

Hydrogeological Assessment Report

Proposed Residential Development 343622 Church Side Road East Owen Sound, ON

MJD Investments Inc.

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Executive Summary

This report presents the results of a hydrogeological assessment that was conducted for a proposed 18.26 hectare residential development to be located in Owen Sound, Ontario. The lands have the municipal addresses of 343622 Church Side Road East and are herein referred to as "the Site". The proposed development is to be 33 lots and serviced municipally for water and privately for septic. GHD Limited (GHD) was retained by MJD Investments Inc. (the Client) to complete this hydrogeological assessment in accordance with our proposal PG-3741, dated November 22, 2016. The site was observed to have a single residential home on a portion of the Site with remainder of the Site being undeveloped, naturalized vegetation with a wooded area.

This hydrogeological assessment included a site inspection, advancement of test pits, soil analysis, water level monitoring, in-situ hydraulic conductivity testing, a review of available Ministry of the Environment and Climate Change (MOECC) well records, a detailed water balance evaluation and a nitrate impact assessment. A door-to-door well survey was conducted which indicated that the area is municipally serviced with some existing wells still in use. The existing wells are generally upgradient of the proposed development. Two wells are considered to be cross-gradient on Church Side Road East. Impacts to the existing wells from the proposed development are not expected as the development will be municipally serviced.

The proposed development area is generally comprised of topsoil underlain by silty clay. Bedrock was not encountered during the hydrogeological assessment. Karst topography was not observed or encountered on the Site or during excavation of the test holes. Water seepage was observed within the silty clay at depths 2.4 to 3.0 m during the test pit program. The water seepage was observed to be minimal. Based upon our observations, the flow direction is toward Georgian Bay.

It is our opinion that there will not be any constraints for development from a groundwater perspective as the existing seepage and water from within the silty clay is minimal and can be handled with appropriate engineering techniques. It is expected that groundwater will generally be below the depth of the future development, although it may be encountered for deeper excavations or foundations that may be required. If groundwater volumes of greater than 50,000 L/day are to be pumped during construction activities then a permit applied for through the Environmental Sector and Activity Registry (EASR) would be required from the MOECC. If the volumes are to exceed 400,000 L/day, a Permit To Take Water (PTTW) would be required. Based upon the groundwater observed, these permits are not anticipated.

With the use of low impact development (LID) strategies, the Site's post-development infiltration values are the same as the pre-development values. The clayey nature of the subsurface soils indicates that nitrate impact will not impact local groundwater sources by the installation of Class IV sewage disposal systems (or connection to a municipal sewer system in the future). Raised tile beds are recommended for the development. Tertiary septic system could be considered for the improvement of sewage effluent for these lots.

In summary, provided that the waste disposal system is properly constructed, no significant impact is anticipated on downgradient receptors from this development. It is GHD's opinion that the results of this hydrogeological assessment support the approval of the proposed 33-lot residential development at this Site.



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1. Introduction

1.1 **Property Information**

This report presents the results of a hydrogeological assessment that was conducted for a proposed 18.257 hectare residential development to be located in Owen Sound, Ontario. The lands have the municipal address of 343622 Church Side Road East and is herein referred to as "the Site". The proposed development is to be 33 lots and serviced municipally for water and privately for septic. GHD Limited (GHD) was retained by MJD Investments Inc. to complete this hydrogeological assessment in accordance with our proposal PG-3741, dated November 22, 2016. Downgradient about 110 metres of the Site is Georgian Bay.

The general location is presented on the National Topographic System Mapping from Centre for Topographic Information, Natural Resources Canada Map 41 A/10 Vicinity Plan, Figure 1. The location with respect to adjacent roadways and surrounding land uses is presented on the Ministry of Natural Resources and Forestry mapping and is shown on the Site Plan, Figure 2. The Plot Plan, Figure 3 is based on an aerial photograph from 2014 and illustrates the location and uses of surrounding lands. A preliminary plan of the proposed development is provided on the Concept Plan, Figure 4. The test hole locations are illustrated on the Test Hole Plan, Figure 5. Other figures are provided in the Enclosures section of this report.

2. Purpose and Scope of Work

The purpose of the hydrogeological assessment was to identify the local hydrogeology of the site, including a generic water balance that establishes target values for infiltration to address recharge / discharge characteristics (to the lands and any adjacent creek subwatersheds) and base flow; determine possible impacts and provide mitigation measures. The following scope of work was performed to accomplish the foregoing purposes:

- 1. Reviewed available background information relevant to the Site such as geologic, physiographic and water resources reports and maps.
- 2. Carried out an inventory of available well record data on file with the Ministry of the Environment and Climate Change (MOECC) for the immediate area to evaluate the physical characteristics of the aquifer complexes that underlie the region. A well survey of any existing wells in the immediate area was carried out to assist in the evaluation of the local aquifer(s) and supplement MOECC well records. A representative water sample was collected during the well survey for analysis of general chemistry parameters
- 3. A walkover inspection was conducted to review surficial ground characteristics.
- 4. The subsurface conditions were explored by advancing, sampling and logging a total of eight (8) test pits on May 9, 2017. The subsurface conditions were recorded and are summarized in detail on the logs attached in Appendix A. The test pits were advanced to depths ranging from 0.6 to 3.4 metres. Piezometers were installed in test pits TP-01 through to TP-07 to facilitate water level measurements and flow direction.



- 5. Carried out laboratory analyses of materials encountered including grain size and moisture content.
- 6. Conducted in-situ hydraulic conductivity testing in representative piezometers and infiltration testing at select locations.
- 7. Completed a generic water balance that considers pre- and post-development conditions and evaluates groundwater baseflow conditions.
- 8. Prepared a detailed report using engineering analyses of the acquired data outlining our conclusions and recommendations herein.

3. Project Details

A conceptual plan is provided as Figure 4 (based upon a drawing entitled "Concept Plan", drawing no. 3969-CP1 dated October 2006) and indicates the overall area of the development as 18.26 hectares (ha). The concept plan provided shows 33 lots, roads and a storm water management facility. Building footprints are not provided on the concept plan. GHD has assumed that future building footprints will cover about 30% of each lot (this value is used in the water balance section of this report). The asphalt roads and driveways are estimated to cover 18,125 m²; the building footprints to have an area of 47,195 m²; the lawn / landscaped areas will include 110,123 m²; and the storm water management facility will encompass 7,125 m².

The details shown on the conceptual plan were used to calculate the water balance and discussed in Section 6 of this report.

4. Site Conditions

4.1 General

The field program consisted of a site inspection, a soils exploration investigation, measurement of water levels, in-situ hydraulic conductivity testing, infiltration testing and a door-to-door well survey. The soils exploration investigation was conducted on May 9, 2017. The test pit locations are provided on Figure 5. Test pit logs and hydrometer results are provided in Appendix A. A site visit was conducted on May 9, 2017 by GHD to observe the general surficial characteristics. Photographs are provided in Appendix B.

Based upon the site visit, the lands slope towards Georgian Bay. The topography is illustrated on Figure 6. Upgradient of the Site is an unevaluated wetland area as shown on Figure 7. The unevaluated wetland feature is about 1000 m away of the Site and will not be impacted by this development.

The residential properties adjacent to the Site along Grey Road 1 are upgradient. Two residential properties exist on Church Side Road East, which are cross gradient of the Site. The Site was observed to have a residential home on an area of the Site, with remainder of the lands undeveloped with a wooded area.



The Site contained depressions and drainage swales directing surface water towards Georgian Bay. A central area of the Site contained ponded water. Two dug wells were observed on the Site during the site visit.

It is GHD's understanding that this is an area of potential karst topography. No evidence of karst topography was observed during our site reconnaissance (i.e. disappearing streams, caves, subsided soil etc.).

4.2 Subsurface

4.2.1 Regional Physiography and Geology

This section of the report details the subsurface conditions based upon reports, mapping and available information. The Site is situated in the physiographic region known at the Bruce Peninsula (Chapman and Putnam, 1984) and the surrounding terrain is dominated by shale plains. The physiographic region is shown on the figure entitled Physiography, Figure 8 indicating this area is within shale plains. The Ontario Geological Survey information indicates that the surficial geology for the area is predominately Paleozoic bedrock and carbonate-derived silty to sandy till closer to Georgian Bay. The surficial geology is presented on Figure 9 and Quaternary geology is presented on Figure 10. Bedrock in the area is expected to be comprised of dolostone and limestone.

There were two (2) MOECC well records available for the Site. Both were for dug / bored wells that were observed during the site visit and extended to 4.6 m through topsoil, clay and shale. There were an additional 14 well records within 500 m indicating a mix of clay, shale and bedrock. The well records showed no indication of karst topography. Two (2) of those well records were for abandonments. The well records considered are provided in Appendix C. Physical and hydraulic data are presented on MOECC well records. The MOECC well records considered were drilled bedrock wells and dug / bored wells. Additional discussion of the well records is provided in Section 5 of this report.

4.2.2 Local Geology

This section of the report discusses the subsurface soil conditions observed during the test hole program. The subsurface stratigraphy was investigated by excavating seven (7) test pits with an excavator and one (1) shallow test hole using a hand shovel in the wooded area on May 9, 2017. Monitoring wells were installed in each of the seven (7) excavated test pits to facilitate water level measurements. The locations of the test holes are illustrated on the Test Hole Plan, Figure 5. Details of the subsurface conditions encountered are presented graphically in Appendix A.

It should be noted that the boundaries between the strata have been inferred from the test hole observations. They generally represent a transition from one soil type to another, and should not be inferred to represent an exact plane of geological change. Further, conditions may vary between and beyond the test holes.



The soils encountered generally consisted of topsoil then silty clay. The topsoil had depths ranging from 100 to 200 mm. The topsoil layer contained an appreciable amount of organic matter and thus is considered to be devoid of any structural engineering value. The native silty clay material encountered beneath the topsoil was generally reddish brown and in a hard in-situ state of relative density. Test pits were excavated to a maximum depth of 3.4 m. Bedrock was not observed. No karst formations or indicators of karst were observed within any of the test holes. Representative samples of the material encountered were submitted to the soils laboratory for analysis and characterization. Grain size distribution analyses were carried out on four (4) representative soil samples and are summarized in Table 4.1. The gradation curves are presented in Appendix A.

		Gra	ain Size Distribut	tion	
Location	Depth (m)	%Gravel	%Sand	%Fines (silt/clay)	Observed Soil Unit
TP-01	0.9 – 1.1	0	1	99	Silty Clay
TP-01	1.8 – 2.0	0	3	97	Silty Clay
TP-05	2.0 – 2.1	0	4	96	Silty Clay
TP-05	2.6 – 2.7	0	1	99	Silty Clay

Table 4.1 Grain Size Distribution Summary

Notes: %Fines indicates silt and clay particles.

Based on the grain size distribution summary, the groundwater recharge rates are estimated to be about 100 mm per year in this area. For purposes of septic percolation rates (T-times), the T-times are greater than 50 min/cm.

4.3 Groundwater

Water seepage was present within the silty clay within all the test pits but was observed to be minimal. From the test pits, the seepage depths ranged from 0.5 m in the hand excavated test hole at TP-08; and from 2.4 to 3.0 m in the excavated test pits TP-01 to TP-07. Monitoring wells were installed in test pits TP-01 to TP-07 in order to facilitate monitoring of water levels. The wells were screened to intersect water where seepage was occurring. A summary of the monitoring well details including water seepage depth is provided in Table 4.2:

Location	Depth of Well (m)	Pipe Stick Up (m)	Well Screen Interval¹ (m)	Water Seepage Depth ² (m)
TP-01	2.6	0.5	1.1 - 2.6	~2.6
TP-02	2.7	0.4	1.2 – 2.7	~2.4
TP-03	3.4	1.1	1.8 – 3.4	~3.0
TP-04	2.7	0.3	1.2 – 2.7	~2.7
TP-05	2.6	1.2	1.2 – 2.7	~2.6
TP-06	2.7	0.7	1.2 – 2.7	~2.7
TP-07	27	1 1	12-27	~2.6

Table 4.2 Summary of Monitoring Well Information

Notes: m = metres; ¹Effective well screen includes 10-slot screen.

²Water seepage depth is the estimated depth where water was encountered during the test pit activities



Groundwater potentiometric water levels were measured at TP-01 to TP-07 on May 9 and 10, 2017 and the data is summarized in Table 4.3.

Location	Ground Elevation*	Water L	.evel (m)	GW Elevation (masl)	
Location	(masl)	May 9, 2017	May 10, 2017	(May 10, 2017 only)	
TP-01	216.9	1.8	0.9	216.0	
TP-02	217.6	0.5	0.2	217.4	
TP-03	217.7	0.8	0.3	217.4	
TP-04	218.1	1.9	1.0	217.1	
TP-05	216.1	0.5	0.2	215.9	
TP-06	216.1	1.8	1.1	215.0	
TP-07	215.8	2.7	2.3	213.5	

Table 4.3 Potentiometric Water Level Summary

Notes: m = metres; masl = metres above sea level; GW = groundwater; *Elevations interpolated from MNRF's Ontario base mapping contours. The elevations provided are for the purposes of evaluating groundwater elevation and flow direction and should not be relied upon as a legal survey or topographic elevation survey.

Based upon the water level data collected and the topography of the Site, the shallow groundwater flow direction toward Georgian Bay. It should be noted that the water levels presented in this report represent potentiometric surface elevations and do not indicate that there is a water table as shallow as the water levels indicated in Table 4.3. Seepage zones were deeper than the measured water levels and water will not be encountered unless the water zones are excavated into.

It is GHD's opinion that there is not a permanently saturated, shallow aquifer at the Site and any water encountered is in relatively limited quantities. It is expected that groundwater seepage will be encountered at depths ranging from 2.4 to 3.0 m. It should be noted that groundwater levels are transient and tend to fluctuate with the seasons, periods of precipitation and temperature. Groundwater aquifers for drinking water sources are expected to be much deeper as indicated by the MOECC well records for drilled wells in this area that indicated well depths of about 28 m.

It is our opinion that there should not be any significant constraints for this development from a groundwater perspective as any water can be handled with appropriate engineering techniques. It is expected that groundwater will generally be below the depth of the future development, although it may be encountered for deeper excavations or foundations that may be required. Engineered foundation drains will be utilized to direct any groundwater encountered within building footprints with details provided at the detailed design stage. If groundwater volumes of greater than 50,000 L/day are to be pumped during construction activities then a permit applied for through the Environmental Sector and Activity Registry (EASR) would be required from the MOECC. If the volumes are to exceed 400,000 L/day, a Permit To Take Water (PTTW) would be required. Based upon the groundwater observed, these permits are not anticipated.

4.4 Single Response Well Testing

Hydraulic conductivity (K) testing was completed at TP-02 and TP-05 on May 10, 2017. The testing consisted of rising and falling head testing and was completed using a one-metre long slug. The water levels were measured using data loggers programmed at three (3) second intervals. The data was analyzed using AQTESOLV and the Bouwer-Rice solution for each rising and falling head test (Appendix D).



The K values for the hydraulic conductivity testing are on the order of 10^{-5} m/sec at TP-02 screened within the silty clay and 10^{-5} to 10^{-6} m/sec at TP-05 screened within the silty clay. These K values are consistent documented K values (e.g. Freeze and Cherry, 1979) and with the silt and clay materials observed during our subsurface investigation.

Infiltration testing was attempted at TP-02 and TP-05 locations. Infiltration testing is typically conducted of the unsaturated zone (vadose zone). Conditions at the Site were too wet at the time of the testing. Based upon the soils observed throughout the test pits, the K-values obtained from the single response well tests discussed above would be considered appropriate and minimal infiltration is expected.

5. Hydrogeology

5.1 General

The hydrogeology of the area is characterized by gently rolling and shale plains consisting of undifferentiated carbonate and clastic sedimentary rock exposed at surface or covered by a discontinuous, thin layer of drift. Groundwater and surface water drainage flow in an easterly direction across the Site. Infiltration through the shallow confining layers recharging the deeper aquifers below is expected to be minimal.

Information regarding groundwater characteristics of the immediate area was obtained from an inventory of MOECC well records. A total of 16 well records were identified within 500 m of the central part of the Site for statistical breakdown. The MOECC well records and their locations are provided in Appendix C.

A door-to-door survey of neighboring properties confirmed that the surrounding area in proximity of the Site is generally on municipal water services with some private wells for those who have not connected to the municipal water service.

5.2 Existing Local Water Supplies

Currently, this area is predominately supplied by municipal services for water. The water well records reviewed represent wells that were established prior to the implementation of municipal services in this area. Physical and hydraulic data are presented on MOECC well records and the information indicates the presence of two (2) aquifer systems:

- 1. A shallow overburden aquifer tapped by dug / bored wells; and,
- 2. A deeper bedrock aquifer tapped by drilled wells.

The groundwater was generally described as "fresh" in the well records reviewed. The information from the MOECC data indicates that 64% of the well records were drilled bedrock wells and 36% were dug / bored wells. The bedrock wells averaged a depth of about 28 m and encountered water at an average depth of 13.9 m.



The dug / bored wells averaged a depth of about 4.5 m and encountered water at a depth of 2.4 m. The pumping rates yielded an average of 12.1 L/min and 13.6 L/min for the bedrock and dug / bored wells, respectively. Shallow dug / bored wells are susceptible to large seasonal fluctuations in the groundwater. The result is that shallow wells are also more prone to becoming dry in the winter and summer months. From a quality perspective, shallow dug/bored wells are generally difficult to seal at the surface and therefore considered to be susceptible to shallow sources of contamination. The MOECC well record data has been summarized in Table 5.1.

Table 5.1 Summary of Water Well Information

Table 5.1 Summary of Water Well Information						
Total Number of Wells Inventoried:14Dug/Bored Wells:5 (36%)Drilled Wells (Overburden):0 (0%)Drilled Wells (Bedrock):9 (64%)Abandoned Wells*:2						
Development	Statistical	Summary	Statistical	Summary	Statistical S	Summary
Parameters	Dug / Bor	ed Wells	Drilled – C	verburden	Drilled – E	Bedrock
WELL YIELDS Range Average	13.6 L/min 13.6 L/min	3 lgpm 3 lgpm	L/min L/min	lgpm lgpm	4.5 - 22.7 L/min 12.1 L/min	1 - 5 lgpm 2.7 lgpm
REPORTED YIELDS	Frequency		Frequency		Frequency	
Not Reported Dry 0 to 1 Igpm 2 to 4 Igpm 5 to 9 Igpm ≥10 Igpm	0 0 5 0 0	0% 0% 100% 0% 0%	0 0 0 0 0 0	0% 0% 0% 0% 0%	0 0 3 4 2 0	0% 0% 33% 45% 22% 0%
STATIC WATER LEVELS Range Average	1.2 – 2.7 m 2.6 m	4 - 9 ft 8.5 ft	m m	ft ft	3.7 – 9.1 m 6.0 m	12 - 30 ft 19.7 ft
WATER ENCOUNTERED Range Average	2.1 – 2.7 m 2.4 m	7 - 9 ft 8 ft	m m	ft ft	4.6 – 30.5 m 13.9 m	15 - 100 ft 45.6 ft
WELL DEPTH Range Average	3.5 – 4.9 m 4.4 m	11.5 -16 ft 14.4 ft	m m	ft ft	12.2 – 38.1 m 27.6 m	40 - 125 ft 90.6 ft

Notes: Data based on MOECC well record information (see Appendix C). L/m represents litres per minute, Igpm indicates Imperial gallons per minute and m is metres *Abandoned wells not considered in the statistical evaluation.

The well records are also generally consistent with the information gathered during GHD's field investigation and that the overburden soils are comprised of silt and clay. Water quality documented in the well records was indicated to be fresh and of good quality.

A door-to-door well survey was completed on May 9, 2017 by GHD. The well survey was conducted by going door-to-door to the residential homes neighbouring the proposed development along Church Side Road East, Grey Road 1 and Balmy Beach Road to gather information regarding the resident's well. The well survey information was used to supplement the MOECC well record data and is summarized in Table 5.2. Residents within about 500 m of the proposed development were surveyed.



Of the ten (10) residents surveyed, information was collected from six (6) locations. Three (3) locations indicated they were connected to municipal water service. Access to wells was not provided at the time of the well survey. The resident at 343650 Church Side Road East indicated issues with water quantity. They are on a shallow dug well with two (2) holding tanks for increased storage. The resident at 319183 Grey Road 1 had a drilled well within a pit and indicated no issues with water quality or quantity. The resident at 319197 Grey Road 1 had a drilled well and indicated no issues with water quality or quantity. The well survey map showing the homes that were surveyed is shown on the Well Survey Plan in Appendix C.

