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ORO SEVENTH LINE AGGREGATE PITS

HYDROGEOLOGICAL STUDY

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FIGURES

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HYDROGEOLOGICAL STUDY

1. INTRODUCTION

Six existing and proposed sand and aggregate extraction properties are located on the Seventh Line of the Township of Oro, between County Road 11 and Bass Lake Sideroad. The licensed properties include the Township of Oro, Seeley & Arnill Aggregates Ltd., Allan G. Cook Limited, and James Dick Construction Limited. Of these, all but the Township of Oro are seeking extensions to their licences. The proposed extraction properties are owned by Alfa Aggregates Limited and The Sarjeant Co. Ltd. Property areas and locations are listed in Table B-1 and shown on Drawing 1.

The six existing and proposed aggregate extraction properties are located almost entirely within an Aggregate Resource Area of Primary Significance (Figure 1), as designated by the Ministry of Natural Resources (MNR) (OGS, 1984).

This hydrogeological study has been undertaken to assess the impacts of the combined existing and proposed extraction pits on the groundwater system, local surface water flows, and private wells.

Locations of private wells are shown on Drawing 1, and the well records filed with the Ministry of the Environment (MOE) are contained in Appendix A.

This assessment includes a review of the individual site hydrogeological reports and on-site drilling and testing data. Estimates were made of stream flow at the Coldwater River tributaries and Hawkestone Creek on 26 November 1991.

2. PHYSICAL CONDITIONS

2.1 Precipitation and Water Surplus

The aggregate properties are located between the Orillia and Midhurst climate stations. Data recorded at the two Orillia climate stations is sequential and, since these stations are located in close proximity to each other, the data were combined to calculate average water budget values. Normal annual precipitation averaged from records for the two Orillia climate stations is 922 mm, as measured for the periods 1929 through 1961 and 1980 through 1989 (Canadian Climate Centre). At the Midhurst climate station, normal annual precipitation is 901 mm for the period 1953 through 1989 (Canadian Climate Centre). The average annual precipitation from the two locations is 911 mm (Table C-1).

The average annual water surplus calculated for the two Orillia climate stations is reported to be 427 mm, and for the Midhurst climate station it is reported to be 407 mm, for an average of 417 mm. The moisture surplus is the excess water after evaporation needs of the surface have been met and soil storage has been returned to its water-holding capacity. It is a measure of the water available for groundwater recharge and runoff. The water surplus calculations are based on a sandy soil with a water-holding capacity of 100 mm (Canadian Climate Centre). The water surplus is an indication of the maximum infiltration to recharge groundwater where there is no surface runoff.

2.2 Physiography and Drainage

The aggregate properties are located on the hummocky terrain of the Bass Lake Kame Moraine (also known as the Oro Sand Hills), where surface elevations range from 310 m above sea level (masl) at the Township of Oro property, to 378 masl at the Alfa Aggregates Limited property. The moraine, as defined by Chapman and Putnam (1984), extends approximately 25.6 km in a general south-west to north-east direction from

Midhurst to three kilometers north-east of Rugby. It is approximately 6590 m wide in a north-west to south-east direction in the vicinity of the Seventh Line of Oro Township.

The sandy surficial materials allow for a high infiltration rate. There is little evidence of surface runoff on the moraine proper, as determined from visual inspection of the properties, and therefore it appears that almost all of the water surplus infiltrates the sandy surficial deposits. On the flanks of the moraine, surficial material is finer grained, resulting in a decreased rate of infiltration and an increase in runoff.

The headwaters of right-bank tributaries of the Coldwater River are to the north on the flanks of the moraine. The Coldwater River flows northward to discharge to Matchedash Bay, Severn Sound. The Coulson Swamp is located on the north flanks of the moraine at an elevation of approximately 290 masl (Drawing 2). This swamp is at the headwaters of a tributary of the Coldwater River. The Coldwater River basin covers 17,700 Ha at Coldwater, where Stream Gauging Station No. 02ED007 is located.

The mean low flow monitored at Station No. 02ED007 is 1.073 m^3/s for the period 1965 through 1988. The area of the drainage basin above this station is 177 km^2. This low flow provides an indication of base flow to the stream. Estimates of the flow rate at locations closer to the pit properties were made on 26 November 1991. The estimates were made by measuring the cross-sectional area of the stream where it passes through a culvert and the stream velocity at the water surface. The mean stream velocity is equivalent to 90 to 95% of the surface velocity (Butler, 1951). Flow in the Coldwater River tributary, which follows the Seventh Line of Oro Township past Coulson (Drawing 1), was monitored at the culvert under Rowanwood Road. A flow rate of 0.027 m^3/s was estimated (Table B-3). Flow in the east tributary, which follows the Eighth Line of Oro Township, was estimated at the culvert beneath the Eighth Line south of Coulson Swamp. A rate of 0.13 m^3/s was estimated for this location.

To the south, a number of small creeks drain the flanks of the moraine and join the eastward-flowing Hawkestone Creek, which discharges to Lake Simcoe near Hawkestone. The Hawkestone Creek basin is estimated to cover approximately 3960 Ha (Young, 1992). The upstream reaches of the creek are within a wetland area identified as the Hawkestone Swamp, which covers approximately 832 Ha (Young, 1992).

There is no stream gauging station located on Hawkestone Creek. The stream flow beneath the Fifteenth/Sixteenth Sideroad bridge was estimated on 26 November 1991. A flow rate of 0.23 m^3/s was estimated at this location.

