/			
Project No.	<u>SUD-23015629-A</u> 0			Figure	No.	B-8	}
Project: Location:	CKSO Road Residential Develop Sudbury, Ontario	pment		Sheet	No	<u>1</u> of	1
	503328E; 5142184N			Combustible Vapour R	eading		
Date Drilled:	January 22, 2024	Auger Sample SPT (N) Value		Natural Moisture		×	
Drill Type:	CME 55 Track Mount	Dynamic Cone Test	<u> </u>	Plastic and Liquid Limi Undrained Triaxial at	t 🗖	——O	
Datum:	Geodetic (Hand Held GPS)	Shelby Tube Field Vane Test	ŝ	% Strain at Failure Penetrometer		▲	
		- Ni Vali	10	Combustible Vapour Rea	ding (ppr	n) S	

G W L	SY MBOL	Soil Description	ELEV.	DEPTH	20 40	Value 60 80	Combustible Vapour Reading (ppm) 25 50 75 Natural Moisture Content % Atterberg Limits (% Dry Weight)	S A M P	Sample
L	D L		m 239.00	H U	Shear Strength 50	kPa 100	Atterberg Limits (% Dry Weight) 10 20 30	L E S	Number
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Borehole data requires interpretation assistance from EXP before use by others.

See Figures B-1A and B-1B for Notes on Sample Description

Time	Water Level (m)	Depth to Cave (m)
Upon Completion Mar. 6, 2024	Drý 0.21	Öpen

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CISR 5140000 The Ontario Water Reso	ources	Commission	Act	א פנ ר \	
Elev	LL	REC	ORD		/
Basin 22 County or District 500BURY				BRO	DER
Con. U Lot 2	Date co	ompleted	6 O		196s'
Owner CENTRAL MORTCAGE	Addres	s R.		in DBU	ry RY
Casing and Screen Record			Pumping	g Test	
Inside diameter of casing 2"		tic level		/	
Total length of casing 20-	Tes	st-pumping ra	ate //	2	G.P.M.
Type of screen		mping level			
Length of screen	Du	ration of test]	pumping 2	HKS.	<u>^</u>
	1			1.1	AR
Diameter of finished hole 2 "				-	G.P.M.
	wit	h pump settir	ag of 30		w ground surface
Well Log			· · · · · · · · · · · · · · · · · · ·	Wate Depth(s) at	r Record Kind of water
Overburden and Bedrock Record		From ft.	To ft.	which water(s) found	(fresh, salty, sulphur)
BOULDERS Y YELLOW CL	AY	0	20		
RED GRANITE		20	56	50	FRESH
					·····
			· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	
For what purpose(s) is the water to be used?			Location a	of Well	
HOUSE		In diagram	n below show	distances of wel	l from
Is well on upland, in valley, or on hillside?		road and	lot line. Indi	cate north by	arrow.
Drilling or Boring Firm		~ 11		11-	
SUDBURY DIAMOND DRILLING	-		769		[]
Address 177 BROOKSIDE ST.				V	~
CHELMSFORD		10	250 ->	\rightarrow	
Licence Number 1717		HURO	NST.		
Name of Driller or Borer C. BENOIT	_				
Name of Driller or Borer G. (SENOIT Address 177 BRODKSIDE ST CHELN	is Fe	nn	50.	LOTI	
Date NNE 21/66		L	72		
(Signature of Licensed Drilling or Boring Contractor)			5		
Form 7 15M-60-4138			i		~ ^
OWRC COPY					Silf
				$q = e^{i \phi_{1}} + e^{-i \phi_{2}}$	

J.B. CODED TM 30610 5901995 -The Ontario Water **Resources** Commission Act ev. 4041 RECORD RO DER 1968 -in 2 JUPBU RU or District County Lot Date completed... Con. dress SITE 5 RR+3 SUBBURY **Pumping Test Casing and Screen Record** 8FT. Inside diameter of casing 11/2 IN Static level Test-pumping rate 80 9915 PEK hR G.P.M. Total length of casing 58 FT. Pumping level 13 FT Type of screen Duration of test pumping ShRS. Length of screen Water clear or cloudy at end of test CLERR. Depth to top of screen Diameter of finished hole 1/2 1 N Recommended pumping rate 80 9ALS PEK MAR G.P.M. with pump setting of 5C feet below ground surface Water Record Well Log Depth(s) at which water(s) Kind of water To ft. From (fresh, salty, sulphur) **Overburden and Bedrock Record** ft. found Y BUICK SAND GRAVEL. RES 5.5 ケヤ Location of Well For what purpose(s) is the water to be used? YOME In diagram below show distances of well from Is well on upland, in valley, or on hillside? UALEL Drilling or Boring Firm A. Guenville VL Site#2 R.R.3. Address Sudbury, CONT Licence Number.... redelle Name of Driller or Borer (Address Date₂ (Signature of Licensed Drilling or Boring Contractor) Form 7 5M 60-20912 OWRC COPY bot 1 bot 12