Address	Water Source	Well Depth	Water Level	Well Survey Plan
343612 Church Side Rd E	Drilled Well & Municipal			WS-1
343598 Church Side Rd E	Municipal			WS-2
343650 Church Side Rd E	Dug Well	3.0 to 3.6 m*		WS-3
319217 Grey Rd 1	Could not be confirmed			WS-4
319203 Grey Rd 1	Could not be confirmed			WS-5
319197 Grey Rd 1	Drilled Well			WS-6
319189 Grey Rd 1	Could not be confirmed			WS-7
319183 Grey Rd 1	Drilled Well			WS-8
319173 Grey Rd 1	Could not be confirmed			WS-9
581 Balmy Beach	Municipal			WS-10

Table 5.2 Well Survey Summary

Note: * indicates information was provided by home owner.

The potential for well impacts to neighboring wells is anticipated to be minimal. The proposed residential development will be municipally serviced for water.

5.3 Background Water Quality

The well records reviewed for this assessment reported fresh water supplies. The information from residents collected during the well survey indicated that the water of this area is generally of good quality. Based upon our well survey, the existing wells (not connected to municipal water services) are generally upgradient of the proposed development. Two wells are considered to be cross-gradient on Church Side Road East. Impacts to the existing wells from the proposed development are not expected.

Groundwater samples were taken from a dug well on Site and a drilled well at 319197 Grey Road 1 to evaluate background water quality. The location of the sampled wells are depicted on the Well Survey Plan, Appendix C. The sample from the dug well was collected directly from the well. The sample from 319197 Grey Road 1 was collected from a raw water tap at the house. The water samples were delivered to SGS Environmental Laboratories for chemical analyses.

A summary of the water quality data is provided in Table 5.3. The analytical results are compared with the Ontario Drinking Water Standards (ODWS). The Certificates of Analyses are presented in Appendix E.



Table 5.3 Water Quality Summary

Deremeter	Dug Well 1	319197 Grey Rd 1	ODWS	
Parameter	Dug Well on Site	Drilled Well	00003	
Calcium	65.1	109		
Sodium	1.11	93.7	200	
Manganese	0.0275	0.00355	0.05	
Magnesium	13.4	32		
Potassium	1.78	6.24		
Iron	0.023	0.009	0.30	
Sulphate	1.1	34	500	
Chloride	1.3	190	250	
Nitrite – N	< 0.003	< 0.003	1.0	
Nitrate – N	0.026	0.353	10	
Organic Nitrogen	0.27	< 0.05	0.15	
Total Organic Carbon	5	3	5	
Fluoride	0.10	0.21	1.5	
Alkalinity	231	332	30 to 500	
Ammonia+Ammonium – N	< 0.04	0.05		
pH (units)	8.23	8.14	6.5 to 8.5	
Hardness	218	404	80 to 100	
Turbidity (N.T.U.)	5.85	0.18	5	
Conductivity (µmhos/cm)	389	1010		
Colour (T.C.U.)	14	< 3	5	
Total Dissolved Solids	222	664	500	

Note: Units are mg/L unless otherwise stated; "<" indicates concentrations are less than laboratory reporting limits. **Bold** indicates the concentration exceeds the ODWS.

In general, the analyses indicate the majority of parameters meet the ODWS. There were no health related parameter exceedances of the ODWS within these water samples. The chemical results indicate that the following parameters exceeded the ODWS aesthetic and operational objectives for the following:

- Organic Nitrogen (Dug Well);
- Hardness (both locations);
- Turbidity (Dug Well); and
- Total Dissolved Solids (319197 Grey Rd 1).

Nitrate concentrations were low in both wells. Elevated hardness is related to the overburden materials containing calcium and to a lesser extent, magnesium. Elevated hardness is a common trait of groundwater supplies in Southern Ontario and, if desired, can be treated using commercially available treatment equipment such as a water softener. Organic nitrogen is an operational guideline with the primary concern being that organic nitrogen compounds frequently contain amine groups, which can react with chlorine and severely reduce its disinfectant power. Treatment of well water by chlorine is not expected and is not considered to be a significant issue.



6. Conclusions and Recommendations

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the site and assume that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the assessment, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like. Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor.

Based on the results of our hydrogeologic review, it is our professional opinion that the Site is suitable for the proposed residential development. It is our professional opinion that there is low potential for groundwater and surface water impact as a result of developing the Site. It is recommended that good construction and mitigation techniques must be used to minimize the potential for impact. Detailed conclusions and recommendations are presented in the following sections regarding the water balance and impacts to groundwater and surface water resources.

6.1 Water Balance Evaluation

An evaluation of the water balance was completed to compute the potential impacts that may occur in the recharge / discharge characteristics related to the proposed development. The objective of the water balance is to ensure that post-development infiltration with the developable area meets the pre-development values. The computations have used detailed parameters such as precipitation (Owen Sound MOE from 1981 to 2010 was used), regional evapotranspiration, infiltration and runoff. Weather data from Owen Sound MOE was selected as it was the closest weather station to the Site (about 9 km to the south). The detailed calculations can be reviewed in Appendix F.

The area to be developed is 18.26 ha based on information provided by the Client. Below is a summary of the expected pre-development water balance values for the proposed development based on the current information.

6.1.1 Predevelopment Water Balance

The pre-development water balance incorporated the existing soils, slope and agricultural areas. The infiltration factor for the area was calculated from the table of values presented in the "Land Development Guidelines" (MOEE, 1995). It is based on three sub-factors which are:

- Topography sub-factor;
- Soil sub-factor; and
- Cover sub-factor.



Groundwater and surface flow direction is towards Georgian Bay. The slope is considered as "rolling" (slope of 2.8 to 3.8 m per km). The soils are generally comprised of silt and clay. The existing vegetation is currently a mixture of forest; tall grasses; and manicured lawn. The predevelopment calculations also included one (1) existing house and a garage.

Table 6.1 summarizes the expected pre-development water balance values for the Site.

Table 6.1 Pre-Development Summary

Total Precipitation (Owen Sound MOE):	- 1114.5 mm/year
Regional Evapotranspiration:	- 588 mm/year
Recharge Available:	- 526.5 mm/year
Area of Recharge Available (Site):	- 18.26 ha
Total Water Surplus:	- 96,189 m ³ /year
Total Estimated Infiltration:	- 21,045 m ³ /year
Total Estimated Runoff:	- 75,144 m ³ /year

Based upon these calculations, the overall Site infiltrates on the order of 21,045 m³ per year or about 115 mm/year. Based upon the soil encountered during our test hole program (silty clay), infiltration is expected to be minimal.

6.1.2 Post Development Water Balance (No Enhancements)

The computation of the water budget was repeated for the proposed development assuming no mitigation techniques, that is, runoff from impervious surfaces is unrecoverable (stormwater from rooftops and asphalt is modelled to be discharged directly to storm sewers) and not infiltrated into the ground. The anticipated impact of the development is related to increased runoff from imperious surfaces such as the residential development roof tops and asphalt areas. These are assumed to be impervious surfaces with zero infiltration capacity in this model. A summary of the computations is provided in Table 6.2.

Table 6.2 Post-Development Summary (No Enhancements)

Area of Site:	- 18.26 ha
Total Water Surplus:	- 122,569 m ³ /year
Total Estimated Infiltration:	- 11,595 m³/year
Infiltration % Difference (pre- vs. post-):	- (-45%) (decrease)
Total Estimated Runoff:	- 110,974 m ³ /year
Runoff % Difference (pre- vs. post-):	- 48% (increase)

Assumptions that were made in order to compute the post-development water budget in Table 6.2 included the impermeable (i.e. 0% infiltration) surface area of asphalt and development roof tops.

Under this scenario, the total infiltration volume decreased by 45% and runoff volume increased by nearly 50%.

Based upon this scenario, mitigative strategies are required to minimize infiltration losses and reduce storm water runoff. The following section discusses the water balance after considering enhanced infiltration options.



6.1.3 Post Development Water Balance (Enhanced Infiltration)

The post-construction water budget computations were repeated considering enhanced infiltration options which are also known as Low Impact Development (LID) technologies. These technologies include and are not restricted to rainwater harvesting, downspout disconnection, infiltration trenches, vegetated filter strips, bioretention, permeable pavement, enhanced grass swales, dry swales and perforated pipe systems in order to balance the water budget and maintain the downgradient wetland features. The shallow subsurface soils are topsoil underlain by silty clay. It is noted that LIDs can work in any soil type.

The primary enhancement for this Site is to direct water from the roof tops to areas where infiltration can occur. The post-development water balance was modelled to include the disconnection of downspouts from storm sewers and directing water from roof tops to lawn / landscaped areas. It is also assumed that grading and levelling will occur for the development increasing the infiltration potential. A summary of the post-construction water budget with enhancements for infiltration is presented in Table 6.3.

Table 6.3 Post-Development Summary (With Enhanced Infiltration)

Area of Site:	- 18.26 ha
Total Water Surplus:	- 122,569 m ³ /year
Total Estimated Infiltration:	- 21,045 m ³ /year
Infiltration % Difference (pre- vs. post-):	- (0%) (no change from pre-dev)
Total Estimated Runoff:	- 101,524 m ³ /year
Runoff % Difference (pre- vs. post-):	- 35% (increase)

In this scenario, the infiltration values have been modelled to show no change compared with predevelopment values. Based upon the water balance calculations, it is our professional opinion that there would be minimal impact to the local groundwater regime and minimal impact to the surface water regime from a quantity perspective due to the proposed development.

6.2 Impact on Groundwater Baseflow

The importance of the groundwater baseflow is that, depending upon the hydraulic functionality with the Site, it provides discharge to water bodies, wetlands and downgradient wells. Water infiltrating into the silty clay is minimal and water balance calculations suggest that the infiltration to the subsurface can be kept at pre-development values. It is GHD's professional opinion that there is no expected impact to the shallow groundwater baseflow that may be supplying baseflow to the downgradient features.

6.3 Impact on Surface Water Bodies

The impacts to surface water bodies are related to the reduction of the groundwater baseflow and water quality concerns related to human activities such as road salting, minor fuel and oil leaks, fertilizer application etc. It is expected that there will be no impacts to groundwater and neighbouring surface water bodies. Runoff from the development will conform to the stormwater management report for the Site.



6.4 Mitigation Measures

Several mitigative techniques have been recommended in order to address concerns relating to the potential for impact to the base flow. The impact and mitigation measures can be arranged into two (2) distinct categories: construction phase and operational phase. Prior to construction, storm water management techniques should be incorporated to control additional surface water runoff and permit enhanced infiltration into the surrounding ground. Storm water management techniques will minimize the potential for groundwater impact and also minimize the amount of silt or other fine-grained soil particles becoming mobile and entering into downgradient areas. The installation of strategically placed silt fences will reduce flow velocities of storm water enabling particulate to settle out prior to entering downgradient areas.

During the operational phase of the development, it is expected that storm water excess will be controlled as per the Stormwater Management report. As indicated above, LIDs will be required to maintain pre-development infiltration values and reduce storm water runoff and will be incorporated into the site plan at the detailed design stage.

6.5 Servicing

6.5.1 Water Supply

Private services for water are not considered as the Site will be connected to municipal water services. However, any wells at the Site are recommended to be decommissioned in accordance with Ontario Regulation 903 prior to development of the Site.

6.5.2 Septic Waste Disposal

A detailed assessment of the septic system suitability is required to determine the potential impact of individual sewage systems at the Site on groundwater resources since the proposed lot sizes are less than one (1) hectare in area on average. The Site is not considered to be hydrogeologically sensitive (Procedure D-5-4, MOE, 1996). No karst formations were observed. The MOE dilution model was used to confirm that the projected post-development nitrate concentration meets the drinking water standard of 10 mg/L for nitrate. It is our professional opinion that the Site is suitable for the construction of septic waste disposal systems.

The overburden materials were investigated during the advancement of 8 test pits. The soils encountered generally consisted of topsoil then silty clay. Test pits were excavated to a maximum depth of 3.4 m. Bedrock was not observed. No karst formations or indicators of karst were observed within any of the test holes.

The T-time of the underlying soil is estimated to be greater than 50 min/cm. Based upon the subsurface soils in the area of the proposed leaching beds, it is recommended that the waste disposal systems be designed as fully raised bed systems. A detailed review of the expected waste disposal impacts and recommendations are presented in the following sections.



6.5.2.1 Development Impact

For the purposes of calculating the potential impact of the planned residential development, 1,000 L/day/household is considered to be an acceptable septic effluent loading rate. Therefore, a proposed development of 33 lots is expected to generate about 33,000 L/day (33 m³/day) of septic effluent. While most constituents in septic effluent are usually removed within a short distance of movement within soil, mobile constituents such as chlorides and nitrates will require sustained dilution to meet the drinking water standards of 10 mg/L N for nitrate.

The MOECC normally considers sewage from a Class 4 waste disposal system will contain 40 mg/L of nitrate. For the purpose of assessing the impact of projected nitrate loading, the dilution requirement of 4:1 was utilized in the impact computations.

A summary of the applicable parameters that were considered in the waste disposal evaluation and the computation of the projected nitrate concentration are presented below in Table 6.4. The detailed calculations can be reviewed in Appendix G. The calculations used a recharge rate of 115 mm/year for silty clay based on exploratory test pits. A shallow water sample was collected from the dug well at the Site to define the existing shallow groundwater background nitrate concentration. The analytical result for nitrate was 0.026 mg/L (refer to Appendix E for the certificate of analysis).

Using dilution only, the nitrate concentration generated from sewage at the Site is calculated to be 14.6 mg/L and exceeds 10 mg/L (ODWS for nitrate in drinking water). The clayey nature of the subsurface soils indicates that nitrate impact will not impact local groundwater sources by the installation of Class IV sewage disposal systems (or connection to a municipal sewer system in the future). Raised tile beds are recommended for the development. Tertiary septic system could be considered for the improvement of sewage effluent for these lots.

Table 6.4 provides a summary of the septic impact parameters for the proposed development

Table 6.4 Nitrate Impact Assessment Summary

Recharge Available Based on Soils:	- 115 mm/yr
Dilution Area:	- 18.26 ha
Background Nitrate:	- 0.026 mg/L
Residential Nitrate Loading (40 mg/L x 33,000 L/day):	- 1,320,000 mg/day
Projected Nitrate Concentration (33 lots at 115 mm/year):	- 14.6 mg/L

6.5.2.2 Waste Disposal Requirements

Based on the results of this assessment, it is our professional opinion that the Site is suitable for a private septic waste disposal system. Fill will be required and drainage patterns and storm drainage will be re-directed and controlled as part of the grading plan.

It is recommended that the septic systems use fully raised absorption trench leaching beds. The waste disposal systems should meet Ontario Regulation 350/06 made under the Building Code Act, 1992 and incorporate the following design features:

1. Organics should be stripped from the area of the leaching beds and downgradient mantle.



- 2. The exposed subgrade below the tile beds should be trimmed and scarified, and provided with a gentle slope of 0.5% in the direction of the mantle.
- The tile beds should be constructed as fully raised leaching type beds to the full height of at least 1 m above existing grade. The raised beds should consist of clean, granular fill capable of providing an in-place percolation rate (T-time) of 4 to 8 min/cm.
- 4. The mantle should be constructed along the downgradient margin of the raised beds. Each mantle should extend along the full width of the bed and for a minimum of 15 m downgradient from the bed. The mantle should consist of similar granular fill raised to a minimum of 250 mm above the surrounding grade. Surface runoff should be diverted away from the leaching beds by means of proper site drainage.
- 5. The waste disposal systems should be kept clear of surface drainage swales, roof leader drains, and other sources of surface water.
- 6. The tile beds should be kept away from shade trees and a healthy cover of vegetation should be developed and maintained over the beds to promote evapotranspiration.
- 7. When sighting tile beds on sloping ground, it is recommended that procedures outlined in the Building Code be followed closely.
- 8. Minimum set back distances from septic tank (plus 2 times height raised):

a) Building – 1.5 m	b) Prope	erty line – 3 m
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- c) Drilled Well 15 m d) Open water course 15 m
- 9. Minimum set back distances from septic tile bed (plus 2 times height raised):

a) Building – 5 m b) Property line – 3	a)	Building – 5 m	b)	Property line – 3 m
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- c) Drilled well, properly sealed 15 m d) Shallow well 30 m
- e) Open water course 15 m
- 10. The layout, design and construction of the waste disposal bed should be subject to inspection by experienced hydrogeologic personnel.

The tile beds should be sized according and will likely be about 400 square metres for a conventional system based upon a T-time of 8 min/cm and a 15 m mantle in the direction of flow. It is our opinion that there is sufficient area within the proposed lots to support the tile bed and house. New technologies are available that can reduce the size of the footprint of the conventional septic system. As outlined above, tertiary treatment systems will be needed if 33 lots are to be developed. If other new technology septic systems are incorporated into the design, it is recommended that the systems be installed as per the Ontario Building Code



6.6 Summary Conclusions

In summary, the proposed development area is generally comprised of topsoil underlain by silty clay. Bedrock or karst topography was not encountered during the hydrogeological assessment. Minimal water seepage was observed within the till at depths 2.4 to 3.0 m during the test pit program. Based upon the water level measurements, the flow direction is toward Georgian Bay.

It is our opinion that there will not be any constraints for development from a groundwater perspective as the existing seepage and water from within the silty clay is minimal and can be handled with appropriate engineering techniques. It is expected that groundwater will generally be below the depth of the future development. If groundwater volumes of greater than 50,000 L/day are to be pumped during construction activities then a permit applied for through the EASR would be required from the MOECC. If the volumes are to exceed 400,000 L/day, a PTTW would be required. Based upon the groundwater observed, these permits are not anticipated.

The MOECC well records indicate that wells in the area are either shallow dug / bored or drilled bedrock wells. The shallow dug / bored wells have an average depth of about 4.4 m and groundwater encountered at about 2.4 m. The drilled bedrock wells have an average depth of about 27.6 m and groundwater encountered at about 13.9 m. A door-to-door well survey was conducted which indicated that the area is municipally serviced with some existing wells still in use. The existing wells are generally upgradient of the proposed development. Two wells are considered to be cross-gradient on Church Side Road East. Impacts to the existing wells from the proposed development are not expected as the development will be municipally serviced.

There are minimal impacts expected to groundwater and surface water as a result of the future development provided that appropriate planning (i.e. incorporation of LIDs as supported by the water balance calculations), mitigation measures and proper construction techniques are considered. Based upon water directed from the rooftops to lawn / landscaped areas, the infiltration is expected to remain the same compared to pre-development values.

The clayey nature of the subsurface soils indicates that nitrate impact will not impact local groundwater sources by the installation of Class IV sewage disposal systems (or connection to a municipal sewer system in the future). Raised tile beds are recommended for the development. Tertiary septic system could be considered for the improvement of sewage effluent for these lots.

In summary, provided that the waste disposal system is properly constructed, no significant impact is anticipated on downgradient receptors from this development. It is GHD's opinion that the results of this hydrogeological assessment support the approval of the proposed 33-lot residential development at this Site.



The following Statement of Limitations should be read carefully and is an integral part of this report. We trust this report meets your immediate needs. Should any questions arise regarding any aspect of our report, please contact our office.

Sincerely,

GHD

0.00

/Jason Geraldi, M.Sc.



Robert Neck, M.Eng., P.Geo. (Limited)

Nyle McIlveen, P.Eng.





7. References

Chapman and Putnam, 1966. The Physiography of Southern Ontario, 2nd Edition. University of Toronto Press.

Chapman and Putnam, 1984. The Physiography of Southern Ontario, 3rd Edition. Ministry of Natural Resources.

City of Toronto, November 2006. Wet Weather Flow Management Guidelines.

Conservation Authority Guidelines for Development Applications, June 2013. Hydrogeological Assessment Submissions.

Credit Valley Conservation and Toronto and Region Conservation Authority. Low Impact Development Stormwater Management Planning and Design Guide. Version 1.0. 2010.

Freeze, R. Allan and Cherry, John A. 1979. Groundwater.