SUD BURY BR O DER # 3 S ITE 4 Boy 28 More contration 14/13/20 16/2 Market 20 More contration COD BURY BR O DER More 20/2 More contration COD BURY COD OF OVERBURDEN AND BEDROCK MATERIALS (cell instructions) More contration in the second instruction instructinstructing instructin instruction instruction inst		2. CHECK X CON	N SPACES PROVIDED RRECT BOX WHERE APPLICA			<u>9023</u>			φN.	22 23		
Market All Site 4 Boy 200 United All <	♥ or district	BURY					CON., BLOCK, TRAC	V V	-			
14/13.7.2 COURTER COURT ON State 1 1 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) COURT OWERBURDEN AND DEDROCK MATERIALS (SEE INSTRUCTIONS) COURT OWER OWERBURDEN AND DEDROCK MATERIALS (SEE INSTRUCTIONS) COURT OWER OWER OWERBURDEN AND DEDROCK MATERIALS (SEE INSTRUCTIONS) COURT OWER OWER OWER OWER OWER OWER OWER OWER	D (SIIDNAME EI	DCT) 28.47	ADDRESS	# 2 51-	ΓΕ Δ	Ro	2 74			48-53		
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USE 01 4 INDUSTRIAL 8 COOLING OR AIR CONDITIONING OTHER 9 NOT USED METHOD 2 ROTARY (CONVENTIONAL) 7 DIAMOND OF 05 0F 0RILLING 4 ROTARY (AIR) 9 DRIVING DRILLING 5 AIR PERCUSSION NAME OF WELL CONTRACTOR		SALTY 4 MINERAL IFRESH 3 SULPHUR SALTY 4 MINERAL FRESH 3 SULPHUR SALTY 4 MINERAL FRESH 3 SULPHUR ISALTY 4 MINERAL HOD 10 PUMPING 2 BAILER 7 WATER LEVEL 25 WA PUMPING 22-24 15 MINU 010 FEET 74 38-41 PUMP INTA 36-41 GPM 2 GPM. IP TYPE RECOMMENT PUMP OEEP SETTING 2 05 GPM./FT. SPE 085ERVATION 1 3 TEST HOLE ' 4 4 RECHARGE WEL 4	2 GALVA/ 3 3 CONCR 4 4 OPEN I 24-25 1 STEEL 2 4 OPEN I 2 24-25 1 2 GALVA/ 3 2 GALVA/ 3 2 GALVA/ 2 4 OPEN I 2 GALVA/ 3 3 CONCR 4 4 OPEN I 4	19 NIZED ETE HOLE 26 NIZED ETE HOLE 20 15-16 15-16 15-16 21 RECOVERY MINUTES 60 72-38 60 74-4 74-4 74-4 75-7 <td>41115. E5 15-37 21 07 6-43 07 6-43 07 6-43 07 6-43 07 07 07 07 07 07 07 07 07 07</td> <td>20-23</td> <td>DEPTH SET AT - FEET FROM TO 10-13 14- 18-21 22-2 26-29 30-3 LOCATIO RAM BELOW SHOW DIS* INDICATE NORTH B'</td> <td>MATERIAL A</td> <td></td> <td>MENT GROUT, PACKER, ETC.</td>	41115. E5 15-37 21 07 6-43 07 6-43 07 6-43 07 6-43 07 07 07 07 07 07 07 07 07 07	20-23	DEPTH SET AT - FEET FROM TO 10-13 14- 18-21 22-2 26-29 30-3 LOCATIO RAM BELOW SHOW DIS* INDICATE NORTH B'	MATERIAL A		MENT GROUT, PACKER, ETC.		
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METHOD OF DRILLING 2 G ROTARY (CONVENTIONAL) 3 G ROTARY (REVERSE) 7 G DIAMOND BY JETTING 9 DRIVING METHOD OF DRILLING 3 G ROTARY (REVERSE) 9 DIETTING 9 DRIVING DRILLING 4 G ROTARY (AIR) 5 G AIR PERCUSSION 9 DIETVING	25-28 1 2 25-28 1 2 30-33 1 2 2 2 2 2 2 2 2 2 2 2 2 2	SALTY 4 MINERAL IFRESH 3 SULPHUR 2 SALTY 4 MINERAL IFRESH 3 SULPHUR 2 ISALTY 4 MINERAL HOD 10 PUMPING R 2 BAILER 2 WATER LEVEL 25 WATER LEVEL 25 WATER LEVEL 25 WATER LEVEL 25 WATER LEVEL 26 PUMPING RECOMMENT 22-24 IP TPUMP IST MINU 0 0 9 9 IP DEEP SETTING 0 0 2 GPM./FT. SPE 54 1 WATER SUPPLY 2 3 TEST HOLE ' 4 4 RECHARGE WEL 256 54 1 MOMESTIC 2 SDESERVATION ' 3 3 IRRIGATION 4 4 IRRIGATION 4	2 GALVAY 3 CONCR 4 OPEN 24-25 1 2 GALVAY 3 CONCR 4 OPEN 24-25 1 2 GALVAY 3 CONCR 4 OPEN 2 GALVAY 3 CONCR 4 OPEN 43-45 RECOM FEET FEET 43-45 RECOM PUMPIN RATE </td <td>19 NIZED ETE HOLE 26 NIZED ETE HOLE 20 RECOVERY MINUTES 20 RECOVERY MINUTES 20 RECOVERY MINUTES 21 RECOVERY MINUTES 22:32 60 MINUT 21 CLEAR 21 CLEAR 21 CLEAR 21 CLEAR 21 CLEAR 21 CLEAR 22 20 21 22 22 23:34 34:40 35:40 36:40 37:40 38:40 39:40 40:50 40:50 40:50 40:50 40:50 40:50 40:50</td> <td>41115. E5 15-37 21 07 6-43 07 6-43 07 6-43 07 6-43 07 07 07 07 07 07 07 07 07 07</td> <td>20-23</td> <td>DEPTH SET AT - FEET FROM TO 10-13 14- 18-21 22-2 26-29 30-3 LOCATIO RAM BELOW SHOW DIS* INDICATE NORTH B*</td> <td>MATERIAL A T T T T T T T T T T T T T</td> <td></td> <td>MENT GROUT, PACKER, ETC.</td>	19 NIZED ETE HOLE 26 NIZED ETE HOLE 20 RECOVERY MINUTES 20 RECOVERY MINUTES 20 RECOVERY MINUTES 21 RECOVERY MINUTES 22:32 60 MINUT 21 CLEAR 21 CLEAR 21 CLEAR 21 CLEAR 21 CLEAR 21 CLEAR 22 20 21 22 22 23:34 34:40 35:40 36:40 37:40 38:40 39:40 40:50 40:50 40:50 40:50 40:50 40:50 40:50	41115. E5 15-37 21 07 6-43 07 6-43 07 6-43 07 6-43 07 07 07 07 07 07 07 07 07 07	20-23	DEPTH SET AT - FEET FROM TO 10-13 14- 18-21 22-2 26-29 30-3 LOCATIO RAM BELOW SHOW DIS* INDICATE NORTH B*	MATERIAL A T T T T T T T T T T T T T		MENT GROUT, PACKER, ETC.		
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NAME OF DRILLER OR BORER 26 Jule SIGNATURE OF CONTRACTOR SUBMISSION DATE DAY 16 NO COLY YB70 0 0	25-28 1 2 25-28 1 2 2 2 2 2 2 2 2 2 2 2 2 2	SALTY 4 MINERAL IFRESH 3 SULPHUR 2 SALTY 4 MINERAL IFRESH 3 SULPHUR 3 SALTY 4 MINERAL IFRESH 3 SULPHUR 3 ISALTY 4 MINERAL HOD 10 PUMPING R 2 BAILER 2 WATER LEVEL 25 WATER LEVEL 25 WA 15 MINU 010 22-24 15 MINU 15 MINU 010 FEET 22-24 15 MINU 010 FEET 20-20-20 GPM./FT. SPE 04 INDUSTRIAL 005ERVATION M 3 05 TEST HOLE' <	2 GALVAY 3 CONCR 4 OPEN 24-25 1 4 OPEN 24-25 1 3 CONCR 4 OPEN 24-25 1 4 OPEN 2 GALVAY 3 CONCR 4 OPEN 3 CONCR 4 OPEN 3 CONCR 4 OPEN 3 CONCR 4 OPEN 43-45 RECOM FEET Rate <td>19 NIZED ETE HOLE 26 NIZED ETE HOLE ON OF PUMPING 2 RECOVERY MINUTES 60 FEET AT END OF TEST CLEAR CLEAR 20 NUSUFFICIENT SUPPO 0 NOT USED RING MOND TING VING</td> <td></td> <td></td> <td>DEPTH SET AT - FEET FROM TO 10-13 14- 18-21 22-2 26-29 30-3 LOCATIO INDICATE NORTH B HURON HURON 10-13 14- 10-13 14- 10-14 14- 10-1</td> <td>MATERIAL A TANCES OF WELL ARBOW TANCES OF WELL ABBOW 2 SOC 20 20 20 20 20 20 20 20 20 20</td> <td>AND TYPE LEAD ELL FROM ROAD ND TH LOT 2 Z 6 TED 870</td> <td>LOT1</td>	19 NIZED ETE HOLE 26 NIZED ETE HOLE ON OF PUMPING 2 RECOVERY MINUTES 60 FEET AT END OF TEST CLEAR CLEAR 20 NUSUFFICIENT SUPPO 0 NOT USED RING MOND TING VING			DEPTH SET AT - FEET FROM TO 10-13 14- 18-21 22-2 26-29 30-3 LOCATIO INDICATE NORTH B HURON HURON 10-13 14- 10-13 14- 10-14 14- 10-1	MATERIAL A TANCES OF WELL ARBOW TANCES OF WELL ABBOW 2 SOC 20 20 20 20 20 20 20 20 20 20	AND TYPE LEAD ELL FROM ROAD ND TH LOT 2 Z 6 TED 870	LOT1		

T OR DISTRICT			3	CON., BLOCK, TRACT, SURVEL EN	C.	LOT 25-2
		TOWNSHIP, BOROLAN, CHY, TOWN, WHEAGE	ODFR	CON., BLOCK, THREET, SOUTHER		X.C
					E COMPLETED	48-53
		Ash Street, Su	dbury, Ont	BASIN CODE	<u>О</u> мо. 12	2 <u>yr.7(</u>
	_	41740 4	0770	5 212 1		
		G OF OVERBURDEN AND BEDRO	CK MATERIAL	S (SEE INSTRUCTIONS)	DEP	TH - FEET
ERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS		GENERAL DESCRIPTION	FROM	то
OWI	Top Soil				0	3
ue	Quck Sand wit	n layers of Blue Clay			3	120
ue	Clay	Boulders			120	135
ue	Boulders and	Coarse Gravel			135	145
						_
		······				
					e	
7) 1039	3602 1 9/20	23 9 795 1 9135 30513	0/453131			
					65	
10 WAT		51 CASING & OPEN HOLE	RECORD	Z SIZE(S) OF OPENING 31-33 (SLOT NO.)	DIAMETER 34-3	38 LENGTH
ED FOUND	KIND OF WATER	LINSTDE MATERIAL DI DIAM. MATERIAL THICKNESS EDG	EPTH - FEET	MATERIAL AND TYPE		OP 41-4
	FRESH $3 \square$ SULPHUR 14 SALTY $4 \square$ MINERAL	THCHES INCHES	1 - 13-16	SC	OF SCREEM	FEET
15-18	FRESH 3 SULPHUR			61 PLUGGING &	SEALING	RECOR
20-23	SALTY 4 MINERAL	4 OPEN HOLE	20-23	DEPTH SET AT - FEET MATERI		(CEMENT GROUT
	☐ FRESH 3 ☐ SULPHUR ☐ SALTY 4 ☐ MINERAL 29			10-13 14-17	<u></u>	
1 1	FRESH ³ SULPHUR SALTY ⁴ MINERAL	4 OPEN HOLE	27-30	18-21 22-25		
] FRESH 3] SULPHUR 34 80	2 🗌 GALVANIZED 3 🔲 CONCRETE 4 🗌 OPEN HOLE		26-29 30-33 80		
PUMPING TEST ME			J	LOCATION OF	WELL	
	² BAILER	0004 GPM. 07 15-16 00 17-18	IN D	IAGRAM BELOW SHOW DISTANCES OF W		
STATIC	PUMPING		LOT	LINE. INDICATE NORTH BY ARROW.	•	
-04"	1 22-24 15 MINUTES 26-2			7 89.	he my	AT /
IF FLOWING,	FEET 006 FEET 38-41 PUMP INTAKE S	T FEET FEET FEET		VI	<u> </u>	
GIVE RATE	0004 GPM.		-+-+-		Huy X to -	
RECOMMENDED PU	PUMP	43-45 RECOMMENDED 46-49 PUMPING 004 GPM.	KI		TC:	
50-53	00:4 gpm./ft. specif		19	HURON INCOM	Rd.	
FINAL	54 WATER SUPPLY	5 ABANDONED, INSUFFICIENT SUPPLY	Cho	h		· .
STATUS	CONSERVATION WEL	L ⁶ ABANDONED, POOR QUALITY 7 UNFINISHED				
OF WELL	4 RECHARGE WELL		0	El Ma	1	
WATER	2 STOCK	6 MUNICIPAL 7 PUBLIC SUPPLY	117	1 0'5	Y.	2
USE (8 COOLING OR AIR CONDITIONING 9 NOT USED	10-	Z 10tril	LOI	
	57 1 CABLE TOOL]	<u> </u>		
METHOD OF	² ROTARY (CONVENT ³ ROTARY (REVERSE	TIONAL) 7 DIAMOND	1 [Supp 108	oi ~	
DRILLING		9 🗋 DRIVING	DRILLERS REMARK	· FE K3G	112	1
NAME OF WELL		LICENCE NUMBER	DATA	58 CONTRACTOR 59-62 DATE	A METO	63-
THE MAR	ESTAY DIANOND I	·	DATE OF INSPEC	1 3614 "	11-127	'0
ADDRESS	av. Ontario.		O DATE OF INSPEC	- 1	,	P/JL
	ER OR BORER	LICENCE NUMBER	S REMARKS:			_/