8. Statement of Limitations

This report is intended solely for MJD Investments Inc. in assessing the hydrogeological aspects of the property (343622 Church Side Road East, Owen Sound, Ontario) and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

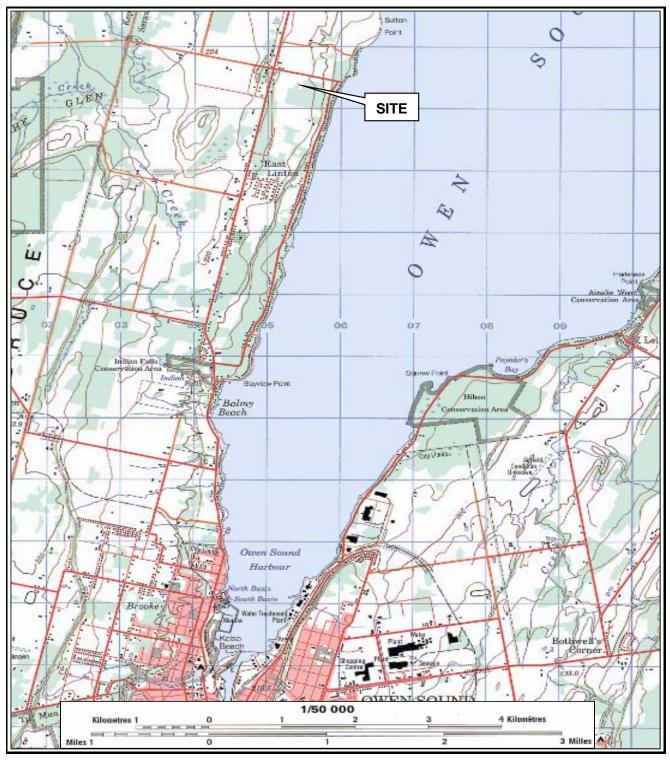
The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of hydrogeological engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a hydrogeological study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

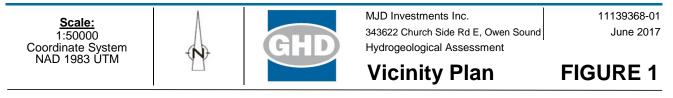
It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test hole locations only. The subsurface conditions confirmed at the test hole locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on site (ex. excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may become apparent during construction which could not be detected or anticipated at the time of our assessment. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

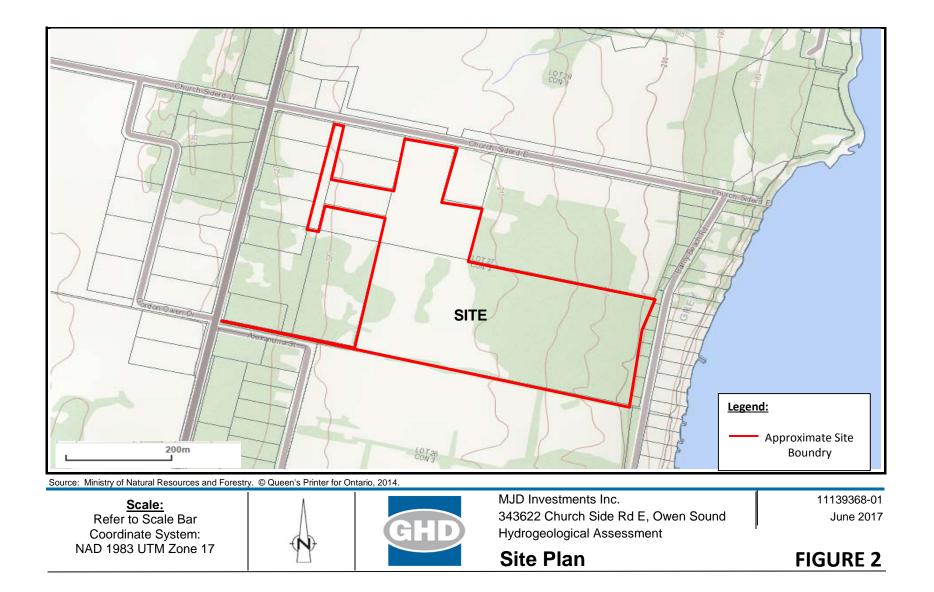


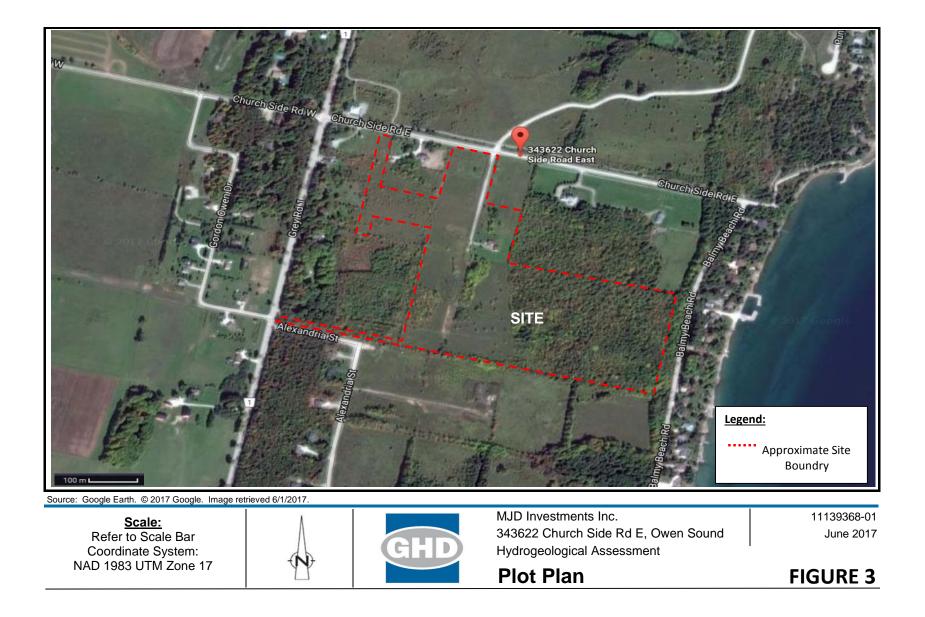
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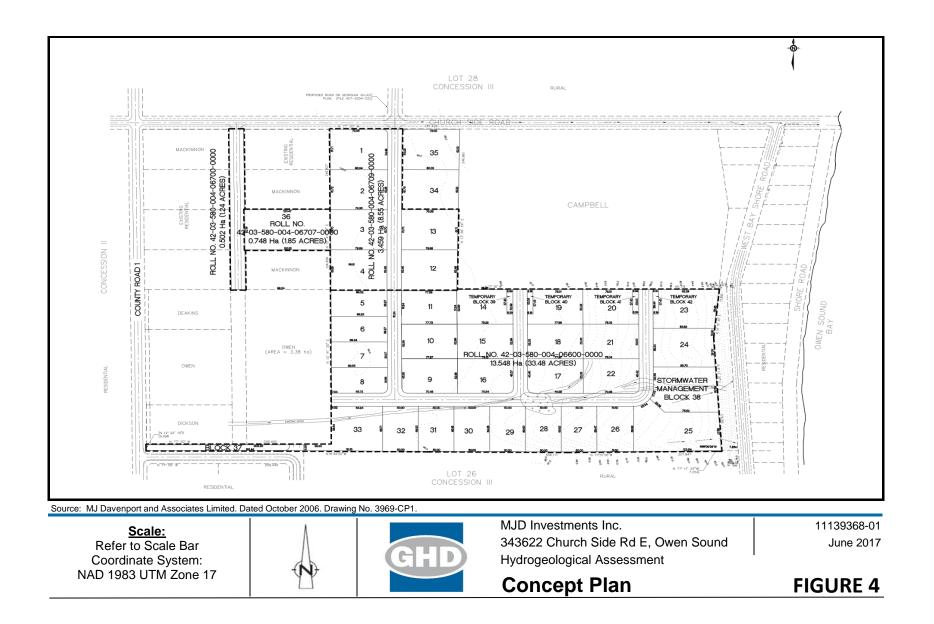


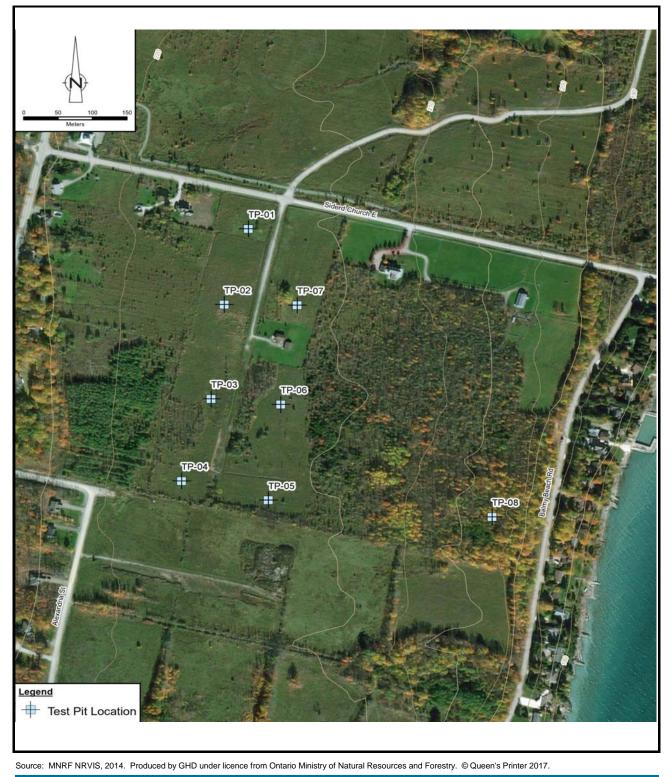
Base map complied from Energy, Mines and Resources Canada Map 41A/10 published 1999.











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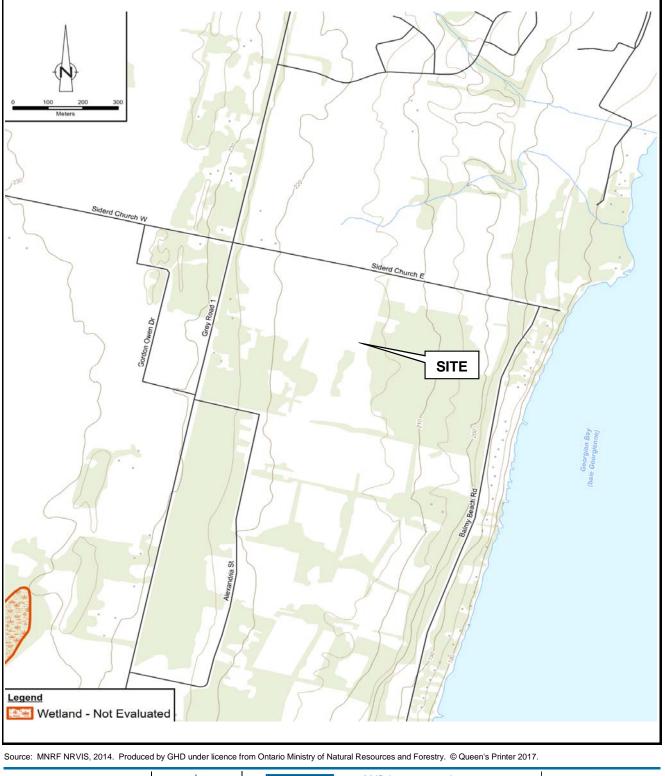
Test Hole Plan

FIGURE 5

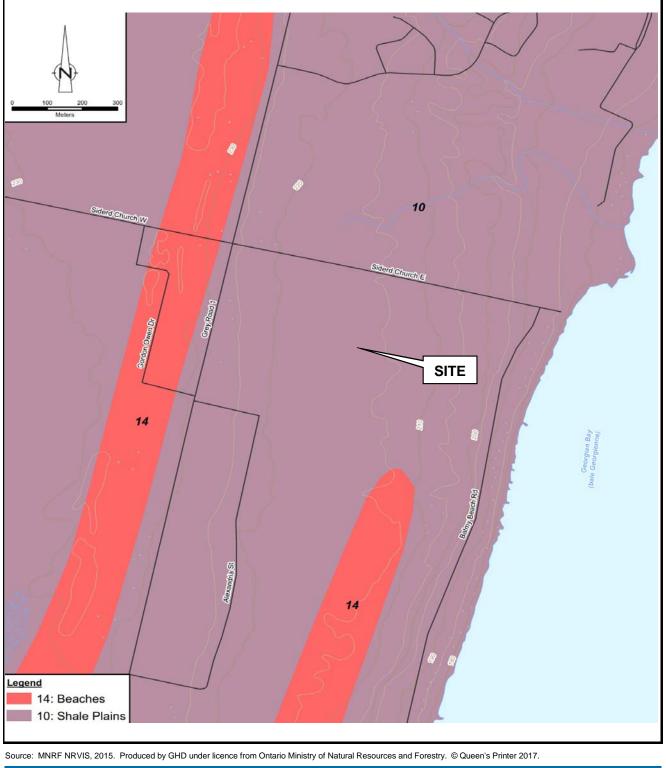


Source: MNRF NRVIS, 2014. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry. © Queen's Printer 2017.

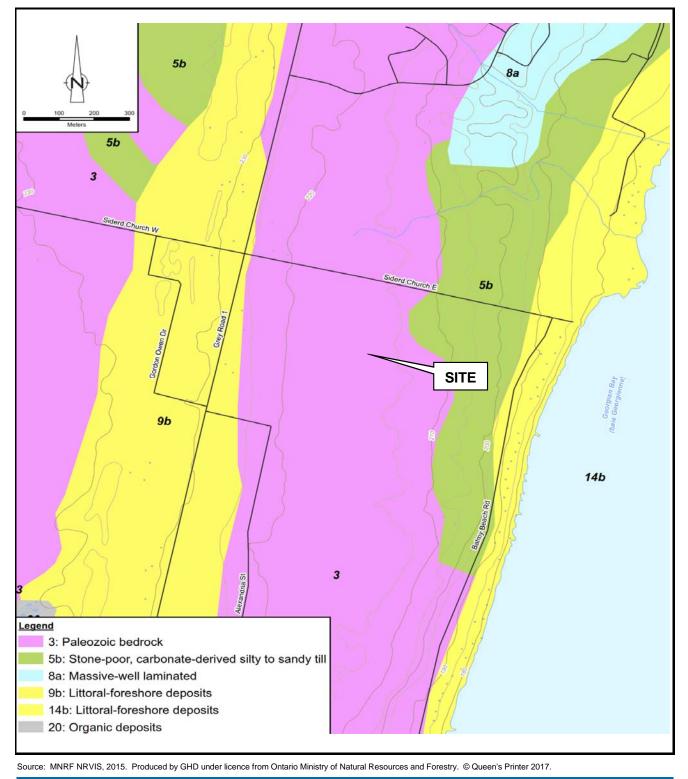










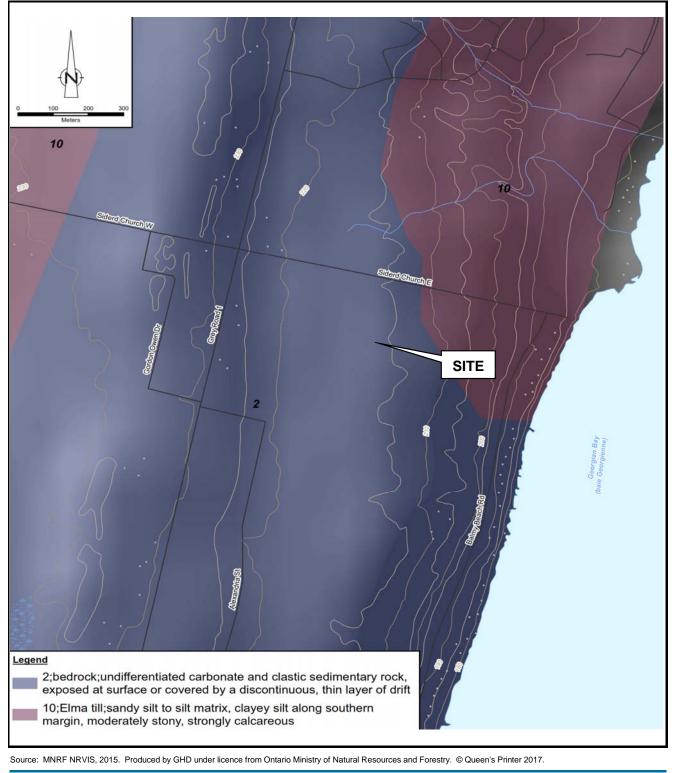


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MJD Investments Inc. 343622 Church Side Rd E, Owen Sound Hydrogeological Assessment 11139368-01 June 2017

Quaternary Geology FIGURE 10

Appendix A Soils Exploration Data

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Photo 1 – Looking south across Site from TP-01.



Photo 2 – Looking east from ditch along Church Side Road East at Site entrance. Georgian Bay in the horizon.



Site Photographs



Photo 3 – Ponded water feature in the central part of the Site.



Photo 4 – Small streams traversing through the wooded eastern area of the Site.



Site Photographs



Photo 5 – Looking north across the Site from around TP-05.



Photo 6 – Looking west across the Site from TP-05.



Site Photographs



Photo 7 – Looking west across the Site from the edge of the wooded area showing the swale conveying surface water to the east.



Photo 8 – Looking north from the swale extending parts of the western area of the Site. The house at 343612 Church Side Road East can be seen.



Site Photographs

Appendix C Well Survey and MOECC Well Records

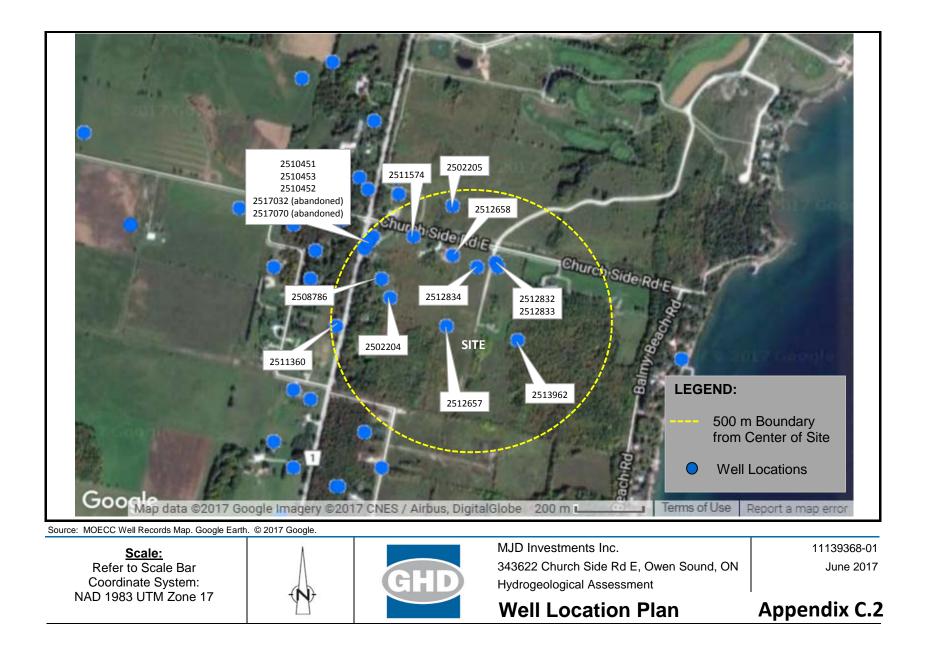


Source: Image obtained from Google Earth Maps. © 2016 Google.