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OUNTY OR DISTRICT	lbury	T	ownship, Borough, c Broder		GE		co	N., BLOCK, TRAC		ETC.		001"
wner (surname f Separat		28-47 61 Bøard	ADDRESS 201	Jogues	St.	Sudbu	rv O	nt		DATE COMPL		48-53 7
21	U ZONE			1500	RC 5	DITION	16	BASIN CODE			 	1 1 1 1
	M 10				DROC	K MATERI	ALS (SE	E INSTRUCTION	15)			
ENERAL COLOUR			OTHER N	MATERIALS			GEN	ERAL DESCRIP	TION		DEPTH	- FEET
	Sand		. <u></u>								0	15
	Clay										15	150
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	Gray G	Franite						<u>,,,,,</u>			189	400
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31) (00)	5 28 1	0150 0	5 1 01	89 28		2400ZZ						<u> </u>
												LL,
41 W/	ATER RECO	RD 5		& OPEN HO	DLE RI			54 ZE(5) OF OPENING SLOT NO 1	,	55 31-33 DIAMET	TER 34-38	LENGTH 3
WATER FOUND AT - FEET	KIND OF WAT			WALL THICKNESS INCHES	DE FROM	PTH - FEET 1 10	CREEN	ATERIAL AND TY	PE		INCHES DEPTH TO TOP OF SCREEN	41-44
	FRESH 3 SALTY 4		10-11 1 STEEL 2 [] GALVANIZ	12 E D		13-1						FEET
	FRESH 3 SALTY 4		3 🗋 CONCRETE 4 🗐 OPEN HOL	16363	0	018 9	61	PLL		& SEAL	ING REC	ORD
20-23 1 2	FRESH 3 SALTY 4	SULPHUR 24	17-18 1 [] STEEL 2 [] GALVANIZ 3 [] CONCRETE		18		FRO	от то	M 14-17	ATERIAL AND		PACKER, ETC.)
25-28 1	FRESH 3 SALTY 4	SULPHUR 29	4 OPEN HOL 24-25 1 [] STEEL			27-3			2-25			
30-33 1	FRESH 3	SULPHUR 34 80	2 🗋 GALVANIZ 3 🗐 CONCRETE	E				26-29	0-33 80			
2	SALTY 4	D PUMPING RATE	4 CI OPEN HOL					LOCATI		E WEL		
		12 00	GPM	15-16 00 HOURS	17-18 MINS	IN [DIAGRAM E	BELOW SHOW I				AND
STATIC LEVEL	WATER LEVEL END OF PUMPING -21 22-2	WATER LEVELS		D PUMPING RECOVERY	TES			INDICATE NOR				
₩́ 00 6	400	28			5-37 FEET			н 1				
IF FLOWING, GIVE RATE	38-4			END OF TEST	42							
U IF FLOWING, GIVE RATE	GPI PUMP TYPE	RECOMMENDED	43-45 RECOMMEN PUMPING		46-49		6					
50-53	OW 🌠 DEEP	SETTING 38	30 FEET RATE	1-2-	GPM		16.	en (.9-	ou	, n	
FINAL		TER SUPPLY	5 🔲 ABANDONED, I		PLY			<u>/</u> >	1			
STATUS OF WELL	3 [] TE	SERVATION WELL ST HOLE CHARGE WELL	6 🗌 ABANDONED, P 7 🗍 UNFINISHED	OOR QUALITY		173	1.36 1		K ',2	<i>D</i> 1		
	55-56 1 DO	MESTIC 5	COMMERCIAL					11	\checkmark			
WATER USE		RIGATION 7	PUBLIC SUPPLY COOLING OR AIR C	ONDITIONING				S.C.	50			
	and derived in the second s		h ool	NOT USED					\mathcal{A}			
METHO	• [_] 2 □ RG	BLE TOOL		DND				7:-1]	Jor			
OF DRILLINI	ς (), 42Ω Rố	TARY (REVERSE) TARY (AIR) R PERCUSSION	8 🗋 JETTI 9 🗌 DRIVI									
NAME OF WEI	CONTRACTOR			LICENCE NUMBER		DRILLERS REM		58 CONTRACTOR	59-62	DATE RECEIVE	· D	Q 63-68
	1. Jack 1.	ourt & S		5210		DATE OF IN	SPECTION +	52	10 SPECTOR	2 ?	2117	0
ADDRESS	lmannerd		ll Drill	-		# 11.1	051		D. M.	e Pr	η	
	lmsffrd aillanc			LICENCE NUMBER			T		U			
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COUNTY OF DISTRICT	TOWNSHI	IP, BOROUGH, CITY, TOWN, JILL	age 7	CON., BLOCK	, TRACT, SURVEY, ETC.	0	of 2 ²⁵⁻²⁷
		(90)	ood Vie	u 1			YR 79
1 2 M 10	12 17	18 ING					IV
		VERBURDEN AND BE			· • • • • • • • • • • • • • • • • • • •	DEPTH	- FEET
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WATER RECO	DRD	CASING & OPEN HC		SIZE(S) OF C (SLOT NO.)	PENING 31-33	DIAMETER 34-38	75 8 ENGTH 39-40
WATER FOUND AT - FEET KIND OF W	UIAM. INCHES	WALL MATERIAL THICKNESS INCHES	DEPTH - FEET		ND TYPE	INCHES DEPTH TO TOP OF SCREEN	FEE 41-44 8
571 2 SALTY 4 [MINERAL	1 [] STREEL 12 2 [] GALVANIZED 3 [] CONCRETE	0 75		PLUGGING & SI	EALING RECO	RD
2 🖸 SALTY 4 [20-23 1 🗍 FRESH 3 [□ MINERAL	4 [] OPEN HOLE 4 1 [] STEEL 19 2 [] GALVANIZED	20-2		FFFT	AND TYPE (CEME	NT GROUT, CKER, ETC.)
2 _ SALTY 4 [25-28 1 _ FRESH 3 [3 [] CONCRETE 4 [] OPEN HOLE 1 [] STEEL 26	27-3	10-13	14-17		
2 🗌 SALTY 4 (30-33 1 🔲 FRESH 3 [2 🗌 SALTY 4 [SULPHUR 34 80	2 🗍 GALVANIZED 3 🗍 CONCRETE		26-29	30-33 80		