<u>Scale:</u> Refer to Scale Bar Coordinate System: NAD 1983 UTM Zone 17



Well Survey Plan	Appendix C.1
Hydrogeological Assessment	
343622 Church Side Rd E, Owen Sound, ON	June 2017
MJD Investments Inc.	11139368-01



APPENDIX C.3: WELL SUMMARY - BORED / DUG WELLS

Well Record Summary Project No.: 11139368-01 343622 Church Side Road East, Owen Sound, ON

MOECC	Well	Water	Water Found		Static Level		Pump Rate		Depth	Comments
Well No.	Use	Feet	Metres	Feet	Metres	Igpm	L/min	Feet	Metres	
2512657	Domestic	8	2.4	-	-	3	13.6	15	4.6	Topsoil to 1', Clay to 6', Shale to 15'
2512658	Domestic	7	2.1	-	-	3	13.6	16	4.9	Topsoil to 1', Clay to 7', Shale to 16'
2512832	Domestic	9	2.7	9	2.7	3	13.6	15	4.6	Topsoil to 1', Clay to 6', Shale to 15'
2512833	Domestic	8	2.4	8	2.4	3	13.6	11.5	3.5	Topsoil to 1', Clay to 6', Shale to 11.5'
2512834	Domestic	8	2.4	4	1.2	3	13.6	15	4.6	Topsoil to 1', Clay to 8', Shale to 15'

Number of wells = 5

	Water Feet	Found Metres	Stati Feet	c Level Metres	Pumj Igpm	o Rate L/min	Well Depth Feet Metres		
	1 001	Motroo	1 001	Motroo	igpin	L /11111	1 001	Motroo	
AVERAGE	8.0	2.4	8.5	2.6	3.0	13.6	14.4	4.4	
МАХІМИМ	9.0	2.7	9.0	2.7	3.0	13.6	16.0	4.9	
MINIMUM	7.0	2.1	4.0	1.2	3.0	13.6	11.5	3.5	

APPENDIX C.4: WELL SUMMARY - DRILLED BEDROCK

Well Record Summary Project No.: 11139368-01 343622 Church Side Road East, Owen Sound, ON

MOECC	Well	Water	Found	Stati	c Level	Pum	o Rate	Well	Depth	Depth to	o Bedrock	Comments
Well No.	Use	Feet	Metres	Feet	Metres	Igpm	L/min	Feet	Metres	Feet	Metres	
2502204	Domestic	30	9.1	30	9.1	5	22.7	90	27.4	10	3.0	Stone and dirt to 10', Limestone to 30', Shale to 90'
2502205	Domestic	15	4.6	25	7.6	2	9.1	40	12.2	-	-	Shale to 40'
2508786	Domestic	17	5.2	13	4.0	2	9.1	70	21.3	3	0.9	Topsoil to 3', Limestone to 23', Shale to 70'
2510451	Domestic	28	8.5	12	3.7	1	4.5	125	38.1	1	0.3	Clay to 1', Limestone to 2.5', Shale to 125'
2510452	Domestic	90	27.4	22	6.7	1	4.5	120	36.6	12	3.7	Fill to 4', Clay to 12', Limestone to 17', Shale to 120'
2510453	Domestic	60	18.3	20	6.1	1	4.5	80	24.4	8	2.4	Fill to 8', Limestone to 14', Shale to 80'
2511360	Domestic	50	15.2	18	5.5	3	13.6	80	24.4	3	0.9	Clay to 3', Limestone to 25', Shale to 80'
2511574	Domestic	20	6.1	12	3.7	4	18.2	90	27.4	-	-	Clay to 5', Shale to 90'
2513962	Domestic	100	30.5	25	7.6	5	22.7	120	36.6	65	19.8	Clay to 6', Shale to 65', Rock to 120'

Number of wells = 9

	Water Feet	Found Metres	Static Level Feet Metres			Pump Rate Igpm L/min		Depth Metres	Depth to Bedrock Feet Metres	
	1 661	inelles	1 661	INIELLES	igpin		Feet	melles	1 661	INIELLES
AVERAGE	45.6	13.9	19.7	6.0	2.7	12.1	90.6	27.6	14.6	4.4
MAXIMUM	100.0	30.5	30.0	9.1	5.0	22.7	125.0	38.1	65.0	19.8
MINIMUM	15.0	4.6	12.0	3.7	1.0	4.5	40.0	12.2	1.0	0.3

hole we blew Three Ell fud GEOLOG DEPARTMENT of MINES elo Elev 41H The Weil Drillers Act drille d'4joined Department of Mines, Province of Ontarig S Water Well Record make C completed well. Village, Town or City. m or City)..... . R. R. N.O. J. Cast conth) (year) (year) Date Completed A. S.... Oct. (day) Pipe and Casing Record **Pumping Test** Casing diameter (s) 4/2, 2 holes 6 Date J. F. . Oct. 18.5.7 Length(s) of casing(s)...../. ?.. Static level..... 30. ful Type of screen..... Pumping level..... Length of screen..... Pumping rate..... 3 0.0. gala pu Distance from top of screen to ground level..... Duration of test... Is well a gravel-wall type?..... Distance from cylinder or bowls to ground level..... Water Record Kind (fresh or mineral)..... Depth(s) to Water No. of Feet Water Rises Kind of to Water Horizon(s) Water Quality (hard, soft, contains iron, sulphur, etc.)..... Appearance (clear, cloudy, coloured)......Cloudy. at. ting. For what purpose(s) is the water to be used?...... \mathcal{U}_{\dots} c. and. K.o.s How far is well from possible source of contamination? . Ian £.... Enclose a copy of any mineral analysis that has been made of water..... Well Log Location of Well Overburden and Bedrock Record From To all 90 0 ft.ft. In diagram below show distances of \mathcal{N} well from road and lot line. In-No ums dr dicate north by arrow. m Za 5 01 18." 0 10 60727 10 30 10 90 30 EAST whillinde. Situation: Is well on upland, in valley, or on hillside?.... Drilling Firm. Municht. Back. Onl. Name of Driller Stann. Address. In non Cont Date flc..... / 5. -. . /. 1.9. 5 2 : Signature of Licensee Wing MT. Form 5

ree ee

UPN Z. 5015129 BE GROUND 205TER NRANCH Ontario Water Resources Commission Act OCT 17 1961 Elev. $\int R$ 1017121 RECOR ONTARIO WATER Basin esour Township, Village, Town o County 25 Con. Date completed Lot vear ddress... Casing and Screep, Record **Pumping Test** Inside diameter of casing... Static level. Total length of casing Test-pumping rate G.P.M. ی گ Pumping level Type of screen Length of screen.... Duration of test pumping.... Depth to top of screen. Water clear or cloudy at end of test Diameter of finished hole Recommended pumping rate Z G.P.M. with pump setting of d'''feet below ground surface Well Log Water Record Depth(s) at which water(s) Kind of water From То Overburden and Bedrock Record (fresh, salty, ft. ft. found sulphar) Trea sk $\bar{\mathcal{O}}$ 5 120 × Location of Well For what purpose(s) is the water to be used? In diagram below show distances of well from road and lot line. Indicate north by arrow. Is well on upland, in valley, or on hillside? Drilling or Boring Firm Address. Licence Number. Name of Driller or Bo Address Date ((Signature of Licensed Drilling or Boring Contractor) Form 7 15M Sets 60-5930 OWRC COPY

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Ontario	Environment	VV A					,		RU
Ontano		I SPACES PROVIDED	251	0878	56	25013	ČON) 111	03
COUNTY OR DIS		TOWNSHIP, BOROUGH, CITY, TOWN, VILLA	GE		CON., BL	OCK. TRACT. SURVE	.,		LOT 25-27
1 (7		SARAWAK				ION 3			27
		R. # 2,		C, ON'		SIN CODE	DAY 22	AU2	<u>, _{yr}86</u>
1_2	10 12	17 N 14 S 2.50	25 26	7.50	30 3				47
	HOST	OG OF OVERBURDEN AND BED	ROCK M	ATERIAL				DEPTH	- FEET
GENERAL COL	COMMON MATERIAL	OTHER MATERIALS			GENERAL	DESCRIPTION		FROM	то
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Brown Grey	Limestone Limestone	· · · · · · · · · · · · · · · · · · ·						3 14	14 23
Blue	Shale						· · · · ·	23	32
Red	Shale	(traces Blue)						32	70
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	/					*			
	<u>·</u>								
}									
L									
41	WATER RECORD	51 CASING & OPEN HOL			Z SIZE (S) C (SLOT NO	DF OPENING	31-33 DIAMETER		ENGTH 39-40.
water found AT - FEET 17-23	KIND OF WATER	INSIDE WALL DIAM MATERIAL THICKNESS INCHES INCHES	DEPTH - F	то		L AND TYPE		INCHES EPTH TO TOP F SCREEN	FEET 41-44 30
1(-2)	2 SALTY 4 MINERAL 1 FRESH 3 SULPHUR ¹⁹	5 10-11 X STEEL 12 1/8 GALVANIZED 188 CONCRETE 188	0 1	¹³⁻¹⁶					FEET
20-23	2 🔲 SALTY 4 🗌 MINERAL	0 OPEN HOLE		20-23	DEPTH SET	AT - FEET	G & SEALIN		NT GROUT.
25-28	1FRESH 3SULPHUR ²⁴ 2SALTY 4MINERAL	GALVANIZED	13	70	FROM 10-13	TO 14-17		LEAD PA	CKER, ETC.) ~
	1 FRESH 3 SULPHUR ²⁹ 2 SALTY 4 MINERAL	Z4-25 OPEN HOLE 24-25 STEEL 26 GALVANIZED	-	z 7 - 30	18-21	22-25			
30-33	1 [] FRESH 3 [] SULPHUR ^{34 60} 2 [] SALTY 4 [] MINERAL	CONCRETE			26-29	30-33 80			·
71	EST METHOD 10 PUMPING RAT	9 15-16 17-1			LO	CATION C	F WELL	······	
1 P	C WATER LEVEL 5 END OF WATER	GPM HOURS HOURS	INS	IN DIAG		SHOW DISTANCE ATE NORTH BY AI		OM ROAD A	NDN
EST	19-21 22-24 15 MINUTES		s 37				$\sqrt{7}$		TI
	FEET 65 FEET 33 6. 38-41 PUMP INTAKE		EET				4		S
Δ	GPN DED PUMP TYPE RECOMMENDE	FEET 1 CLEAR TO CLOUD					/		
Озн	PUMP	PUMPING O	PM			7	"		
\$9+53	54					/.	F ^f .		1
FINA	JS 2 OBSERVATION WE	5 ABANDONED, INSUFFICIENT SUPPL LL 6 ABANDONED, POOR QUALITY 7 UNFINISHED	Y						
OF WE	55-56 D DOMESTIC		_				e í		
WATE	R 2 C STOCK	GOMMERCIAE MUNICIPAL PUBLIC SUPPLY				100	r` ø		
USE	4 🗋 INDUSTRIAL	COOLING OR AIR CONDITIONING P NOT USED				/			
METH	57 CABLE TOOL OD 2 TO ROTARY (CONVEN	6 🗍 BORING ITIONAL) 7 🗍 DIAMOND				1			
OF	NG A D ROTARY (REVERS							n۵	355
	S AIR PERCUSSION			RS REMARKS	58 CONTR	ACTOR 59-62	ATE DECEMPS		
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15 208		ARTON, ONT.	SE	E OF INSPECTION	10-1	NSPECTOR			ଦ
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S SIGNATUM	Montraction With	14 SUBMISSION DATE	0FFICE	· •		0.5	5 58		1
	TRY OF THE ENVIRON	DAY MO. YR		•			FO	RM NO. 0506-	-4-77 FORM 7

Ministry of the			Ontario Water Resour	
Ontario Environment	ACES PROVIDED	25104	_	CON,
2. CHECK 🖄 CORREC	T BOX WHERE APPLICABLE	E	CON BLOCK. TRACT. SURVE	15 22 23 74 EY ETC LOT 25-27
	unal			DATE COMPLETED
	24<344	AL ELEVATION		
LOG	OF OVERBURDEN AND BED	ROCK MATERIA	ALS (SEE INSTRUCTIONS)	47
GENERAL COLOUR MOST COMMON MATERIAL	OTHER MATERIALS		GENERAL DESCRIPTION	DEPTH - FEET FROM TO
			- clay	0 1
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			lu chale	68 71
			ed chale	71 103
			shill work	103 125
			SIZE S7 OF OPENING	65 75 00 31-33 DIAMETER 34-38 LENGTH 39-40
WATER FOUND AT - FEET KIND OF WATER	51 CASING & OPEN HOL	DEPTH - FEET		INCHES FEET
$\begin{array}{c c} 10 \cdot 13 & 1 \\ \hline & & \\ 7 & & \\ 2 & \\ & & \\ 6 & \\ & & \\ 6 & \\ & & \\ 6 & \\ & & \\ 6 & \\ & \\$	INCHES INCHES	FRUM TO 13-16	0	OF SCREEN
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20-23 1 C FRESH 3 SULPHUR 24 2 SALTY 6 GAS	1 - STEEL 2 - GALVANIZED 3 - CONCRETE 4 - OPEN HOLE	21 125	FROM TO 10-13 14-17	MATERIAL AND TYPE LEAD PACKER, ETC)
25-24 1 _ FRESH 3 _ SULPHUR 29 2 _ SALTY 4 _ MINERALS 30-33 , _ FRESH 3 _ SULPHUR 34 eq	5 D PLASTIC 24-25 1 D STEEL 2 D GALVANIZED	27-30	10-21 22-25	
2 C SALTY 6 C GAS	3 CONCRETE 4 DOPEN HOLE 5 DPLASTIC		26-29 30-33 00	-
71 PUMPING TEST METHOD 10 PUMPING RATE 1 PUMPING I	11-14 DURATION OF PUMPING 15-16 17 GPMHOURSMI	vs.	LOCATION O	
STATIC WATER LEVEL 23 LEVEL END OF WATER LEVE	LS DURING		AGRAM BELOW SHOW DISTANCE INE INDICATE NORTH BY AF	
<u><u>12</u> 125 20-20</u>	98 10-30 64 10-30 68 55			<i>k</i>
Y FEET FEET FEET IF FLOWING. 30-41 PUMP INTAKE SET GIVE RATE IIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	ANS FEET I DELEAR 2 CLOUD		54	PAWAK Rd.
SHALLOW DEEP SETTING	43-45 RECOMMENDED 44- 15 FEET RATE 1-12 GP		ו	4om.
50-53	S 🗋 ABANDONED. INSUFFICIENT SUPPLY	×_	31	
FINAL 1 WATER SUPPLY 2 OBSERVATION WELL STATUS 3 TEST HOLE OF WELL 4 RECHARGE WELL	ABANDONED POOR QUALITY UNFINISHED Dewatering	×	S Greek	1/2
SS-S6 I DOMESTIC	COMMERCIAL MUNICIPAL			÷
	PUBLIC SUPPLY COOLING OR AIR CONDITIONING D NOT USED		Fast	~ <u> </u>
57 1 CABLE TOOL	• BORING	-	East	
METHOD 2 DI ROTARY (CONVENTION OF 3 DI ROTARY (REVERSE) CONSTRUCTION 4 DI ROTARY (AIR)	NAL) 7 🗌 DIAMOND I JETTING I DRIVING			35557
NAME OF WELL CONTRACTOR	UDIGGING OTHER	DRILLERS REMAR	58 CONTRACTOR 59-62	
ADDATESS Wright Will Me	LICENCE NUMBER	DATE OF INSI	5507	FEB 2 1 1990
NAME OF WELL TECHNIGH	Unt well technician			
AIGNATURE OF FECHNICIANTCONTRACTOR	SUBMISSION DATE	OFFICE		
MINISTRY OF THE ENVIRONM	DAY MO YR	_ [ō	088.88	FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment	WAT	The Ontario Water Resource	
Ontario 1. PRINT ONLY IN	SPACES PROVIDED	2510452 25413	
COUNTY OF DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN VILLAGE	CON BLOCK, TRACT, SURVEY, E	15 22 29 74 TC LOT 15-27
	16 # King	L.	DATE COMPLETED 40-53 DAY MO .5 YR 81
Г <u>1</u> 10 12		C ELEVATION RC EASIN CODE	
	OG OF OVERBURDEN AND BEDR	OCK MATERIALS (SEE INSTRUCTIONS) GENERAL DESCRIPTION	DEPTH - FEET
COMMON MATERIAL		1.11	
		- iling to is	4 12
		- limistore	12 17
		ud shale	27 120
		<i></i>	
		2	
31			
41 WATER RECORD	51 CASING & OPEN HOLE		INCHES FEET
$\frac{10-13}{90} - \frac{1}{100} = \frac{1}{2} = \frac{1}{2}$	INCHES INCHES FF	RUM TO MATERIAL AND TYPE	DEPTH TO TOP 41-44 10 OF SCREEN FEET
19-18 I _ FRESH 3 _ SULPHUR ¹⁹ 2 _ SALTY 6 _ GAS 20-23 I _ FRESH 3 _ SULPHUR ²⁴		20-21 DEPTH SET AT PEET	RIAL AND TYPE
2 SALTY 4 SULPHUR 2 SALTY 6 GAS 25-28 1 FRESH 3 SULPHUR 29	2 D GALVANIZED 3 D COMERETE 4 GOPEN HOLE 5 D PLASTIC	FROM TO	LEAD PACKER, ETC)
2 SALTY 4 MINERALS 6 GAS 30-33 1 FRESH 3 SULPHUR 34 90 4 MINERALS	24-25 26 2 GALVANIZED 3 □ CORCRETE 4 □ OPEN HOLE	27-30 16-21 22-25 26-29 30-33 80	
2 3 SALTY 6 GAS		LOCATION OF	WELL
	GPM 15-16 17-18 GPM HOURS MINS EVELS DURING 2 □ RECOVERY	IN DIAGRAM BELOW SHOW DISTANCES OF ⊌OT LINE INDICATE NORTH BY ARROV	
5 19-21 22-24 IS MINUTES 22-24 28-2 28-2	96 19 59		Ϋ́Ν
TIF FLOWING SIGNERATE GPW 12 PLMP INTAKES	SET AT WATER AT END OF TEST 42		
RECOMMENDED PUMP TYPE RECOMMENDED		yon T to	/• m
FINAL SA WATER SUPPLY	I abandoned. Insufficient supply		
STATUS OF WELL 2 DOBSERVATION WEL 2 OBSERVATION WEL 3 DISERVATION WEL 3 DISERVATION WEL	L 6 ABANDONED POOR QUALITY 7 UNFINISHED 9 Dewatering	Sie Ro	et ad.
SS-SE I D DOMESTIC 2 STOCK 3 IRRIGATION	5 COMMERCIAL 6 MUNICIPAL 7 PUBLIC SUPPLY	1	
USE 4 🗆 INDUSTRIAL	COOLING OR AIR CONDITIONING I NOT USED	East Linton	
57 I CABLE TOOL METHOD 2 I ROTARY (CONVENT OF 3 I ROTARY (REVERSE)		Liniza	05550
CONSTRUCTION 4 D ROTARY (AIR) 4 D ROTARY (AIR) 5 D AIR PERCUSSION		DRILLERS REMARKS	35556
A NAME OF WELL CONTRACTOR	Well CONTRACTOR'S LICENCE NUMBER		FEB 2 1 1990
Borto well technique	t. Ont well technician's	O DATE OF INSPECTION INSPECTOR	
SIGNATURE OF TECHNICKING CONDUCTOR	T-DETAD	FICE	
MINISTRY OF THE ENDITION	M DAY NO YR		FORM NO. 0506 (11/86) FORM 9

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2. CHECK (COR	TOWNSHIP BOROUGH. CITY. TOWN. VILLAGE	TO 14 15 CON BLOCK TRACT. SURVEY ETC TTT	LOT 23-27
	KR#2	Kimble DAY	MO4_ YR. 89
- <u>10</u> 11	*** 5369		
GENERAL COLOUR MOST COMMON MATERIAL	OG OF OVERBURDEN AND BEDRO	GENERAL DESCRIPTION	DEPTH FEET
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		limitore	8 14
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31			
		43	75 80 R 34-38 LENGTH 39-40
41 WATER RECORD	DIAM MATERIAL THICKNESS	RECORD Z (SLOT NO.) DEPTH - FEET W VIM TO CC MATERIAL AND TYPE	INCHES FEET DEPTH TO TOP 41-44 30
10-13 2 SALTY 6 MINERALS 15-18 15-18 15-18 15-18 15-18 15-18 15-18 15-18 15-18 15-18 15-18 15-18 15-18 16 16 16 18 18 18 18 18 18 18 18 18 18	10-11 1 SPEEL 12		DF SCREEN FEET
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71 PUMPING TEST NETHOD 10 PUMPING RAT 1 D D D	re II-14 DURATION OF PUMPING 15-16 17-18 GPMNOURSNINS	LOCATION OF WELL	
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120 80 74	-20 63 20-31 5 432-34 45 ⁷⁵⁻³⁷	l V	
U FEET FEET FUNP INTAKE GIVE RATE GIVE RATE GPM GPM RECOMMENDED PUMP TYPE RECOMMENDED PUMP PUMP	RODS FEET I DELEAR 2 CLOUDY		
C SHALLOW DEEP SETTING	75 FEET PUMPING RATE GPM		
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OF WELL 3 TEST HOLE	2 UNFINISHED 9 D DEWATERING 5 D COMMERCIAL		
WATER 2 STOCK 3 IRRIGATION USE 4 INDUSTRIAL 0 OTHER	MUNICIPAL DUBLIC SUPPLY COOLING OR AIR CONDITIONING	East Linton	-
37 1 CABLE TOOL 2 ROTARY (CONVE) OF 3 ROTARY (REVERS CONSTRUCTION 4 ROTARY (AIR) 5 TAIR PERCUSSION		DRILLERS REMARKS	3555 8
Roman Contractor	Well CONTRACTOR'S LICENCE NUMBER	DATA SOURCE SA CONTRACTOR 0 20.42 DATE RECEIVED	2 1 1990
AXME OF WELLE TECHNICITY	Well TECHNICIAN'S LICENCE NUMBER		
SIGNATURE OF TECHNICIAL ON TRACTOR	SUBMISSION DATE DAY	CSS S8	
MINISTRY OF THE ENVIRO		FOR	M NO. 0506 (11/86) FORM 9