2 SALIT 4		4 OPEN HOLE		LOC	ATION OF W	ELL	
1 PUMP 2 BAILER STATIC WATER LEVEL END OF		1 PUMPING		LINE INDICAT	IOW DISTANCES OF W		ND
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14:8 1:8	EET FEET F 8-41 PUMP INTAKE SET AT	FEET FEET WATER AT END OF TEST		L. CL-1	4-1-462	-	······
RECOMMENDED PUMP TYPE	8-41 PUMP INTAKE SET AT GPM. RECOMMENDED 43 PUMP	FEET 1 CLEAR 2 CLO FEET 1 CLEAR 2 CLO A-45 RECOMMENDED PUMPING	YOUG	المراجعين المراجع المر ما مراجع المراجع)M
U FELDWING. 38 GIVE RATE	8-41 PUMP INTAKE SET AT GPM. RECOMMENDED 43 PUMP	FEET 1 CLEAR 2 CLC FEET 1 CLEAR 2 CLC PUMPING FEET 042-3	YOUG	المراجعين المراجع المر ما مراجع المراجع			Ŋ
RECOMMENDED PUMP TYPE	8.41 PUMP INTAKE SET AT GPM. RECOMMENDED 43 PUMP SETTING 3 GPM./FT. SPECIFIC CAPAC WATER SUPPLY 5 OBSERVATION WELL 6	HATER AT END OF TEST FEET 1 CLEAR 2 CLO S-45 PUMPING FEET 0012 3 CLTY ABANDONED, INSUFFICIENT SUF ABANDONED, POOR QUALITY	DU DY 46-49 Crpm PPLY	House			Ŋ
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46 ²			LVANIZED	38 0	0146			NG & SEAL		FEET
2	SALTY 4 \square MINERAL FRESH 3 \square SULPHUR 24	17-16 I 🗍 STE			20-23	61 DEPTH SET	AT - FEET	MATERIAL AND	CEM	ENT GROUT
2 [3 🗆 co	LVANIZED NCRETE EN HOLE			10-13	t +	A		
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PUMPING TEST ME	THOD TO PUMPING RATE 2 BAILER ACUS	11-14 DUR	IS-16 HOURS	17-18 MINS	$ \vdash \mathcal{N} $					_
STATIC	WATER LEVEL 25	EVELS DURING	PUMPIN RECOV	NG		4	100	mul		
19-2	26-21	29-31	32-34	MINUTES 35-37		<u> </u>	69 2		·····	
FEE IF FLOWING, GIVE RATE	38-41 PUMP INTAKE S	SET AT WA	TER AT END OF TEST							
	GPN 131		COMMENDED] CLOUDY 45-49		9001	NIEW			
SHALLON			0005	GPM				5		
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STATUS OF WELL	BERVATION WEL 3 D TEST HOLE 4 RECHARGE WELL	7 🗍 UNFINIS	NED, POOR QUALIT	·		111/1-	C7 A	R.		, V
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32				NG & OPEN HO				54 -s; of opening 3 ot no ;	1-33 DIAM	ETER 34-38	75 80
WATER	FOUND	ATER RECORD	INSIDE	ERIAL THICKNESS	·····	PTH FEET		ERIAL AND TYPE		INCHES DEPTH TO TO OF SCREEN	
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		□ FRESH □ SULPHUR □ SALTY □ MINERAL □ FRESH 3 □ SULPHUR ²⁹	/ [] GAL > [] COM / [] OPE					10-12 14-17			
	z	SALTY 4 MINERAL FRESH 3 SULPHUR	24-29 1 [] STE 2 [] GAL 3 [] CON	VANIZED		27-30		18-21 22-25 6-29 30-33 80			
	2 UMPING TEST	SALTY 4 MINERAL	4 [] OPE		<u> </u> 		L	LOCATION O		1	
	* AB	WATER LEVEL 25	GPM		17-18 M1NS		GRAM BE	LOW SHOW DISTANCES	OF WELL		DAND
TEST	LEVEL	PUMPING 0-21 22-24 15 MINUTE:	-28 29-31	2 RECOVERY 45 MINUTES 60 MINU 32-34		LOT LI	NE IN	IDICATE NORTH BY ARI	KDAN	HOTE	Ľ
		EET FEET D F 38-41 PUMP INTAK	EET 1345ET	135 ³²⁻³⁴ 135 ^{FEET} 135	FEET 42		7				`
d N	ECOMMENDED		ED 43-45 REC		UDY 46-49	Je	Suy	, fou	Ą	(69	ソ
	SHAL	OW DEEP SETTING		E 0010	GPM				- 50	0 m	
	FINAL	2 OBSERVATION W		NED. INSUFFICIENT SUP NED POOR QUALITY	PLY	600p	VIEU	v kpr			
	STATUS OF WEL	L 4 🗌 RECHARGE WELL						n 250m		\wedge	4
	WATER	2 DOMESTIC 2 STOCK 3 IRRIGATION	5 COMMERCIAL 6 MUNIC PAL 7 D PUBLIC SUPI					- 10223			ħ
	/ USE	OI 4 INDUSTRIAL	8 D COOLING OR	AIR CONDITIONING 9 NOT USED				50 50	· .		Z
	METHO	57 1 CABLE TOOL 2 ROTARY (CONVE 3 ROTARY (REVERS	$ntional$) $\chi^7 \square$	BORING DIAMOND JETTING				, 50'		Ŧ	Sty
1	OF DRILLIN			DRIVING		DRILLERS REMARK	s				
		111 ancourt &	Sons LTD.	LICENCE NUMBER		DATA SOURCE DATE OF INSPEC	58	CONTRACTOR 59-62 5210	25	01	63-68 80
U U U U U	ADDRESS	msford Ont,				゠゙ゟヽ		09 INSPECTOR	m	gar	v
LN L	NAME OF DR	ILLER OR BORER		5816		REMARKS				0	
1 S	R V	OF CONTRACTOR	SUBMISS DAY	ION DATE	in a second	OFFICE	<u> </u>		• •		
M	INISTE	Y OF THE ENVIR	RONMENT C	ΟΡΥ						FORM NO 0	506- 477 FORM 7