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h		2	Saran	rk		<u> </u>	DATE COMPLETED	27
			Eas	t I	nton		DATE COMPLETED	<u>12" , 90</u>
	10 12	17 1910	NGG			BASIN CODE		
 	MOST		EN AND BEDR		RIALS (SEE	INSTRUCTIONS		PTH - FEET
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	s. fort	a and a set			<u>st c</u>	lay sto	2	.25
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	ER RECORD		& OPEN HOLE			54 SIOFOPENING 31- TINO >	65. -33 DIAMETER 34-3	75 10 18 LENGTH 39-40
WATER FOUND AT - FEET	KIND OF WATER	INSIDE DIAM MATERIAL INCHES	WALL THICKNESS INCHES	DEPTH - FEET	<u>_</u>	RIAL AND TYPE	INCHE DEPTH TO TH OF SCREEN	
50-10	SALTY $4 \square$ MINERALS $6 \square$ GAS FRESH $3 \square$ SULPHUR ¹⁹	10-11 1 STEEL 2 GALVANIZEI 3 CONCRETE 4 OPEN HOLE	111	0 20				FEET
2 🗌	$\frac{4 \ \Box \text{ minerals}}{6 \ \Box \text{ gas}}$ FRESH 3.0 $\Box \text{ sulphur }^{24}$	17-18 1 - STEEL	19		0-23 DEPTH FROM	SET AT FEET MAT	ERIAL AND TYPE	CORD
2 []	SALTY 4 □ MINERALS 6 □ GAS FRESH 3 □ SULPHUR	2 GALVANIZEI 3 CONGRETE 4 COPEN HOLE 5 PLASTIC	° d	0 80		10 D-13 14-17		D PACKER, EIC /
2 🗌		24-25 1 STEEL 2 GALVANIZEI 3 DCONCRETE		27		22-25		
2 🗆	SALIT 6 UGAS	5 DPLASTIC				-29 30-33 80		
71 PUMPING TEST METHO			15-16 17-18 HOURS			OCATION OF		
STATIC LEVEL	WATER LEVEL 25 END OF WATER L PUMPING 22-24 15 MINUTES		PUMPING RECOVERY			OW SHOW DISTANCES C DICATE NORTH BY ARRO		DAND
		29 29-31 15	60 MINUTES 62-34 35-37 FEET FEET			11		
IF FLOWING, GIVE RATE	38-41 PUMP INTAKE : GPM 801	RUDS FEET 1 BAL	END OF TEST 42				/¥	
RECOMMENDED PUMP	TYPE RECOMMENDED PUMP	43-45 RECOMMENT	дер 46-49 З дрм		-		Som.	
50-53	······	· · · · · · · · · · · · · · · · · · ·				12	SOM. CON TIL	
FINAL STATUS	 WATER SUPPLY OBSERVATION WEL TEST HOLE 	S C ABANDONED. IN L S ABANDONED PO 7 UNFINISHED				->		
OF WELL	4 🗌 RECHARGE WELL						en.	
WATER	2 STOCK 3 IRRIGATION	6 🗌 MUNICIPAL 7 🔲 PUBLIC SUPPLY				R	sud *	51
USE	4 INDUSTRIAL	COOLING OR AIR CC	NDITIONING NOT USED				/	<u>ј</u> Ц
METHOD	1 CABLE TOOL 2 ROTARY (CONVENT	-	N D			ŧ	1-	
OF CONSTRUCTION	3 TROTARY (REVERSE 4 ROTARY (AIR) 5 AIR PERCUSSION) • JETTIN 9 [] DRIVIN DIGGIN	G	00111-00-0				99224
NAME OF WELL CO			ELL CONTRACTOR'S			CALIFY ACTOR DAT	ERECEIVED	63-54 B0
HOLADDRESS	ght Dellow	Uns Stil	CENCE NUMBER		SPECTION	5507		991
A KAY 16	TECHNICIA PUDE	h Ont	ELL TECHNICIAN'S					
NAME OF WELL			CENCE NUMBER	OFFICE				
Lefiller	a thugh		IO YR	ō				
MINISTRY	OF THE ENVIRO	NMENT COPY					FURM NO. 050	6 (11/86) FORM 9

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COUNTY OR DISTRICT		TOWNSHIP, BOROUGH.	CITY, TOWN, VILL	AGE		CON	BLOCK TRACT SURVEY.	ETC +		27
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		N ^G 4	5369	RC.			BASIN CODE		111 111	
		G OF OVERBURD	EN AND BE				31 NSTRUCTIONS)	<u> </u>		
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31			ullili				4411111			
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41 WAT		51 CASING	& OPEN HO	DEP	TH · FEET				INCHES	FEET
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20-23 1	FRESH 3 SULPHUR 24	17-18 1 - STEEL 2 - GALVANIZE 3 - CONCRETE	19 : D	2	20-23	FROM	10	ATERIAL AND T		ENT GROUT ACKER. ETC)
25-28 1	FRESH 3 SULPHUR 29 4 MINERALS	24-25 24-25 1 D STEEL	E 26	28	90 27-30		0-13 14-17 1-21 22-25			
30-3,3 1 🗆	SALTY 6 \Box GAS FRESH $34 \Box$ SULPHUR 34 BC 4 \Box MINERALS SALTY 6 \Box GAS	2 GALVANIZE				26	-29 30-33 80			
PUMPING TEST NET		······································			The	L	OCATION O	F WELL		
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	22-24 15 MINUTES	30 MINUTES 45 MIN	UTES 60 MINU	UTES					Ą	
	70		END OF TEST	FEET 42					N	
U FEET IF FLOWING, GIVE RATE RECOMMENDED PUL	GPM 98 K MP TYPE RECOMMENDE			5UDY 46-49				->**	(on.	-
SO-53	PUMP	80 FEET RATE	4	 ₽М				`		
	54 I TER SUPPLY	s 🗌 ABANDONED.	INSUFFICIENT SU					\backslash		
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WATER USE	2 STOCK 3 IRRIGATION 4 INDUSTRIAL	 PUBLIC SUPPLY COOLING OR AIR H 					/			
	57	9 [] 	NOT USED				East			
METHOD OF	2 CABLE TOOL 2 CROTARY (CONVEN 3 ROTARY (REVERS)	TIONAL) 7 DIAM E) 8 DIETT	IOND ING				East Linton		• •	
CONSTRUCTIO	ON A ROTARY (AIR) 5 AIR PERCUSSION	9 DRIV			DRILLERS REMAR	ĸs			09	9260
NAME OF WELL	CONTRACTOR	11. 111	WELL CONTRAC	TOR'S ER	DATA SOURCE O DATE OF INSP	58	5507	NOV	1 9 199	63-66 ⁰⁰
	17 Jun -	the Ont	<u> </u>		ш.	ł.	INSPECTOR			}
	UTECHNICIPAL		WELL TECHNIC LICENCE NUMB							
SIGNATURE OF	TECHNICIAN CONTRACTOR	SUBMISSION DA			OFFICE					
	AM WAYAL	DNMENT COPY	_ MO Y	(R	<u> </u>			FOR	M NO. 0506	(11/86) FORM 9

(F	Ministry of the			WA	TI					Resource		CC	ORD
Onta	Environ ario	MENI	CES PROVIDED	– – – –			26		NUNICIP	009			, 0,3
COUN		2. CHECK 🔀 CORRECT	BOX WHERE APPLICABL TOWNSHIP BOROUGH.					CON	10	ICT. SURVEY	ETC		LOT 25-27
			21	$\frac{r=r}{R#, P}$			3L É	5	<u></u>		DATE COMPL		41-53 8 yr 94
, . .,			•G		RC.	ELEVAT		RC .	BASIN COD			 	
		LOG	OF OVERBURD	EN AND BED	ROC	26 K MA1	TERIAL	30 .S (SEE	NSTRUCTIO	(NS)			
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31				<u>, , , , , </u>									
	2 10 14 1		51 CASING	& OPEN HO		ECORI	<u></u>		54 SI OF OPENI	NG	65 31-33 DIAME	TER 34-3	75 80 8 LENGTH 39-40
WAT	T - FEET	ND OF WATER 	INSIDE DIAM MATERIA INCHES	WALL THICKNESS INCHES	DE FRUN	PTH FE	то		ERIAL AND T	IYPE IEL		INCHI DEPTH TO T OF SCREEN	OP 41-44 30
		$\begin{array}{c} 4 \square \text{ minerals} \\ 6 \square \text{ gas} \\ \hline \end{array}$	10-11 2 GALVANIZ 3 GONCRETI 4 GOPEN HOL	e 🔨	0	. /	13-16				S & SEAL	ING RE	
	12 ² SA 20-23 ¹ FRI	$\begin{array}{c} 4 \square \text{MINERALS} \\ 17Y 6 \square \text{Gas} \\ 18H 3 \square \text{SULPHUR} \end{array}$	5 PLASTIC 17-18 STEEL 2 GALVANIZ	19			20-23		I SET AT - FI	₩ №	IATERIAL AND		CEMENT GROUT AD PACKER, ETC 3
-	2 _ SA 25-28 1 _ FR	ESH 3 CISULPHUR 4 CIMINERALS	3 CONCRET 4 OPEN HO 5 PLASTIC	ε. <u>3</u>	10		27:30	0	18-21	22-25	ENSE	AL	e .
	2	ESH 3 CISULPHUR 34 80	1	E i ii				2	6-29	30-33 80	AKK	TE	JUNTS
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ѷ	STATIC	TER LEVEL 25 END OF WATER LEV			uns	୍ତ	P AF DI	DARMER IN	VORASHON	DISTANCE	Beger	FROM RO	AD AND
TEST	19-21	22-14 15 MINUTES 26-28	30 MINUTES 45 MI 29-31	NUTES 60 MINUT 32-34 3	5-37		1	*****					
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PUMPING	RECOMMENDED PUMP TY	PUMP	FÉET 43-45 RECOMMI PUMPING FEET RATE	ENDED 4	5-49						PROPO	DSED	,
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	FINAL STATUS	1 W WATER SUPPLY 2 OBSERVATION WELL 3 TEST HOLE			LY						NEC	JE S	WELL A 70
	OF WELL 55-56	A RECHARGE WELL	D DEWATERING				\square		300				<u>v</u>
	WATER USE	2 🗌 STOCK 3 🔲 PRIGATION 4 🔲 INDUSTRIAL	MUNICIPAL PUBLIC SUPPLY COOLING OR AIR	CONDITIONING									
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		S AIR PERCUSSION					TTO CA		/		DATE BECEIVE		24852
E E	NAME OF WELL CON TOHNSON	V I. GAET		WELL CONTRACT LICENCE NUMBER	2		TA URCE TE OF INSP	58 ECTION	3 0	30	ÖC'	T 13	1994
RACTOR	NAME OF WELL T		LEA SAN	WELL TECHNICI		S S	MARKS						
CONTR		DAETZ	SUBMISSION	7-833	3	OFFICE	-					CSS.	ES
	L	act	DAY	MO YR		ő					 F	ORM NO. 0	506 (11/86) FORM 9
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COUN	TY OR DISTRICT	<i>U</i>	TOWNSHIP, BOROUGH, CIT	PPE C	-		CON	BLOCK. TRACT. SURV	?		27
			RI	(#1	KE.	m B.	LE		DATE COMPL DAY		<u>3 ук. 94</u>
<u> </u>	J		NG			1.1.	RC.	BASIN CODE			
		LC	OG OF OVERBURDEN	AND BEDR	оск ма	TERIA	S (SEE IN	ISTRUCTIONS)			· FEET
GENI	ERAL COLOUR	MOST COMMON MATERIAL	OTHER MA	TERIALS			GENERA	L DESCRIPTION		FROM	то
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41 WAT	ER FOUND		INSIDE					NO 1		INCHES	FEET
		Image: Second	1 DSTEEL	THICKNESS INCHES	RUM	10 13-16	101	RIAL AND TYPE KAVE (DEPTH TO TOP OF SCREEN	41-44 30 FEET
	15-10 1	G ☐ GAS IFRESH 3 ☐ SULPHUR 4 ☐ MINERALS ☐ SALTY 6 ☐ GAS	$48 \stackrel{2}{\underset{\text{dopen hole}}{3}} \stackrel{\text{galvanized}}{\underset{\text{dopen hole}}{3}}$	4	0	12	61		NG & SEAL		
\downarrow	20-23	FRESH 3 CSULPHUR 4 CMINERALS SALTY 6 GAS	17-18 1 □ STEEL 2 □ GALVANIZED 3 □ CONCRETE 4 □ OPEN HOLE	3		20-23 16	FROM	10 10 13 14-17	MATERIAL AND	LEAD	IENT GROUT PACKER ETC)
		FRESH 3 CISULPHUR 4 CIMINERALS 5 SALTY 6 CIGAS	Z4-ZS 1 STEEL		/ /	27-30		-21 22-25	BENJI SAKLI		e TUINITS
		GRESH 3 CISULPHUR 34 4 CIMINERALS 5 SALTY 6 CIGAS	2 GALVANIZED 3 CONCRETE 4 OPEN HOLE 5 PLASTIC				26-				
71	PUMPING TEST MI	ETHOD ¹⁹ PUMPING RAT ² BAILER	1	i-16 17-16				OCATION			
	STATIC	WATER LEVEL 25		DURS MINS] PUMPING] RECOVERY				DICATE NORTH BY	CES OF VERV	TRON ROAD	AND
TEST		26-3	28 29-31 3	5 60 MINUTES 2-34 35-33 FEET FEE	11	1					
PING	FEI IF FLOWING, GIVE RATE	38-41 PUMP INTAKE	SET AT WATER AT EN						. 1		
PUMPIN	RECONMENDED P	GPM UMP TYPE RECOMMENDE PUMP DEEP SETTING	FEET		11			1	\sim		
	\$0.53										DEAD
	FINAL STATUS	WATER SUPPLY OBSERVATION WE TEST HOLE	S C ABANDONED, INS LL S ABANDONED POO 7 C UNFINISHED								END
	OF WELL	4 C RECHARGE WELL	D DEWATERING					300	/		75'
	WATER USE	2 SOCK 3 I IRRIGATION 4 INDUSTRIAL	 MUNICIPAL PUBLIC SUPPLY COOLING OR AIR CON 			K		300		\rightarrow	WE -
	036		⁹ 🗆 N	OT USED					Ler	Kolose	
	METHOD OF	¹ □. CABLE TOOL ² □ ROTARY (CONVE) ³ □ ROTARY (REVERS							,	ALTIN	
CC		ION 4 D ROTARY (AIR) 5 A R PERCUSSION	9 DRIVING	G OTHER	DRILL		, x 1			12	4853
۲		ISON & BA	ETZ WE	LL CONTRACTOR ENCE NUMBER 3030	NLV NLV	URCE		30 3 0	2 DATE RECEIVED	1319	94
TRACTOR	ADDRESS	#, mT. P.	EASANT		ы К	TE OF INSPI	ECTION	INSPECTOR			÷.
CONTR	and the second sec	N DRETZ	- "	-0333		MARXS					
	SIGNATURE C	Sach	SUBMISSION DATE	0 YR	OFFICE					CSS.ES	<u>s</u>
8	MINISTRY	OF THE ENVIRON	IMENT COPY						F	ORM NO. 0506	(11/86) FORM 9

Ontario Ministry of Environment and Energy		The		<i>Resources</i> Act
Print only in spaces provided. Mark correct box with a checkmark, where applicable.	11 1 2	2512832		Con. CIOINI III III III 15 2 23 24
County or District	Township/Borough/City/To		Con block tract su	irvey, etc. Lot 25-27
	Address	EMBLE	Date	ad 17 4 45
01	Northing	RC Elevation RC	Basin Code ii	day month year
LOG OF OV		COCK MATERIALS (see instruction	31 tions)	47
General colour Most common material	Other materials	Genera	al description	Depth - feet From To
BROWN TOP-SOIL				0 /
RED CLAY	0			69
GREEN SHALE RED SHALE	REU	LATERS HARD		9 15
AED SHALE				
SHALE	IN BOT	TOM OVER WEE	<u>,</u>	
6 FT OF	WATER	OVER WEE	KEN.	
			fopening 31-33 Diam	eter 34-38 Length 39-40
Meter found Inside	CASING & OPEN HOLE Wall Material thickness	Depth - feet	i opennig jenem	inches feet
10-13 B Fresh 3 Sulphur 14 10-11 D Colta 4 Minerals	Steel 12 Galvanized	From To Materia	l and type AVE L	Depth at top of screen ³⁰
15-18 1 D/Fresh 3 D Sulphur 19 36 4 0	Concrete Open hole Plastic	0 15 61	PLUGGING & SEA	
20-23 1 C Fresh 3 Culphur 24 17-18 1 C 2	Steel ¹⁹ Gaivanized Concrete	20.23	Annular space	C Abandonment
2 U Saity 6 Gas 4 5	Open hole Plastic	From	To Material and typ 8 ¹⁴⁻¹⁷ CONCR	e (Cement grout, bentonite, etc.)
30-33 G Erech 3 Sulphur 34 60 3	Galvanized Concrete	27-30	2-25 SAKRIT	E JOINTS
	Open hole Plastic	26-29	30-33 80	
71 Pump 2 Bailer GPM	Iration of pumping 15-16 			n road and leftline
Static level Water level end of pumping 25 Water levels during 1 Pu H 19.21 22-24 15 minutes 30 minutes 45	mping 2 🗌 Recovery	In diagram below show Indicate north by arrow		(
Image: Signature 19 21 22-54 15 minutes 30 minutes 45 Image: Signature 16 minutes 26-28 30 minutes 29-31 Image: Signature 16 minutes 26-28 16 minutes 29-31 Image: Signature 16 minutes 28-41 Pump intake set at W Image: Signature 16 minutes 16 minutes 16 minutes 16 minutes Image: Signature 16 minutes 16 minutes 16 minutes 16 minutes Image: Signature 16 minutes 16 minutes 16 minutes 16 minutes Image: Signature 16 minutes 16 minutes 16 minutes 16 minutes Image: Signature 16 minutes 16 minutes 16 minutes 16 minutes	32-34 35-37 feet feet			GE
If flowing give rate 38-41 Pump intake set at W GPM feet	ater at end of test 42		·N	KG
Shallow Deep	ecommended 46-49 Imp rate 3.NT GPM			GWOKG A
50-53	GPM		LIZO' WELL	
FINAL STATUS OF WELL 54 Water supply 5 Abandoned, insufficient supp Deservation well 6 Abandoned, poor quality	ly 🤋 🗌 Unfinished 10 🔲 Replacement well		K WELL	AY
3 □ Test hole 7 □ Abandoned (Other) 4 □ Recharge well 8 □ Dewatering				
WATER USE 55-56 , Domestic 5 Commercial	🤋 🗌 Not used			
2 Stock 6 Municipal 3 Irrigation 7 Public supply 4 Industrial 8 Cooling & air conditioning	10 Cther			
METHOD OF CONSTRUCTION 57				
1 Cable tool s Air percussion 2 Rotary (conventional) 6 Boring 3 Rotary (reverse) 7 Diamond	9 🗋 Driving 10 🗋 Digging 11 🔲 Other			
4 □ Rotary (air) 8 □ Jetting			DEAD 1 END 1	58379
Name of Well Contractor JOHNSON & BAETZ	Well Contractor's Licence No.	Data 58 Contracct		te received 63-68 80
Address RR#1 MT REASANT	J - J -	Date of inspection	Inspector	
Name of Well Technician	Well Technician's Licence No.	Remarks	1	
JOHN BAETZ Signature of Technician/Contractor	7-0333 Submission date	MINISTF		CSS.ES
Lata .	day mo yr			0506 (07/04) Front Form 0

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Onta) . PRINT ONLY IN SPACE	_		25128	22	2,5,0,1,3		103
COUNT	2 TY OR DISTRICT	. CHECK 🛛 CORRECT E	OWNSHIP. BOROUGH CITY.	1 2	•. •		CK. TRACT. SURVEY ET	15	LOT 25-27 Z 7
			RR#		n BLE			TE COMPLETED	44-53 YR 95
	J y L			RC.		RC BAS			
	" 10	LOG (AND BEDRO	CK MATERIA				- FEET
		MOST N MATERIAL	OTHER MATE	RIALS		GENERAL D	ESCRIPTION	FROM	TO
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31									
32	10 14 15				43	SIZE (S) OF	OPENING 31-33	65 DIAMETER 34-38	75 00 LENGTH 39-40
	ER FOUND KIND OF	WATER D	1 CASING & C	WALL E	DEPTH - FEET	U (SLOT NO)	· '	INCHES DEPTH TO TOP	FEET
Ę	3 ² SALTY 6	DSULPHUR DMINERALS DGAS	10-11 1 □ STEEL 2 □ GALVANIZED 3 □ CONCRETE		13-16	S GRI	AVEL	OF SCREEN	FEET
/	2 G SALTY 6	D GAS	3 □ CONCRETE 4 □ OPEN HOLE 5 □ PLASTIC 17-18 1 □ STEEL 19	3 0	20-23	61 DEPTH SET A	AT - FEET MATE		ORD
	2 SALTY 6	□ SULPHUR □ MINERALS □ GAS □ SULPHUR	2 GALVANIZED 3 CONCRETE 4 OPEN HOLE 5 PLASTIC	3 8	113	FROM 10-13	то В ⁴⁻¹⁷ Со,	NCRETE	
-	2 SALTY 6 30-33 ! FRESH 3	☐ MINERALS ☐ GAS ☐ SULPHUR ³⁴ 10 ☐ MINERALS	24-25 1 □ STEEL 2 □ GALVANIZED 3 □ CONCRETE 4 □ OPEN HOLE		27-30	18-21 26-29	22-25 30-33 80	KKITE J	Toin 75
71	2 SALTY 6	IC PUMPING RATE	5 DPLASTIC			LO(CATION OF	WELL	
انتا	I PUMP Z BAILE STATIC WATER LEV LEVEL END OF BUILDING	EL 25 WATER LEVEL		IS MENS PUMPING RECOVERY	IN DI LOT L		SHOW DISTANCES OF	F WELL FROM ROAD . N.	
TEST	FUMFING		0 MINUTES 45 MINUTES 29-31 32-3	60 MINUTES 4 35-37			1		Acme
PUMPING		FEET FEET 8 41 PUMP INTAKE SET A					N		G
PUM	RECOMMENDED PUMP TYPE	GPM RECOMMENDED PUMP SETTING	43-45 RECOMMENDED	46-49 31NT GPM				150	40
	50-53							130	
	STATUS	WATER SUPPLY OBSERVATION WELL TEST HOLE	5 ABANDONED INSUF 6 ABANDONED POOR 7 UNFINISHED				60	WELL	A
	55-56 1 🗗		DEWATERING COMMERCIAL MUNICIPAL						
	WATER , D	IRRIGATION 7	PUBLIC SUPPLY COOLING OR AIR CONDI O O O O O O O O O O O O O O O O O O O						
		CABLE TOOL ROTARY (CONVENTION	6 De Boring						1
со		ROTARY (REVERSE) ROTARY (AIR) AIR PERCUSSION	 JETTING DRIVING 	OTHER	DRILLERS REMAR	iks	DEAD END.	13	1982
	NAME OF WELL CONTRACTO	RAE		CONTRACTOR'S CE NUMBER	IDATA	58 CONT		JUN 07 19	63-68 A0
RACTOR	NAME OF WELL CONTRACTOR JOHNSON ADDRESS RR#1 NAME OF WELL TECHNIK	MT. PL	EASANT		A SOURCE	ECTION	INSPECTOR		
CONTR	JOHN B	AETZ	LICET 7-	TECHNICIAN'S NCE NUMBER 0333	D REMARKS				
Ľ			DAY MO	YR	OFFICE			CSS.	
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Ontario Ministry of Environm	ent		7	The Ontario Water H WATER WEL	
Print only in space Mark correct box	ces provided. < with a checkmark, where applicable.	11	2512834	$ \begin{array}{c} \text{Municipality} & \text{Cor} \\ \hline 2 5 3 1 3 \\ \hline 10 14 5 \end{array} $	N
County or District		Township/Borough/City/T	own∕Village 4₩AK	Con block tract surve	ey, etc. Lot 25-27 27
		Address	KENBLE	Date	17 4 95
		Northing	RC Elevation	RC Basin Code ii	day month year
21			ROCK MATERIALS (see inst	20 31	47
General colour	Most common material	Other materials		eneral description	Depth – feet From To
BROW	IN TOPSOIL				0 1
RED	CLAT				. 18
RED	SHALE	GREEN	SHALE LA	TERS	8 14
RED	SHALF				14 15
	11 FT OF	WATER	OVER A	24 HR	
	PERIOD				
31	<u>╷╷╷╷╷╷╷╷╷╷╷╷╷</u>				
	1 15 21 TER RECORD 51 Inside	CASING & OPEN HOLI Wall		es of opening ^{31–33} Diameter ot No.)	r 34-38 Length 39-40
Water found at – feet	Kind of water diam inches	Material thickness inches	From To	terial and type	inches feet Depth at top of screen 30 41-44 30
8-14 20	$\begin{array}{c c} \hline Salty & 4 & \square & Minerals \\ \hline 6 & \square & Gas \\ \hline $	Galvanized Galvanized Concrete Open hole	0 12 0	GRAVEL	feet
2		□ Plastic □ Steel ¹⁹	20-23	PLUGGING & SEALI	Abandonment
2	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	□ Galvanized ₽ Concrete □ Open hole	11 15 Depths	set at - feet Material and type (C	Cement grout, bentonite, etc.)
25-28 1 E 2 E	Salty 4 Minerals	Plastic Steel 26 Galvanized	27-30	3 CONCRE	
30-33 v [Fresh 3 Sulphur ³⁴ ⁶⁰ 3 Minerals 4	Concrete Open hole Plastic	28-		JOINT
Pumping test m		Duration of pumping			······
71 1 Pump 2	Bailer GPM Water level 25 Water level	Pumping 2 C Recovery	In diagram below s	LOCATION OF WELL show distances of well from r	oad and lot line.
I.	22-24 15 minutes 30 minutes 26-28 29-31	45 minutes 32-34 60 minutes 35-37	Indicate north by a	rrow.	G
	feet feet feet	feet feet			
If flowing give r Recommended	GPM feet	Water at end of test 42 Clear Cloudy Recommended 46-49		N BE a	anc ing
Recommended			T AB	DUMY BER	× 1
FINAL STATU	S OF WELL 54		200	1	$\langle \tilde{v} \rangle$
Water su Water su Dobservat Test hole	pply 5 Image: Abandoned, insufficient superior duality tion well 6 Image: Abandoned, poor quality	oply 9 D Unfinished 10 D Replacement well			E .
₄ □ Recharge			H IO	00	D. BA
WATER USE	55-56 c ₅ ☐ Commercial	9 🗌 Not used			1 4
2 Stock 3 Irrigation 4 Industria		10 Other			
METHOD OF (68		
1 ☐ Cable to 2 ☐ Rotary (0 3 ☐ Rotary (1	conventional) 6 Boring	9 Driving 10 Digging 11 Dother		DEAD	
	air) ₈] Jetting			END 1	58376
Name of Well Cont	ON & BAETZ	Well Contractor's Licence No. 3030	Data 58 Contra source		UN 0 7 1995
Address Address	MT. REASANT	JU JU	Uate of inspection	Inspector	
Name of Well Tech	nnicia	Well Technician's Licence No.	Remarks		
JOHN Signature of Techn	BAETZ_ ician/Contractor	7-0333 Submission date	Remarks		000
QG	ant	day mo yr	Σ		CSS.ES

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Ontario Ministry of Environment and Energy

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The Ontario Water Resources Act WATER WELL RECORD

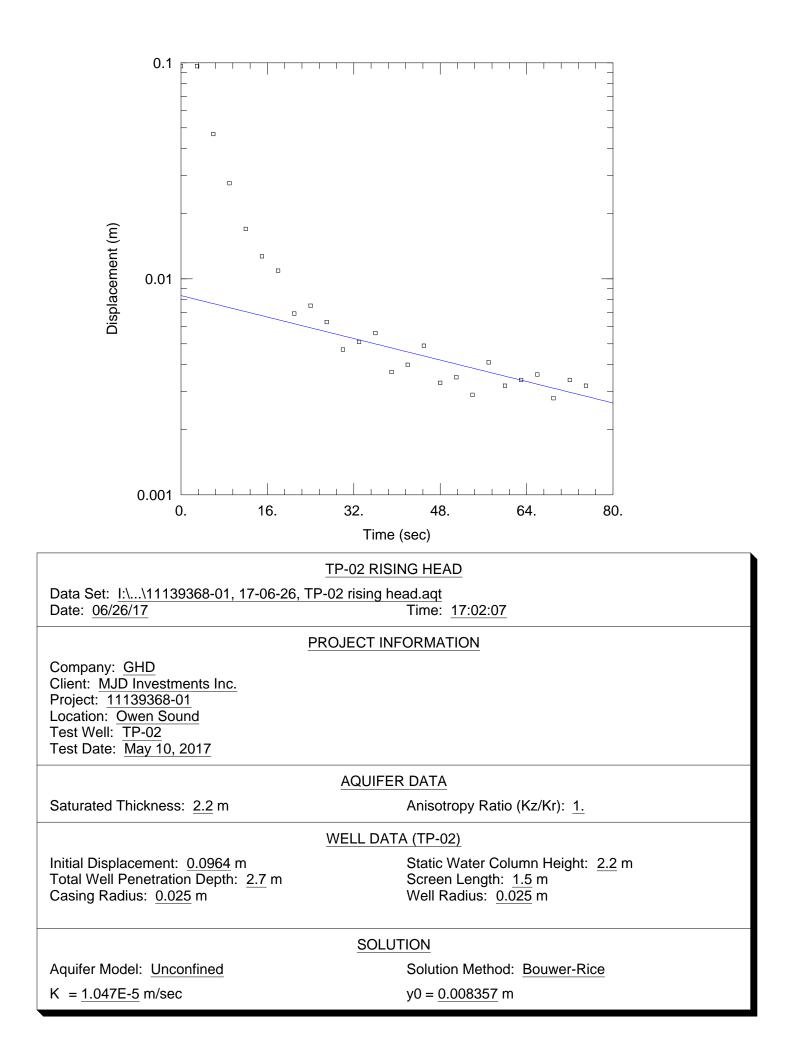
County or District				Towns	hip/Borough/Ci	y/Town/Village	•		Con block	tract surve		
Saul				Addres	Jan	runk	-			// Date		27
						Dux	RC Elev	ration RC	Basin Code	completed	day n	nonth ye
212		T M 10		1 1 17	18		25 26	30	31			
General colour	Most c	ommon mater			OEN AND BE Other materials		TERIALS		tions)	····	D	epth – feet
									store	1	From	
							110	g and	hicerca.		6	65
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	•••••			<u> </u>					Max 91 - 21 - 2			
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	15	21				43				65		
WAT ater found - feet	ER RECORE		51 Inside diam	CASING Material	& OPEN HO Wall thickness	Depth -	feet	Sizes of a (Slot No.)	pering	- ³³ Diameter	^{34–38} Leng	jth ³ 10
10-13 1	Fresh ³ S	ulphur ¹⁴ linerals	inches 10-11	1 Steel	inches	From	To 13-16		and type		Depth at top	
15-18 1		ulphur 19	67	2 Galvanized 3 Concrete 4 Open hole	.188	0	24	0				feet
2 [] 20-23 1 []	Salty 6 G	ias ulphur ²⁴	17-18	 Plastic Steel Galvanized 	19		20-23	61	PLUGGINC Annular space	à & SEALIN	G RECOR	
2 🗌	Salty 6 G	interais		 Calvallized Concrete Concrete Open hole Plastic 	·	24	120	Depth set at - From	To Mater	al and type (Cer	nent grout, b	entonite, et
2 []	Fresh ³ 3 S Salty ⁴ 3 M 6 3 G	linerals as	24-25		26		27-30	10-13	14-17 22-25			
	Fresh ³ □ Si 4 □ M Salty ₈ □ G	linerals		 Concrete Open hole Plastic 				26-29	30-33 80			
Pumping teel m	od ¹⁰ P	umping rate	11-14	Duration of pun		1						
	ater level 25	S	GPM during 1	Pumping	² Becovery		In diagram	below show			id and lot I	ine.
er	22-24 1		0 minutes 29-31	45 minutes	60 minutes	-	Indicate no	orth by arrow.		∧		
25 ^{feet}	126 feet	feet	feet	25 _{feet}						W		
19-21 feet If flowing give ra Recommended	GPM	ump intake set	OS leet	Water at end of	Deloudy					·		
	pump type P	tecommended ump setting	43-45 feet	Recommended	46-49 GPM						1 77	r
⁵⁰⁻⁵³ NAL STATUS		54	1000] 				*	CON DE	r
 Mater supple Observation 	ply 5[on well 6[Abandoned,	poor quality	upply 9 🗌 Unfi 10 🗌 Rep	nished lacement well			bey Roa				
 ³ Test hole ⁴ Recharge 		 Abandoned Dewatering 	(Other)					Degrou	41			
		55-56		9 🗌 Noti	used	-			East	Linton		
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4 🗌 Industrial						41						
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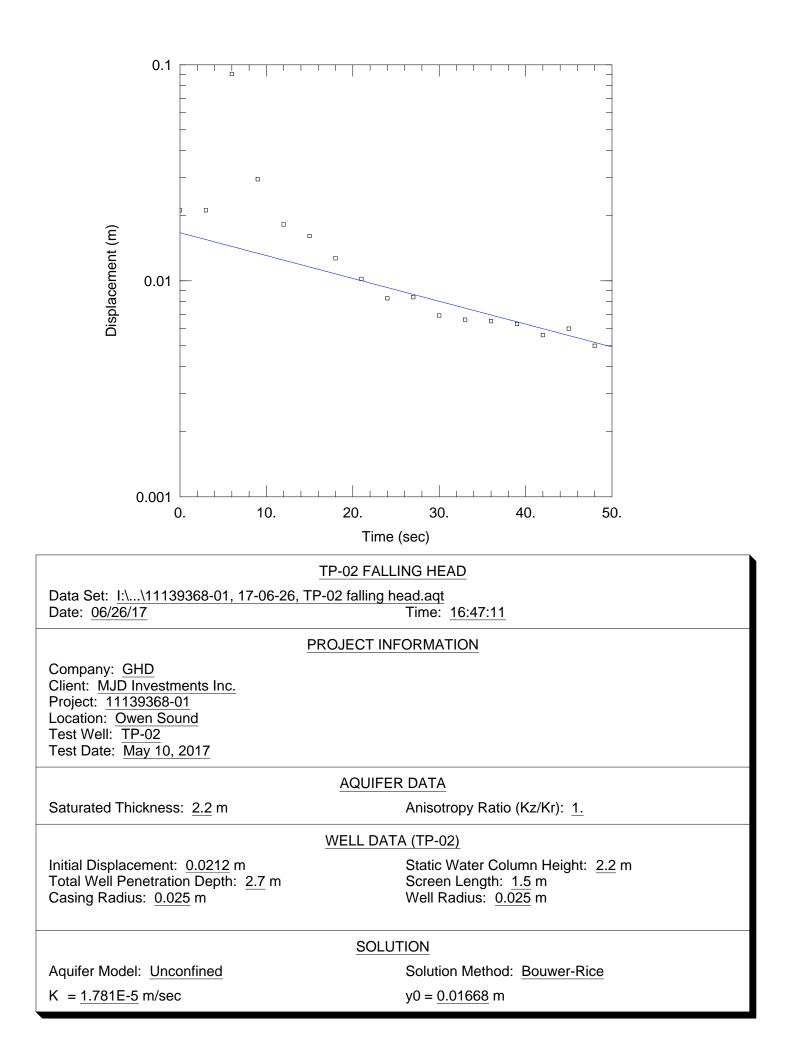
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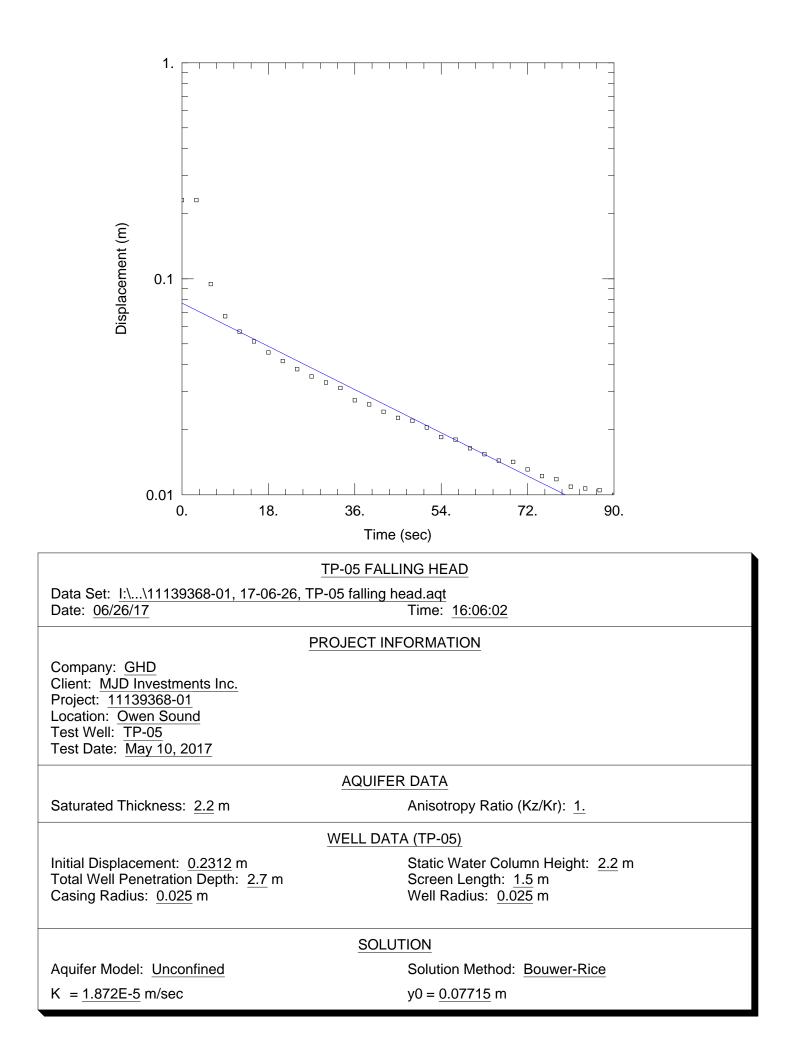
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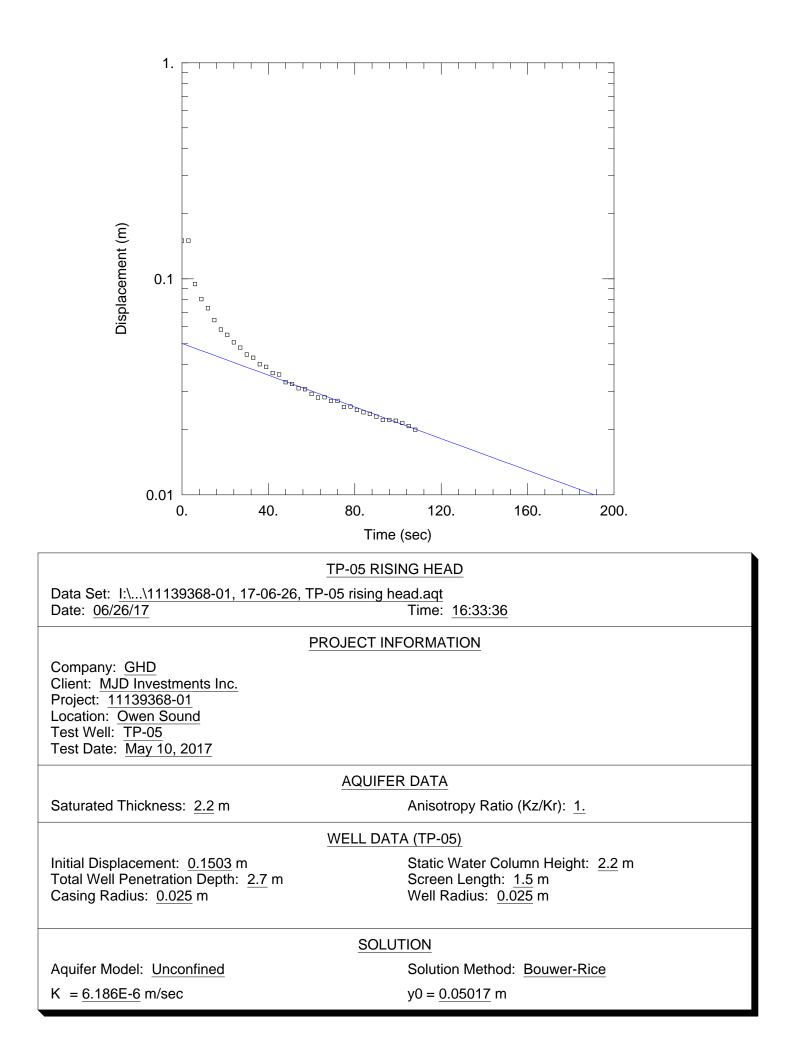
😵 Ontario	Ministry of Well Tag Number (Place st the Environment	icker and print number below)	Regulation 903 Ont	Well Record ario Water Resources Act
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Address of Well Location (Coun R#/Street Nonfber/Name		y/Town/Village	Site/Compartme	nt/Block/Tract etc.
		it Make/Model Mode	of Operation: Undifferen	tiated Averaged
Log of Overburden and I	edrock Materials (see instructions)			Depth Depth
General Colour Most commo	n material Other Materials		Description	From To
		previous	y anna	
	Construction Record		Test of	Well Yield
Hole Diameter Depth detres Diamete	Inside Wall	Depth Metres	Pumping test method D	raw Down Recovery Water Level Time Water Level
From To Centimetre	diam Material thickness centimetres	From To	Pump intake set at - Stati	Metres min Metres
	Casing		(metres) Leve Pumping rate - 1	
Water Record	Plastic Concrete		(litres/min) Duration of pumping 2	2
Water found Kind of Water	Steel Fibreglass		hrs + min Final water level end 3	3
Gas Salty Minera			of pumping	4
m Fresh Sulphu	Diactic Concrete		type. Shallow Deep Recommended pump 5	5
Other:	Galvanized		depthmetres	10
Gas Salty Minera			rate. (litres/min) 15 If flowing give rate - 20	15
After test of well yield, water was	Plastic Concrete		(litres/min) 25	25 30
Other, specify	No Casing or Scree	n	ued, give reason. 40	40
Chlorinated 🗌 Yes [] No	Open hole		60	60
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I From I IO	(cable i	Indicate north by	arrow.	
3 115 h	u plug.			ell Dad, lot line, and building. <u>Church</u> 3 dersad 2001. Road
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Cable Tool Rota	y (air) 🗌 Diamond 🔤 🗖	ligging other	Grey	Koad
Rotary (reverse)				
Domestic Indus	trial)ther		
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	d, insufficient supply	ed, (Other) Was the well ow package delivered		livered _{YYYY} MM DD
Well C	cl, poor quality Replacement well ntractor/Technician Information	ence No. Data Source	Ministry Use Or Contrac	tor
Name of Well Contractor	Well Contractor's Lic Son the Son the			101 5507 Inspection уууу MM DD
Business Address street name, nu Name of Well/Technigan (last name	unworth Oat	NOT		cord Number
Signature of Technician/Contractor	akt 1-0140	MM DD		
X 0506E (09/03)	Contractor's Copy 🗌 Ministry's Copy	Well Owner's Copy 🗌	Cette form	ıle est disponible en français