Ministry			Water Resources	
of the Environment	WAT		ELLF	RECORD
Ontario 1. PRINT ONLY IN S 2. CHECK 🗵 CORRE	PACES PROVIDED	5904963	59051	C. O.N
COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON	. BLOCK. TRACT. SURVEY ET	
	lers			
	Joques St	Sudbury Ont		
	OF OVERBURDEN AND BEDRO		31	
CENERAL COLOUR MOST	OTHER MATERIALS		AL DESCRIPTION	DEPTH - FEET FROM TO
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grey clay				5 150
sand				150 160
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(31) baosidas 11 bisc	295 6160 28]	0/67 2811	1	┛╎╷╷╷╷╷╷╷╷╷╷╷╷╷
41 WATER RECORD	51) CASING & OPEN HOLE I		(S) OF OPENING 31- OT NO)	33 DIAMETER 34-38 LENGTH 39-40
WATER FOUND AT - FEET KIND OF WATER 10-13	DIAM MATERIAL THICKNESS		TERIAL AND TYPE	INCHES FEET DEPTH TO TOP 41-44 30 OF SCREEN
0167 ¹⁰⁻¹³ ¹ 20 FRESH ³ □ SULPHUR ¹⁴ ² □ SALTY ⁴ □ MINERAL	67 2 GALVANIZED	0 0167" 0		FEET
15-10 1FRESH 3SULPHUR 19 2SALTY 4MINERAL	06 CONCRETE	20-23 DEPTH	SET AT - FEET	ERIAL AND TYPE (CEMENT GROUT
20-23 1FRESH 3SULPHUR 24 2SALTY 4MINERAL	I GALVANIZED	FROM	10-13 14-17	LEAD PACKER. ETC)
25-28 1 _ FRESH 3 _ SULPHUR 29 2 _ SALTY 4 _ MINERAL	4 [- OPEN HOLE 24-25 1 [] STEEL 26	27-30	18-21 22-25	
30-33 1 🗍 FRESH 3 🗍 SULPHUR 2 🗍 SALTY 4 🗍 MINERAL	2 🖸 GALVANIZED 3 🗌 CONCRETE 4 🗋 OPEN HOLE		26-29 30-33 80	
PUMPING TEST METHOD	11-14 DURATION OF PUMPING		LOCATION OF	WELL
STATIC WATER LEVEL 23	<u>325 дри 01 ноире 310 иля</u> ноире римрила			DF WELL FROM ROAD AND
LEVEL PUMPING 19-21 22-24 15 MINUTES		LOT LINE IN	NDICATE NORTH BY ARRC	"about
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IF FLOWING, 30-41 PUMP INTAKE GIVE RATE B RECOMMENDED PUMP TYPE C C C C C C C C C C C C C C C C C C C	SET AT WATER AT END OF TEST 42	-	+ n	and the second sec
RECOMMENDED PUMP TYPE RECOMMENDED PUMP	D 43-45 RECOMMENDED 25 46-49 PUMPIN 00 25 GPM		/ (0	
50-53		10-4-	17 Ess Good ver	
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OF WELL / B RECHARGE WELL	7 🗋 UNFINISHED		90000	frank wat
55-56 1 DOMESTIC 2 3 STOCK	5 COMMERCIAL 6 MUNICIPAL		A .	o communit
WATER USE 07 - IRRIGATION	PUBLIC SUPPLY COOLING OR AIR CONDITIONING ONT USED			S N
37 CABLE TOOL	6 BORING		stppm R c	5
METHOD 2 1 ROTARY (CONVEN OF 1 3 ROTARY (REVERSI	TIONAL) ? 🗍 DIAMOND E) 🖁 🗍 JETTING	St-School	pl. 57	
	9 DRIVING	DRILLERS REMARKS	11	
NAME OF WELL CONTRACTOR		DATA 54 SOURCE	CONTRACTOR 59-62 DA	030485"
ADDRESS Chelmsford	Sons LTD. 5210	O DATE OF INSPECTION	5210	
Chelmsford NAME OF DRILLER OR BORER	LICENCE NUMBER	HUN AGOS Q	j /Jei	gtafel-
A. Vailancourt Signature of Contractor	SU MISSION DATE	OFFICE	C C	
Noll anco	DAY MO YR	04		
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Ontario	1. PRINT ONLY IN	SPACES PROVIDED ECT BOX WHERE APPLICABLE	[11]		533		COM.		
COUNTY OR DISTRICT	Y	TOWNSHIP, BOROUGH			CON	BLOCK, TRACT, SURVEY	DATE COMPLET	ED	OT 25-21
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1 2	10 12	" " Ind	Communic	ations	30	<u></u>	<u> </u>	1	111
		DG OF OVERBURD	EN AND BEDRO	OCK MATER	IALS (SEE)	NSTRUCTIONS			
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	9.	: 2. 4			-		7		
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2 10 11 WAT	ER RECORD	51 CASING 8	OPEN HOLE	RECORD	Z SIZE (SLOT	54 I OF OPENING 3 NO)	65 1-33 DIAMETER	34-38 LI	75 ENGTH 39
AT - FEET	KIND OF WATER	INSIDE DIAM MATERIAL INCHES	THICKNESS	DEPTH - FEET		RIAL AND TYPE	DEP	INCHES	F8
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mo ¹⁵⁻¹⁸ ¹ □	6 DGAS	61 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE 5 PLASTIC	188	0 85	61	PLUGGING	& SEALING	G RECO	
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1 ' U	FRESH 3 SULPHUR 29 A MINERALS SALTY 6 GAS	24-25 1 STEEL 2 GALVANIZED	26	27-3	30 18	-21 22-25			
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20	100 15 MINUTES	30 MINUTES 45 MINUT	10 0 MINUTES						
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RECOMMENDED PUM	 Р ТУРЕ RECONMENDED	FEET 1 CLE							
SHALLOW	PUMP		ео (1-4) 15 дрм				/70	<i>y</i> 6	95.
50-53						1156 GOODVIEW			
FINAL	1 D WATER SUPPLY	ABANDONED IN			1	6.0000 L			
STATUS OF WELL	3 🗌 TEST HOLE 4 🔲 RECHARGE WELL	7 UNFINISHED 9 Dewatering							
55-	I DOMESTIC	5 COMMERCIAL							
WATER USE	2 STOCK 3 IRRIGATION 4 INDUSTRIAL	MUNICIPAL PUBLIC SUPPLY COOLING OR AIR COI	NDITIONING						
UGE			NDITIONING NOT USED			······································			
METHOD	57 I CABLE TOOL	6 D BORING							
OF	2 ROTARY (CONVENT 3 ROTARY (REVERSE)	I D JETTINO	G ·						- 0
	A ROTARY (AIR)	9 🗍 DRIVING		DRILLERS REMA	ARKS		· []	152	79
NAME OF WELL CO	ONTRACTOR		LL CONTRACTOR'S		58 00	DNTRACTOR 59-62 DA		0	
ADDRESS Vai	llancourt& S	ons Ltd	5210		SPECTION	INSPECTOR	DEC 0	861 8	∮
Chelms	Well Drillin ford Ont				<u>ne 28</u> /	88 2/	L 1/S	\square	X
	_		CENCE NUMBER		-				ر
SIGNATURE LA	Langourt Actor	SUBMISSION DATE		OFFICE	WW	IS	p	l	\mathcal{X}
IR Vall	1ancour	DAY N	0 YR	0					X