Appendix D Single Response Well Testing Data













GHD

Attn : Jason Geraldi

347 Pido Rd., Unit #29 Peterborough, ON K9J 6Z8,

Phone: 705-749-3317 Fax:705-749-9248 26-May-2017

 Date Rec. :
 11 May 2017

 LR Report:
 CA14339-MAY17

 Reference:
 11139368-01 PO#

 73507536

0001010767

Copy: #1

CERTIFICATE OF ANALYSIS Final Report

Analysis	1:	2:	3:	4:	5:	6:	7:
	Analysis	Analysis	Analysis	Analysis	MAC	AO/OG	NR 319917 Grey
	Start Date	Start Time	Approval Date	Approval Time			Rd. 1
Sample Date & Time							09-May-17 14:30
Temperature Upon Receipt [°C]							6.0
UV Transmittance [%]	12-May-17	12:51	12-May-17	16:31			97.7
Alkalinity [mg/L as CaCO3]	12-May-17	11:05	16-May-17	11:25		30-500	332
Colour [TCU]	12-May-17	11:53	15-May-17	09:30		5	< 3
Conductivity [µS/cm]	12-May-17	11:05	16-May-17	11:25			1010
pH [no unit]	12-May-17	11:05	16-May-17	11:25		6.5-8.5	8.14
Total Suspended Solids [mg/L]	15-May-17	08:05	17-May-17	14:41			< 2
Turbidity [NTU]	12-May-17	16:18	15-May-17	14:12	1	5	0.18
Organic Nitrogen [mg/L]	12-May-17	21:16	16-May-17	15:09		0.15	< 0.05
Total Kjeldahl Nitrogen [mg/L]	15-May-17	20:47	16-May-17	15:08			< 0.05
Ammonia+Ammonium (N) [mg/L]	12-May-17	21:16	15-May-17	13:47			0.05
Total Organic Carbon [mg/L]	15-May-17	22:25	16-May-17	13:54		5	3
Chloride [mg/L]	15-May-17	21:28	16-May-17	11:31		250	190
Fluoride [mg/L]	12-May-17	18:38	15-May-17	11:09	1.5		0.21
Nitrite (as N) [mg/L]	12-May-17	19:32	15-May-17	08:05	1		0.003 <mdl< td=""></mdl<>
Nitrate (as N) [mg/L]	12-May-17	19:32	15-May-17	08:05	10		0.353
Sulphate [mg/L]	15-May-17	21:28	16-May-17	11:31		500	34
Hardness [mg/L as CaCO3]	18-May-17	09:00	19-May-17	11:56		80-100	404
Aluminum (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56		0.1	0.001
Arsenic (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.025		< 0.0002
Boron (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	5		0.469
Barium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	1		0.0294
Calcium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56			109
Cadmium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.005		< 0.000003
Copper (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56		1	0.00327
Chromium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.05		0.00015
Iron (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56		0.3	0.009

Page 1 of 2

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LR Report : CA14339-MAY17

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: MAC	6: AO/OG	7: NR 319917 Grey Rd. 1
Potassium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56			6.24
Magnesium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56			32.0
Manganese (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56		0.05	0.00355
Sodium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	20*	200	93.7
Phosphorus (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56			< 0.003
Lead (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.01		0.00015
Antimony (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.006		0.0003
Selenium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.01		0.00010
Uranium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56	0.02		0.000586
Zinc (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:56		5	0.007
Cation sum [meq/L]							12.3
Anion Sum [meq/L]							12.7
Anion-Cation Balance [% difference]							-1.58
Ion Ratio							0.97
Total Dissolved Solids (calculated) [mg/L]							664
Conductivity (calculated) [µS/cm]							1250
Langelier's Index [@4°C]							0.71
Saturation pH [pHs @ 4°C]							7.43

MAC - Maximum Acceptable Concentration AO/OG - Aesthetic Objective / Operational Guideline NR - Not reportable under applicable Provincial drinking water regulations as per client.

Jeana Eduar

Deanna Edwards, B.Sc, C.Chem **Project Specialist** Environmental Services, Analytical

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GHD

Attn : Jason Geraldi

347 Pido Rd., Unit #29 Peterborough, ON K9J 6Z8,

Phone: 705-749-3317 Fax:705-749-9248 26-May-2017

 Date Rec. :
 11 May 2017

 LR Report:
 CA14340-MAY17

 Reference:
 11139368-01 PO#

 73507536

0001010780

Copy: #1

CERTIFICATE OF ANALYSIS Final Report

Analysis	1: Analysis	2: Analysis	3: Analysis	4: Analysis	5: MAC	6: AO/OG	7: NR Dug Well 1
	Start Date	Start Time	Approval Date	Approval Time			
Sample Date & Time							09-May-17 08:00
Temperature Upon Receipt [°C]							6.0
UV Transmittance [%]	12-May-17	12:51	12-May-17	16:31			68.0
Alkalinity [mg/L as CaCO3]	12-May-17	11:05	16-May-17	11:25		30-500	231
Colour [TCU]	12-May-17	11:53	15-May-17	09:30		5	14
Conductivity [µS/cm]	12-May-17	11:05	16-May-17	11:25			389
pH [no unit]	12-May-17	11:05	16-May-17	11:25		6.5-8.5	8.23
Total Suspended Solids [mg/L]	15-May-17	08:05	17-May-17	14:42			5
Turbidity [NTU]	12-May-17	16:18	15-May-17	14:12	1	5	5.85
Organic Nitrogen [mg/L]	12-May-17	21:16	16-May-17	15:09		0.15	0.27
Total Kjeldahl Nitrogen [mg/L]	15-May-17	20:47	16-May-17	15:09			0.28
Ammonia+Ammonium (N) [mg/L]	12-May-17	21:16	15-May-17	13:47			< 0.04
Total Organic Carbon [mg/L]	15-May-17	22:25	16-May-17	13:54		5	5
Chloride [mg/L]	15-May-17	21:28	16-May-17	13:25		250	1.3
Fluoride [mg/L]	12-May-17	18:38	15-May-17	11:09	1.5		0.10
Nitrite (as N) [mg/L]	12-May-17	19:32	15-May-17	08:05	1		0.003 <mdl< td=""></mdl<>
Nitrate (as N) [mg/L]	12-May-17	19:32	15-May-17	08:05	10		0.026
Sulphate [mg/L]	15-May-17	21:28	16-May-17	13:25		500	1.1
Hardness [mg/L as CaCO3]	18-May-17	09:00	19-May-17	11:57		80-100	218
Aluminum (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57		0.1	0.033
Arsenic (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.025		< 0.0002
Boron (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	5		0.037
Barium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	1		0.0125
Calcium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57			65.1
Cadmium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.005		0.000010
Copper (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57		1	0.00144
Chromium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.05		0.00006
Iron (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57		0.3	0.023

Page 1 of 2

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LR Report : CA14340-MAY17

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	5: MAC	6: AO/OG	7: NR Dug Well 1
Potassium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57			1.78
Magnesium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57			13.4
Manganese (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57		0.05	0.0275
Sodium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	20*	200	1.11
Phosphorus (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57			0.015
Lead (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.01		0.00006
Antimony (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.006		0.0003
Selenium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.01		0.00007
Uranium (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57	0.02		0.00135
Zinc (dissolved) [mg/L]	18-May-17	09:00	19-May-17	11:57		5	0.002
Cation sum [meq/L]							4.44
Anion Sum [meq/L]							4.67
Anion-Cation Balance [% difference]							-2.49
Ion Ratio							0.95
Total Dissolved Solids (calculated) [mg/L]							222
Conductivity (calculated) [µS/cm]							456
Langelier's Index [@4°C]							0.47
Saturation pH [pHs @ 4°C]							7.76

MAC - Maximum Acceptable Concentration AO/OG - Aesthetic Objective / Operational Guideline NR - Not reportable under applicable Provincial drinking water regulations as per client.

Jeana Eduar

Deanna Edwards, B.Sc, C.Chem **Project Specialist** Environmental Services, Analytical

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Appendix F Water Balance Calculations

Appendix F.1

Water Budget (Thornthwaite Method 1948) - Average Values*

Owen Soun	d MOE (1981 -	2010)	Elevation:	178.9 masl	Distance Away:	8.6 km south		
Month	Mean Temperature	Heat Index	Potential ET	Daylight Correction	Adjusted ET	Total Precipitation	Surplus	Deficit
	(°C)		(mm)	Factor	(mm)	(mm)	(mm)	(mm)
January	-5.4	0	0	0.82	0	128.8	128.80	
February	-4.8	0	0	0.82	0	86.3	86.30	
March	-1	0	0	1.03	0	77.8	77.80	
April	5.8	1.25	26.53	1.12	29.71	71	41.29	
May	11.5	3.53	55.09	1.27	69.96	84	14.04	
June	16.6	6.15	81.51	1.28	104.34	73.5	0.00	30.84
July	20.1	8.22	99.98	1.3	129.98	70.4	0.00	59.58
August	19.6	7.91	97.33	1.2	116.79	78.7	0.00	38.09
September	15.8	5.71	77.33	1.04	80.42	106.1	25.68	
October	9.6	2.68	45.43	0.95	43.16	98	54.84	
November	3.8	0.66	16.89	0.81	13.68	110	96.32	
December	-1.8	0	0	0.78	0	129.9	129.90	
TOTAL	7.5	36.1	500.1		588.0	1114.5	655.0	128.5
			т	OTAL WATE	R SURPLUS:	526.5	mm	

Owen Sound MOE (1981 - 2010) Elevation: 178.9 masl Distance Away: 8.6 km south

Notes:

*Average values of precipitation were used. Average values of temperature were also used.

Appendix F.2 Water Budget Pre-Development

Catchment Designation		SITE		
-	Mixed Grass	Wooded	House	
	Area	Area	Rooftop	Total
Area (m²)	112370	70000	200	182570
Pervious Area (m ²)	112370	70000	0	182370
Impervious Area (m ²)	0	0	200	200
	ON FACTORS	Ŭ	200	200
Topography Infiltration Factor	0.15	0.15	0.15	
Soil Infiltration Factor	0.1	0.1	0.1	
Land Cover Infiltration Factor	0.1	0.2	0.1	
MOE Infiltration Factor	0.35	0.45	0.35	
Actual Infiltration Factor	0.2	0.25	0	
Runoff Coefficient	0.8	0.75	1	
Runoff from Impervious Surfaces*	0	0	0.8	
· · · · · · · · · · · · · · · · · · ·	R UNIT AREA)			
Precipitation (mm/yr)	1115	1115	1115	1115
Run On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	1115	1115	1115	1115
	ER UNIT AREA)		1	
Precipitation Surplus (mm/yr)	526	526	892	527
Net Surplus (mm/yr)	526	526	892	527
Evaportranspiration (mm/yr)	588	588	223	588
Infiltration (mm/yr)	105 0	132 0	0	115 0
Rooftop Infiltration (mm/yr) Total Infiltration (mm/yr)	105	132	0	115
Runoff Pervious Areas	421	395	892	412
Runoff Impervious Areas	0	0	0	0
Total Runoff (mm/yr)	421	395	892	412
Total Outputs (mm/yr)	1115	1115	1115	1115
Difference (Inputs - Outputs)	0	0	0	0
	VOLUMES)		1	
Precipitation (m ³ /yr)	125236	78015	223	203474
Run On (m ³ /yr)	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0
Total Inputs (m ³ /yr)	-	-	-	-
	125236 (VOLUMES)	78015	223	203474
Precipitation Surplus (m ³ /yr)	Ì	20052	470	00100
Net Surplus (m ³ /yr)	59158	36852	178	96189
	59158	36852	178	96189
Evaportranspiration (m ³ /yr)	66078	41163	45	107285
Infiltration (m ³ /yr)	11832	9213	0	21045
Rooftop Infiltration (m ³ /yr)	0	0	0	0
Total Infiltration (m ³ /yr)	11832	9213	0	21045
Runoff Pervious Areas (m ³ /yr)	47327	27639	178	75144
Runoff Impervious Areas (m ³ /yr)	0	0	0	0
Total Runoff (m ³ /yr)	47327	27639	178	75144
Total Outputs (m³/yr)	125236	78015	223	203474
Difference (Inputs - Outputs)	0	0	0	0