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the	1.28 - 1 - 1 		The C	Ontario Water Resou		
Ontario Environme		WAI				RD
COUNTY OR DISTRICT	1. PRINT ONLY IN SPACES PROVIDED 2. CHECK CORRECT BOX WHERE APPL TOWNSHIP, BORG	ICABLE 11 DUGH. CITY, TOWN, VILLAGE	59055	37 59051	14 13	22 23 74
Cudhung	Bro	der			DATE COMPLETED	44-53
		65 Winterhav			DAY_18MO_NO	
		And Communic	ations	30 31		
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Gre	ey Granite		<u></u>	·	85	310
			·			
		Ý				
31						
		<u></u>				75 60
41 WATER REC	CORD 51 CASI		RECORD	SIZE (S) OF OPENING (SLOT NO)	31-33 DIAMETER 34-38 INCHES	LENGTH 39-40 FEET
	3 USULPHUR 14 4 UNINERALS 6 GAS	INCHES FRO	13-16	C MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN	41-44 30 FEET
15-18 1 C FRESH	3 DSULPHUR '' 64 3 CONCI 4 DMINERALS 6 DGAS 12 12 12 12 12 12 12 12 12 12 12 12 12				G & SEALING RECO	RD
2 🗌 SALTY	3 USULPHUR 24 4 UMINERALS 6 UGAS 3 UCONCI 4 DOPEN	RETE	20-23	DEPTH SET AT - FEET FROM TO 10-13 14-17		NT GROUT CKER, ETC.)
2 🗋 SALTY	4	Z6 NIZED	10 310 27-30	18-21 22-25		
	3 ULPHUR 34 10 3 CONC 4 MINERALS 4 0 OPEN 6 GAS 5 PLAST	HOLE		26-29 30-33 80		
71 PUMPING TEST METHOD		TION OF PUMPING 15-16 17-18 HOURS MINS		LOCATION O	F WELL	
STATIC WATER LEV LEVEL PUNPING	WATER LEVELS DURING	1 DUMPING 2 RECOVERY MINUTES 60 MINUTES	IN DIAC LOT LI	RAM BELOW SHOW DISTANCE NE INDICATE NORTH BY AF		ND
₩ 10 10C	FEET 45 FEET 75 FEET 1	0 6 12-14 10 03-17 FEET 10 075-17				201
	GPM 100 FEET 1 8	RATEND OF TEST 42	2	WINTERHAUE =	1+ uy	07.
RECOMMENDED PUMP TYPE	PUMP 🔬 🖍 👝 PUMPI	MMENDED 46-49 ING GPM	-	Anative	Б	
<u> </u>		ED. INSUFFICIENT SUPPLY			Duic	•
STATUS	· • •	ED POOR QUALITY		OLIAVE	G	
55-56 1	DONESTIC S COMMERCIAL STOCK 6 MUNICIPAL					
,	IRRIGATION 7 DUBLIC SUPPL INDUSTRIAL 0 COOLING OR A OTHER 9					
		ORING				
	ROTARY (CONVENTIONAL) 7 D ROTARY (REVERSE) 8 JI ROTARY (AIR) 9 D	ETTING RIVING			11 1528	20
NAME OF WELL CONTRACTOR		GGING OTHER	DRILLERS REMARKS	58 CONTRACTOR 59-62		• • • • •
	ourt & Sons Ltd	5210	NO DATE OF INSPECT		DEC 0 8 1987	
We We	ll Drilling	WELL TECHNICIAN'S LICENCE NUMBER	HI LINA	28/88 Th	LVSL	
NAME LOL BEDIC	NCONTRACTOR SUBMISSION	5216		WWIS	Street and	\mathbb{X}
MINISTRY OF THE		MO YR		······································	FORM NO. 0506 (1	1/86) FORM 9

WIRONME MINISINI

Appendix C – Raw Data and Certificates of Analysis









FINAL REPORT

CA40010-MAR24 R----

SUD-23015629-AO

Prepared for

EXP Services Inc.



FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAIL	LS
Client	EXP Services Inc.	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	885 Reagent Street	Address	185 Concession St., Lakefield ON, K0L 2H0
	Sudbury, Ontario		
	P3E 5M4. Canada		
Contact	Jamie Batten	Telephone	705-652-2143
Telephone	705-674-9681	Facsimile	705-652-6365
Facsimile	705-674-5583	Email	brad.moore@sgs.com
Email	jamie.batten@exp.com; yves.beauparlant@exp.com	SGS Reference	CA40010-MAR24
Project	SUD-23015629-AO	Received	03/02/2024
Order Number		Approved	03/04/2024
Samples	Solution (2)	Report Number	CA40010-MAR24 R
		Date Reported	03/04/2024

COMMENTS

Temperature of Sample upon Receipt: 9 degrees C Cooling Agent Present: Yes Custody Seal Present: Yes Chain of Custody Number: 035574

RL is raised due to sample matrix

SIGNATORIES





FINAL REPORT

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First Page	1
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Results	3
QC Summary	4
Legend	5
Annexes	6

SGS				FINAL	REPORT	CA40010-MAR24 R					
JUD						Client: EXP Services Inc.					
						Project: SUD-23015629-AO					
						Project Manager: Jamie Batten					
						Samplers: Shianne Van Duzen					
MATRIX: WATER			Sample Number Sample Name Sample Matrix Sample Date	5 MW1 Solution 29/02/2024	6 MW4 Solution 29/02/2024						
Parameter	Units	RL		Result	Result						
Metals and Inorganics											
Nitrite (as N)	as N mg/L	0.03		< 0.03	< 0.3↑						
Nitrate (as N)	as N mg/L	0.06		< 0.06	< 0.6↑						
Nitrate + Nitrite (as N)	as N mg/L	0.06		< 0.06	< 0.6↑						



QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENVIIC-LAK-AN-001

Parameter	QC batch	Units	RL	Method	Duplicate		LC	S/Spike Blank		Matrix Spike / Ref.			
	Reference			Blank	RPD	AC	Spike	Recovery Limits (%)		Spike Recovery	Recovery Limits (%)		
						(%)	Recovery (%)	Low	High	(%)	Low	High	
Nitrate + Nitrite (as N)	DIO0046-MAR24	mg/L	0.06	<0.06	NA		NA			NA			
Nitrite (as N)	DIO0046-MAR24	mg/L	0.03	<0.03	4	20	97	90	110	102	75	125	
Nitrate (as N)	DIO0046-MAR24	mg/L	0.06	<0.06	0	20	97	90	110	98	75	125	

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL. **Matrix Spike Qualifier**: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.



LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.

- RL Reporting Limit.
 - Reporting limit raised.
 - ↓ Reporting limit lowered.
 - NA The sample was not analysed for this analyte
 - ND Non Detect

Results relate only to the sample tested.

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.

"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

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This report supersedes all previous versions.

-- End of Analytical Report --

Pageof	LAB LINS # CA- 4 0010- MARCH	SP	TAT) REQUIRED TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day i 3 Days 4 Days	SS REPRESENTATIVE PRIOR TO SUBMISSION NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SYSA DRINKING WATER CHAIN OF CURTODY		PTCLP	Specify tests a M&I		0						1) (UNDR VON VUZCI) signature: A VOU DUZCI signature: A VOU SIGNATURE: A SIGNATUR
	LAB LIMS #		ED 1 in business days (exclu d after 6pm or on weeke d Days	S FOR HUMAN CO		becify) SPLP		xtended	Sewer Use: Specify pkg: Deneral Characte Deneral Characte						(mm/dd/yy) (mm/dd/yy)
	¥	P.O. #: Site Location/ID:	T) REQUIRED T's are quoted in but mples received afte	PRIOR TO SUBMISSION ABLE) WATER SAMPLES FOR HUMAN CONSUMPTIC WITH SES DRINKING WATER CHAIN OF CLISTODY		Other (please specify)						1			1 24
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72-0361	IY		TURNAROL	EASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION ecify Due Date:	ANALYSIS RE	-			BTEX 911 Incl BTEX 100 B						
8-8060 Fax: 519-67	Laboratory Information Section - Lab use only Control Cooling Agent Present: Yes No No Temperature Upon Receipt (°C)	23015620	Regular TAT (5-7days) RUSH TAT (Additional Charges May Apply):	EASIBILITY WIT	AN	SVOC PCB	Aroclor	- II	PCBs Tota SYOCS PCBs Tota						
0 Toll Free: 877-84	mation Section - Lab use Cooling Agent Present: Yes Temperature Upon Receipt (°C)	SUD-2	Regular TAT (5-7days)	NFIRM RUSH F		& I S	,As,Ba,Be,B,Cd,	as Vir	Full Metals S ICP metals plue B(HWS- Cr.Co.Cu.Pb.Mo.Ni,Se.A Cr.Co.Cu.Pb.Mo.Ni,Se.A		*				Ly S
JD-602-2000 Fax: Dre: 519-672-4500	Reveree Coo	Quotation #: Project #:	RUSH TAT (PLEASE CONFIR Specify Due Date		W	soir	rgan	Field Filtered Metals & Ino ind CrVI, CN,Hg PH(B(I (CI, Na-water)	K	K	*			2 DIA
ON, NGE 2S8 Pho		NO				Sewer By-Law:	Storm Municipality:		F LES MATRIX	water	water	twater			re: XVV
um Court, London,	Received By (signature): Custody Seal Present: Yes Custody Seal Intact: Yes	INVOICE INFORMATION Report Information)					3 Day min TAT) MMER Other: Dortable *See note		TIME # OF SAMPLED BOTTLES	13:00 1	3:10 1	2.05 1		Circutation of the second seco	Signature:
- London: 657 Consortium Court, London, ON, N6E 258 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361		ne as	Contact:Address:	Phone: Email:	REGULATIONS	Other Regulations:	Reg 347/558 (3 Day min TAT) PWQO MMER CCME Other: MISA Other: ODWS Not Reportable *See note	YES NO	DATE SAMPLED SA	1 2-20-4202	2024-02-29 13:10	2054-02-2413-D			an Duzen
- London: 657 Consortium Courtesson OK, London, ON, NGE 258 Phone: 519-672-4500 Tall Free: 877-948-8060 Fax: 519-672-0361	Siri Romard. = 03/02/24. (mm/dd/y)	Services	-IC Mahay C		REGUL		☐ Res/Park Soil Texture: ☐ Ind/Com Coarse ☐ Agri/Other ☐ Appx. Appx. ne <350m3	RECORD OF SITE CONDITION (RSC)	SAMPLE IDENTIFICATION			1		11 12 Observations/Comments/Special Instructions Samuled Bv (NAME)	
50	Received By: Strain Received Date: O	Company: EXP S Contact: JONNIC	SLA	Fax: Email:		O.Reg 153/04	Table 1 Table 2 Table 3 Soil Volume	RECO	SAMP	1 MWI	2 MWD	3 Dup	0 0 0 4	11 12 Observations/Commen Sambled Bv (NAME):	Relinquished by (NAME):