Appendix F.3 Water Budget Post-Development - No Mitigation Strategies

Buildings Storm Landscaping Trees, Grass Parking, Access Total Area (m ²) 47195 7125 110123 18127 71251 Pervious Area (m ²) 0 0 110123 0 110123 Impervious Area (m ²) 47195 7125 0 18127 72447 Topography Infiltration Factor 0 0 0.15 0 Sol Infiltration Factor 0 0 0.15 0 MOE Infiltration Factor 0 0 0.4 0 Runoff Coefficient 1 1 0.8 1 Runoff Coefficient form Impervious Surfaces* 0.8 0.8 0 0 0 Runoff Coefficient form Impervious Surfaces* 0.8 0.8 0	Catchment Designation			SITE		
Prod Trees, Grass Parking, Access Total Area (m ²) 47195 7125 110123 18127 182570 Pervious Area (m ²) 0 0 100123 0 110123 Impervious Area (m ²) 47195 7125 0 18127 72447 Topography Infiltration Factor 0 0 0.15 0 1 0 Soll Infiltration Factor 0 0 0.15 0	-	Buildings	Storm	Landscaping	Asphalt	
Area (m ²) 47195 7125 110123 18127 182570 Pervious Area (m ²) 0 0 0 110123 0 110123 Impervious Area (m ²) 47195 7125 0 18127 72447 Impervious Area (m ²) 0 0 0.15 0 18127 72447 Topography Infiltration Factor 0 0 0.15 0		J				Total
Pervious Area (m ²) 0 0 110123 0 110123 Impervious Area (m ²) 47195 7125 0 18127 72447 Topography Infiltration Factor 0 0 0.15 0 72447 Soli Infiltration Factor 0 0 0.15 0 0 Land Cover Infiltration Factor 0 0 0.4 0 0 Runoff Coefficient 1 1 0.8 0 0.8 0 Runoff Coefficient (mm/yr) 1115	Area (m ²)	47195	7125			
Impervious Area (m ²) 47195 7125 0 18127 72447 Topography Infiltration Factor 0 0 0.15 0 0 Soil Infiltration Factor 0 0 0.15 0 0 Soil Infiltration Factor 0 0 0.15 0 0 MOE Infiltration Factor 0 0 0.44 0 0 Runoff Coefficient 1 1 0.8 1 0 Runoff Coefficient 1 1 0.8 1 0 Precipitation (mm/yr) 1115 1115 1115 1115 1115 Precipitation (mm/yr) 0 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 0 Precipitation Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 0 0	-	0	0	110123	0	
INFILTRATION FACTORS Topography Infiltration Factor 0 0 0.15 0 Land Cover Infiltration Factor 0 0 0.1 0 MOE Infiltration Factor 0 0 0.4 0 Actual Infiltration Factor 0 0 0.4 0 Runoff Coefficient 1 1 0.8 1 Runoff Trom Impervious Surfaces* 0.8 0.8 0 0 Runoff Trom Impervious Surfaces* 0.8 0.8 0 0 Precipitation (mm/yr) 11115 11115 11115 11115 Run On (mm/yr) 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 Total Inputs (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 223 223 588 223 443 Total Infiltration (mm/yr) 0 0 105 64 Runoff Pervious Areas 92			-		18127	
Soil Infiltration Factor 0 0.15 0 Land Cover Infiltration Factor 0 0 0.15 0 MOE Infiltration Factor 0 0 0.4 0 Runoff Coefficient 1 1 0.8 1 Runoff Coefficient 1 1 0.8 1 Precipitation (mm/yr) 1115 1115 1115 1115 Runoff Coefficient 0 0 0 0.8 0 Precipitation (mm/yr) 1115 1115 1115 1115 1115 Run On (mm/yr) 0 0 0 0 0 0 Ottrel inputs (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 0 0 105 0 64 Rooftop Infiltration (mm/yr) 0 0 105 0 64 Runoff Pervious Areas 892 892 <td< td=""><td></td><td></td><td></td><td>-</td><td></td><td></td></td<>				-		
Land Cover Infiltration Factor 0 0 0.15 0 MOE Infiltration Factor 0 0 0.4 0 0 Runoff Coefficient 1 1 0.8 1 0 0.8 0 0.8 0 0.8 0 0.8 0 0.8 0 0.8 0 <t< td=""><td>Topography Infiltration Factor</td><td>0</td><td>0</td><td>0.15</td><td>0</td><td></td></t<>	Topography Infiltration Factor	0	0	0.15	0	
MOE Infiltration Factor 0 0 0.4 0 Actual Infiltration Factor 0 0 0.2 0 Runoff Coefficient 1 1 0.8 1 Runoff Coefficient 1 1 0.8 0 0.8 Precipitation (mm/yr) 1115 1115 1115 1115 1115 Precipitation (mm/yr) 0 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 0 0 0 0 Total Inputs (mm/yr) 892 892 526 892 671 Evaportranspiration (mm/yr) 223 223 588 223 443 Infiltration (mm/yr) 0 0 0 0 0 60 64 Runoff Impervious Areas 0 0 0 0 254 892 354 Total Infiltration (mm/yr) 0 0 0 0 0 0 0 0	Soil Infiltration Factor	0	0	0.1	0	
Actual Infiltration Factor 0 0 0.2 0 Runoff Coefficient 1 1 0.8 1 Runoff from Impervious Surfaces* 0.8 0.8 0 0.8 Precipitation (mm/yr) 1115 1115 1115 1115 Run On (mm/yr) 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 0 Total Inputs (mm/yr) 1115 1115 1115 1115 1115 Precipitation Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 0 0 0 0 0 Not Surplus (mm/yr) 0 0 0 0 0 Total Infiltration (mm/yr) 0 0 0 0 0 Total Infiltration (mm/yr) 0 0 0 0 0 0 <t< td=""><td>Land Cover Infiltration Factor</td><td>0</td><td>0</td><td>0.15</td><td>0</td><td></td></t<>	Land Cover Infiltration Factor	0	0	0.15	0	
Runoff Coefficient 1 1 0.8 0 0.8 Runoff from Impervious Surfaces* 0.8 0.8 0 0.8 Precipitation (mm/yr) 1115 1115 1115 1115 Run On (mm/yr) 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 0 Total Inputs (mm/yr) 1115 1115 1115 1115 1115 1115 Precipitation Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 0 0 105 64 800 64 Rooftop Infitration (mm/yr) 0 0 0 0 64 802 832 354 Total Infitration (mm/yr) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MOE Infiltration Factor	0	0	0.4	0	
Runoff from Impervious Surfaces* 0.8 0.8 0.8 0.8 0.8 INPUTS (PER UNIT AREA) Precipitation (mm/yr) 11115 11115 11115 11115 11115 Run On (mm/yr) 0 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 0 Total Inputs (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Evaportranspiration (mm/yr) 0 0 0 0 0 Net Surplus (mm/yr) 0 0 0 0 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 0 0 Runoff Impervious Areas 892 892 0 892 354 Total Runoff (mm/yr) 892 892 0 0 0 0 Difference (Inputs - Outputs) 0 0 0	Actual Infiltration Factor	0	0	0.2	0	
INPUTS (PER UNIT AREA) Precipitation (mm/yr) 1115 1115 1115 1115 Run On (mm/yr) 0 0 0 0 0 Other Inputs (mm/yr) 0 0 0 0 0 0 Total Inputs (mm/yr) 1115 1115 1115 1115 1115 Precipitation Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 0 0 0 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 0 Total Infiltration (mm/yr) 0 0 0 0 0 0 Total Infiltration (mm/yr) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <td></td> <td>1</td> <td>1</td> <td>0.8</td> <td>1</td> <td></td>		1	1	0.8	1	
Precipitation (mm/yr) 1115 111	Runoff from Impervious Surfaces*	0.8		-		
Run On (mm/yr) 0				PUTS (PER UN	IIT AREA)	
Other Inputs (mm/yr) 0 0 0 0 0 0 0 Total Inputs (mm/yr) 1115 1115 1115 1115 1115 1115 Precipitation Surplus (mm/yr) 892 892 526 892 671 Evapotranspiration (mm/yr) 223 223 588 223 443 Infiltration (mm/yr) 0 0 105 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 0 64 Runoff Pervious Areas 0 0 105 0 64 Runoff Impervious Areas 0 0 105 0 64 Runoff Impervious Areas 0 0 115 1115 1115 1115 Stat Runoff (mm/yr) 892 892 0 892 354 Total Runoff (mm/yr) 1115 1115 1115 1115 1115 Difference (Inputs (mm/yr) 1115 1115 1115 1115 1115		-				1115
Total Inputs (mm/yr) 1115 0				÷	-	-
OUTPUTS (PER UNIT AREA) Precipitation Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Lexportranspiration (mm/yr) 223 223 588 223 443 Infiltration (mm/yr) 0 0 105 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 0 64 Runoff Impervious Areas 0 0 421 0 254 Runoff Impervious Areas 892 892 0 892 354 Total Numus (mm/yr) 1115 1115 1115 1115 1115 Difference (Inputs - Outputs) 0 0 0 0 0 Vericipitation (m ³ /yr) 52599 7941 122732 20203 203474 Run On (m ³ /yr) 0 0 0 0 0 0 0 Outputs (m ³ /yr) 52599 7941 122732 20203		÷		-	-	÷
Precipitation Surplus (mm/yr) 892 892 526 892 671 Net Surplus (mm/yr) 892 892 526 892 671 Evaportranspiration (mm/yr) 223 223 588 223 443 Infiltration (mm/yr) 0 0 105 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 0 64 Runoff Impervious Areas 0 0 0 0 64 0 254 Runoff Impervious Areas 892 892 0 892 354 Total Runoff (mm/yr) 892 892 421 892 608 Total Outputs (mm/yr) 1115 1115 1115 1115 Difference (Inputs - Outputs) 0 0 0 0 0 Precipitation (m ³ /yr) 52599 7941 122732 20203 203474 Run On (m ³ /yr) 0 0 0 0 0 0 0	Total Inputs (mm/yr)	1115				1115
Net Surplus (mm/yr) 892 892 526 892 671 Evaportranspiration (mm/yr) 223 223 588 223 443 Infiltration (mm/yr) 0 0 105 0 64 Rooftop Infiltration (mm/yr) 0 0 0 0 0 0 Total Infiltration (mm/yr) 0 0 0 421 0 254 Runoff Impervious Areas 892 892 0 892 354 Total Runoff (mm/yr) 892 892 421 892 608 Total Runoff (mm/yr) 892 892 421 892 608 Total Runoff (mm/yr) 1115 1115 1115 1115 1115 Difference (Inputs - Outputs) 0 0 0 0 0 0 Precipitation (m ³ /yr) 52599 7941 122732 20203 203474 Run On (m ³ /yr) 0 0 0 0 0 0 0				TPUTS (PER U	NIT AREA)	
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Infiltration (mm/yr) 0 0 105 0 64 Rooftop Infiltration (mm/yr) 0 <						
Rooftop Infiltration (mm/yr) 0						
Total Infiltration (mm/yr)00105064Runoff Pervious Areas004210254Runoff Impervious Areas8928920892354Total Runoff (mm/yr)892892421892608Total Outputs (mm/yr)11151115111511151115Difference (Inputs - Outputs)00000INPUTS (VOLUMES)Precipitation (m³/yr)52599794112273220203203474Run On (m³/yr)000000Ottel Inputs (m³/yr)000000Total Inputs (m³/yr)52599794112273220203203474Precipitation Surplus (m³/yr)52599794112273220203203474OUTPUTS (VOLUMES)Precipitation Surplus (m³/yr)4207963535797516162122569Net Surplus (m³/yr)4207963535797516162122569Evaportranspiration (m³/yr)0011595011595Infiltration (m³/yr)000000Total Infiltration (m³/yr)0011595011595Runoff Pervious Areas (m³/yr)0011595011595Runoff Pervious Areas (m³/yr)0046380046380Runoff Pervious Areas (m³/yr)420796353016162 <td></td> <td>-</td> <td>-</td> <td></td> <td></td> <td>-</td>		-	-			-
Runoff Pervious Areas004210254Runoff Impervious Areas8928920892354Total Runoff (mm/yr)892892421892608Total Outputs (mm/yr)11151115111511151115Difference (Inputs - Outputs)00000INPUTS (VOLUMES)Precipitation (m ³ /yr)52599794112273220203203474Run On (m ³ /yr)000000Other Inputs (m ³ /yr)000000Other Inputs (m ³ /yr)52599794112273220203203474OUTPUTS (VOLUMES)Precipitation Surplus (m ³ /yr)52599794112273220203203474OUTPUTS (VOLUMES)Precipitation Surplus (m ³ /yr)4207963535797516162122569Nation Surplus (m ³ /yr)4207963535797516162122569Evaportranspiration (m ³ /yr)0011595011595Runoff (m ³ /yr)0000000000000Outputs (m ³ /yr)0011595011595Runoff (m ³ /yr)00011595011595Runoff Pervious		-		-	-	-
Runoff Impervious Areas8928920892354Total Runoff (mm/yr)892892421892608Total Outputs (mm/yr)11151115111511151115Difference (Inputs - Outputs)00000INPUTS (VOLUMES)Precipitation (m³/yr)52599794112273220203203474Run On (m³/yr)000000Other Inputs (m³/yr)000000OUTPUTS (VOLUMES)Precipitation Surplus (m³/yr)52599794112273220203203474OUTPUTS (VOLUMES)Precipitation Surplus (m³/yr)4207963535797516162122569Net Surplus (m³/yr)4207963535797516162122569Evaportranspiration (m³/yr)10520158864757404180905Infiltration (m³/yr)000000Total Infiltration (m³/yr)0011595011595Runoff Pervious Areas (m³/yr)00046380046380Runoff (m³/yr)42079635301616264594Total Runoff (m³/yr)420796353016162110974Total Outputs (m³/yr)4207963534638016162110974		-				
Total Runoff (mm/yr) 892 892 421 892 608 Total Outputs (mm/yr) 1115 1155 1033 103474		-	-		-	
Total Outputs (mm/yr) 1115				-		
Difference (Inputs - Outputs) 0						
INPUTS (VOLUMES) Precipitation (m³/yr) 52599 7941 122732 20203 203474 Run On (m³/yr) 0 0 0 0 0 0 0 0 Other Inputs (m³/yr) 0 0 0 0 0 0 0 0 0 Total Inputs (m³/yr) 52599 7941 122732 20203 203474 OUTPUTS (VOLUMES) Precipitation Surplus (m³/yr) 42079 6353 57975 16162 122569 Net Surplus (m³/yr) 42079 6353 57975 16162 122569 Evaportranspiration (m³/yr) 10520 1588 64757 4041 80905 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 Runoff Pervious Areas (m³/yr) 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 0	Difference (Incute Outpute)	-				
Precipitation (m³/yr) 52599 7941 122732 20203 203474 Run On (m³/yr) 0	Dillerence (inputs - Outputs)	0	0	-	-	0
Run On (m³/yr) 0		50500	70.44		· · · ·	000474
Other Inputs (m³/yr) 0 112575 16162 122569 122569 122569 122569 122569 16162 122569 122569 16162 122569 122569 1588 64757 4041 80905 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0						
Total Inputs (m³/yr) 52599 7941 122732 20203 203474 OUTPUTS (VoLUMES) Precipitation Surplus (m³/yr) 42079 6353 57975 16162 122569 Net Surplus (m³/yr) 42079 6353 57975 16162 122569 Evaportranspiration (m³/yr) 42079 6353 57975 16162 122569 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 Total Infiltration (m³/yr) 0 0 0 11595 0 11595 Runoff Pervious Areas (m³/yr) 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 0 16162 110974 Total Runoff (m³/yr) 42079 6353 0 16162 110974 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>						
OUTPUTS (VOLUMES) Precipitation Surplus (m³/yr) 42079 6353 57975 16162 122569 Net Surplus (m³/yr) 42079 6353 57975 16162 122569 Evaportranspiration (m³/yr) 10520 1588 64757 4041 80905 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 Total Infiltration (m³/yr) 0 0 42079 6353 0 11595 Runoff Pervious Areas (m³/yr) 0 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 46380 16162 110974 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 7941 122732 20203 203474		0	0	0	0	0
Precipitation Surplus (m³/yr) 42079 6353 57975 16162 122569 Net Surplus (m³/yr) 42079 6353 57975 16162 122569 Evaportranspiration (m³/yr) 10520 1588 64757 4041 80905 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 Total Infiltration (m³/yr) 0 0 42079 6353 0 11595 Runoff Pervious Areas (m³/yr) 0 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 46380 16162 110974 Total Runoff (m³/yr) 42079 6353 20203 203474	Total Inputs (m³/yr)	52599				203474
Net Surplus (m³/yr) 42079 6353 57975 16162 122569 Evaportranspiration (m³/yr) 10520 1588 64757 4041 80905 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 0 Total Infiltration (m³/yr) 0 0 0 11595 0 11595 Runoff Pervious Areas (m³/yr) 0 0 42079 6353 0 16162 64594 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Qutputs (m³/yr) 52599 7941 122732 20203 203474				OUTPUTS (VO	LUMES)	
Net Surplus (m³/yr) 42079 6353 57975 16162 122569 Evaportranspiration (m³/yr) 10520 1588 64757 4041 80905 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 0 Total Infiltration (m³/yr) 0 0 0 11595 0 11595 Runoff Pervious Areas (m³/yr) 0 0 42079 6353 0 16162 64594 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Qutputs (m³/yr) 52599 7941 122732 20203 203474	Precipitation Surplus (m ³ /yr)	42079	6353	57975	16162	122569
Evaportranspiration (m³/yr) 10520 1588 64757 4041 80905 Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 0 0 0 0 0 Total Infiltration (m³/yr) 0 0 0 11595 0 11595 Runoff Pervious Areas (m³/yr) 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 0 16162 64594 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 7941 122732 20203 203474						
Infiltration (m³/yr) 0 0 11595 0 11595 Rooftop Infiltration (m³/yr) 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 14595 0 14595 0 46380 0 46380 0 46380 0 46380 64594 10974			1588		4041	
Rooftop Infiltration (m³/yr) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11595 0 11595 0 11595 0 11595 0 11595 0 11595 0 14080 0 46380 0 46380 0 46380 0 46380 0 46380 0 16162 64594 0 16162 10974 <th1< td=""><td></td><td>0</td><td>0</td><td>11595</td><td>0</td><td>11595</td></th1<>		0	0	11595	0	11595
Total Infiltration (m³/yr) 0 0 11595 0 11595 Runoff Pervious Areas (m³/yr) 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 0 16162 64594 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 7941 122732 20203 203474						
Runoff Pervious Areas (m³/yr) 0 0 46380 0 46380 Runoff Impervious Areas (m³/yr) 42079 6353 0 16162 64594 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 7941 122732 20203 203474						
Runoff Impervious Areas (m³/yr) 42079 6353 0 16162 64594 Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 7941 122732 20203 203474						
Total Runoff (m³/yr) 42079 6353 46380 16162 110974 Total Outputs (m³/yr) 52599 7941 122732 20203 203474						
Total Outputs (m ³ /yr) 52599 7941 122732 20203 203474						
Difference (Inputs - Outputs) 0 0 0 0 0 0	Difference (Inputs - Outputs)	0				0

Appendix F.4 Water Budget Post-Development - With Mitigation Strategies

Catchment Designation			SITE		
	Buildings	Storm	Landscaping	Asphalt	
	-	Pond	Trees, Grass	Parking, Access	Total
Area (m ²)	47195	7125	110123	18127	182570
Pervious Area (m ²)	0	0	110123	0	110123
Impervious Area (m ²)	47195	7125	0	18127	72447
	17100		FILTRATION F		72111
Topography Infiltration Factor	0	0	0.15	0	
Soil Infiltration Factor	0	0	0.1	0	
Land Cover Infiltration Factor	0	0	0.15	0	
MOE Infiltration Factor	0	0	0.4	0	
Actual Infiltration Factor	0	0	0.2	0	
Runoff Coefficient	1	1	0.8	1	
Runoff from Impervious Surfaces*	0.8	0.8	0	0.8	
		IN	PUTS (PER UN	IIT AREA)	
Precipitation (mm/yr)	1115	1115	1115	1115	1115
Run On (mm/yr)	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0
Total Inputs (mm/yr)	1115	1115	1115	1115	1115
		OU	TPUTS (PER U	NIT AREA)	
Precipitation Surplus (mm/yr)	892	892	526	892	671
Net Surplus (mm/yr)	892	892	526	892	671
Evaportranspiration (mm/yr)	223	223	588	223	443
Infiltration (mm/yr)	0	0	105	0	64
% Rooftop to balance infiltration	22%		-	-	
Rooftop Infiltration (mm/yr)	200	0	0	0	52
Total Infiltration (mm/yr)	200	0	105	0	115
Runoff Pervious Areas	0	0	421	0	254
Runoff Impervious Areas	691 691	892 892	0 421	892 892	302 556
Total Runoff (mm/yr)					
Total Outputs (mm/yr) Difference (Inputs - Outputs)	1115 0	<u>1115</u> 0	1115 0	1115 0	1115 0
Difference (inputs - Outputs)	0	0	INPUTS (VOL	-	0
Dressinitation (m^3/m)	50500	70.44		,	000.474
Precipitation (m ³ /yr)	52599	7941	122732	20203	203474
Run On (m^3/yr)	0	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0	0
Total Inputs (m³/yr)	52599	7941	122732	20203	203474
			OUTPUTS (VO	LUMES)	
Precipitation Surplus (m ³ /yr)	42079	6353	57975	16162	122569
Net Surplus (m³/yr)	42079	6353	57975	16162	122569
Evaportranspiration (m ³ /yr)	10520	1588	64757	4041	80905
Infiltration (m ³ /yr)	0	0	11595	0	11595
Rooftop Infiltration (m ³ /yr)	9450	0	0	0	9450
Total Infiltration (m ³ /yr)	9450	0	11595	0	21045
Runoff Pervious Areas (m ³ /yr)					
	0	0	46380	0	46380
Runoff Impervious Areas (m ³ /yr)	32629	6353	0	16162	55144
Total Runoff (m ³ /yr)	32629	6353	46380	16162	101524
Total Outputs (m³/yr)	52599	7941	122732	20203	203474
Difference (Inputs - Outputs)	0	0	0	0	0

Appendix F.5 Water Budget Summary

			SITE		
PARAMETER	Pre-Development	Post-Development No Mitigation	Difference Pre- vs. Post-	Post-Development Mitigation	Difference Pre- vs. Post-
		INPUTS (VOLUMES)			
Precipitation (m ³ /yr)	203474	203474	0%	203474	0%
Run On (m³/yr)	0	0	0%	0	0%
Other Inputs (m ³ /yr)	0	0	0%	0	0%
Total Inputs (m³/yr)	203474	203474	0%	203474	0%
		OUTPUTS (VOLUMES	3)		
Precipitation Surplus (m ³ /yr)	96189	122569	27%	122569	27%
Net Surplus (m ³ /yr)	96189	122569	27%	122569	27%
Evapotranspiration (m ³ /yr)	107285	80905	-25%	80905	-25%
Infiltration (m ³ /yr)	21045	11595	-45%	11595	-45%
Rooftop Infiltration (m ³ /yr)	0	0	0%	9450	
Total Infiltration (m ³ /yr)	21045	11595	-45%	21045	0%
Runoff Pervious Areas (m ³ /yr)	75144	46380	-38%	46380	-38%
Runoff Impervious Areas (m ³ /yr)	0	64594	-	55144	-
Total Runoff (m ³ /yr)	75144	110974	48%	101524	35%
Total Outputs (m ³ /yr)	203474	203474	0%	203474	0%

Appendix G Nitrate Impact Assessment Calculations

APPENDIX G.1: Contaminant Attenuation Considerations

MASS	BALANCE	EQUATION

$Q_T C_T = Q_e$	$C_e + Q_i C_i + Q_b C_b$	Data to be Input	
		Lots =	33 lots
$C_T = (Q_e C_e)$	$_{\rm s}$ + $\rm Q_i C_i$ + $\rm Q_b C_b)/\rm Q_T$	Average flow =	1000 L/day
		Site area =	18.26 ha
<u>SEWAGE</u>	EFFLUENT (Q _e C _e)		
Q _e =	Lots * Average Flow		
Q _e =	33000 L/lot/day		

- $C_e =$ Concentration of effluent
- $C_e = 40 \text{ mg/L}$

 $Q_eC_e = 1320000 \text{ mg/Lot/day}$

INFILTRATION (Q_iC_i)

- Q_i = Infiltration volume
- C_i = Concentration of infiltration
- C_i = 0 mg/L

Therefore, $Q_iC_i = 0$ and drops from mass balance equation.

BACKGROUND GROUND WATER (Q_bC_b)

C_b = Concentration of aquifer

 $C_b = 0.026 \text{ mg/L}$ From dug well on site

Note: The volume of insitu groundwater will ultimately be replaced by the infiltrating precipitation and therefore is not included in the mass balance equation (MOEE Hydrogeological Technical Info Requirements, page 5-6).

Therefore, $Q_bC_b = 0$ and drops from mass balance equation.

Therefore, $C_T = (Q_e C_e)/Q_T$ Where $Q_T = Q_e + Q_i$

Q _e =	33000 L/lot/day	
Q _i =	115 mm/year	(Infiltration rate based upon soil type observed at 8 test pits)
Q _i =	57531.51 L/day	
Q _T =	90531.51 L/day	
C -	14.58 mg/l (NO	-N) for 33 lots

$C_T =$	14.58 mg/L (NO_3 -N)	101 33 1015	
Therefore	, 33 lots can be developed based	upon the nitrate impact assessme	ent.

APPENDIX G.2: Contaminant Attenuation Considerations

MASS	BALANCE	EQUATION

$Q_T C_T = Q$	$V_e C_e + Q_i C_i + Q_b C_b$	Data to be Input	
		Lots =	33 lots
$C_T = (Q_e C_e)$	$C_e + Q_i C_i + Q_b C_b) / Q_T$	Average flow =	1000 L/day
		Site area =	18.26 ha
<u>SEWAG</u>	<u>E EFFLUENT (Q_eC_e)</u>		
Q _e =	Lots * Average Flow		
Q _e =	33000 L/lot/day		

- C_e = Concentration of effluent
- C_e = 27.4 mg/L

 $Q_eC_e = 904200 \text{ mg/Lot/day}$

INFILTRATION (Q_iC_i)

- Q_i = Infiltration volume
- C_i = Concentration of infiltration
- C_i = 0 mg/L

Therefore, $Q_iC_i = 0$ and drops from mass balance equation.

BACKGROUND GROUND WATER (Q_bC_b)

C_b = Concentration of aquifer

C_b = 0.026 mg/L From dug well on site

Note: The volume of insitu groundwater will ultimately be replaced by the infiltrating precipitation and therefore is not included in the mass balance equation (MOEE Hydrogeological Technical Info Requirements, page 5-6).

Therefore, $Q_bC_b = 0$ and drops from mass balance equation.

Therefore, $C_T = (Q_e C_e)/Q_T$ Where $Q_T = Q_e + Q_i$

Q _e =	33000 L/lot/day	
Q _i =	115 mm/year	(Infiltration rate based upon soil type observed at 8 test pits)
Q _i =	57531.51 L/day	
Q _T =	90531.51 L/day	
С _т =	9.99 mg/L (NO ₃	-N) for 33 lots

Therefore, 33 lots can be developed based upon the nitrate impact assessment and provided that nitrate is reduced using tertiary treatment to: 27.4 mg/L.