2.3 Geology

Ordovician-age limestone of the Bobcaygeon Formation forms a relatively flat-lying bedrock surface in the Township of Oro (OGS, 1984). This surface is at an elevation of approximately 165 to 175 masl, which is at a depth of up to 200 m at the height of the moraine and 50 m at Lake Simcoe (Drawing 3).

The bedrock is overlain by Quaternary deposits. The upper layers of unconsolidated materials are deposits of the Wisconsinan ice sheet(s) (OGS, 1984).

The Ontario Geological Survey (1991) has drilled, cored, and visually logged three boreholes in the Township of Oro: one on the moraine and two to the south (Drawing 3). Another three boreholes were drilled in the Township of Medonte, north of the moraine (one of which is shown on Drawing 3). The logs of boreholes drilled north and south of the moraine indicate thick sequences of diamictic material (unstratified, poorly-sorted, fine- and coarse-grained material), probably till, and also indicate layers of sand. Six sand layers were intersected in wells south of the moraine, shown on Drawing 3. The surficial deposits on the lowlands surrounding the moraine are composed of the Lake

Simcoe till plain, which is described as a gritty clay loam which coarsens towards the north (OGS, 1984).

The moraine was deposited during a halt in the retreat of the glacier margin. The moraine deposits in the vicinity of the pits are described as ice contact stratified drift (OGS, 1984) which are comprised of glacial outwash, possibly from north-western and eastern sources (OGS, 1984). The kame deposits consist of discontinuous layers of sand, gravel, silt and clay, as shown in the logs of borehole OGS90-8, on-site test wells, and private wells shown on Drawing 3. The east-west orientation of the moraine suggests it may not be related to the last glacial advances during the Wisconsinan glaciation period, which is believed to have been from the north-east in the vicinity of the Township of Oro. It may be an interlobate moraine or an overridden deposit of an earlier glacial advance (Chapman and Putnam, 1984). Source material for the moraine is of Precambrian origin, with very little Ordovician material (Chapman and Putnam, 1984).

2.4 Hydrogeology

The aggregate properties are located on the Bass Lake Kame Moraine. The local hydrogeology is illustrated in Sections A-A through D-D. Regional hydrogeology is illustrated in Drawing 3.

Confined aquifers in the lowland areas appear to be relatively continuous, as shown in Drawing 3. They are composed predominantly of sand with lesser amounts of gravel. Where the aquifers have been completely intersected south of the moraine, thicknesses are generally less than 5 m. Thicker sequences of sand are indicated north of the moraine. The limestone bedrock aquifer is at a depth of 50 to 200 m between the Coldwater River and Lake Simcoe. Adequate water supplies are normally obtained from the overburden aquifers, and therefore few wells are drilled to the deep rock aquifer.

The moraine materials were deposited on top of the regional deposits, as discussed in Section 2.3. Moraine deposits are complex and irregular, and therefore distinct hydrogeological units cannot be traced to any extent. The moraine is a complex sequence of sand, gravel, silt and clay. Two aquifers have been intersected in the vicinity of the properties, as illustrated in the sections. An upper aquifer (A1) is at elevations of approximately 310 to 330 masl, and another aquifer (A2) is at the base of the moraine at elevations mainly below 280 masl. Other aquifers intersected in some locations appear to be more localized.

Upper aquifer A1, intersected in the central moraine area, is under water-table conditions within the Allan G. Cook Limited, The Sarjeant Co. Ltd., and James Dick Construction Limited properties. It is confined in some locations, as at OW1/91 on the Allan G. Cook Limited property, where there is a sandy silt confining layer above the water table. At some locations, upper aquifer A1 is under artesian conditions, as at Wells 11786 and 19519 (Section B-B). The aquifer is generally composed of sand combined with gravel in some locations. The hydraulic conductivity of the aquifer, estimated from grain-size analyses and single well response testing (discussed in Section 3), is estimated to be 4×10^{-3} to 10^{-2} cm/s. These estimates represent conditions where wells were tested. The hydraulic conductivity may vary from these estimates at other locations. Aquifer characteristics are summarized in Table B-2.

The intersected aquifer thickness varies from 5 to 12 m on the Allan G. Cook Limited, The Sarjeant Co. Ltd., and the James Dick Construction Limited properties. This aquifer thickness and calculated hydraulic conductivity indicate an aquifer transmissivity of 20 to 110 m^2/day. A specific yield or storativity of 0.05 to 0.2 is reasonable for a water-table aquifer. For calculation purposes, a value of 0.1 has been assumed.

Beneath the crest of the moraine, confined aquifer A2 is present at approximately 280 masl. This aquifer is not present at all locations drilled to this depth, indicating that the aquifer is discontinuous. Towards the flanks of the moraine, aquifer A2 appears to be interconnected with aquifer A1, as indicated by the log of Well 18049 (Section B-B). Pumping test data (discussed in Section 3) indicate a transmissivity of 22 to 92 m^2/day and a storativity of 5.6 x 10^{-5} for this aquifer at The Sarjeant Co. Ltd. property, and a transmissivity of 500 m^2/day at the flanks of the moraine on the Seeley & Arnill Aggregates Ltd. property. Testing at this location indicated leaky confining layer conditions. The aquifer material intersected at the Seeley & Arnill Aggregates Ltd. property is approximately 10.5 m thicker and coarser-grained than that intersected at The Sarjeant Co. Ltd. property, which accounts for the difference in transmissivity values.

2.5 Groundwater Recharge

The moraine is an upland area with a predominantly sandy surface, which provides a portion of the recharge to regional aquifers between the moraine and Lake Simcoe to the south, and Matchedash Bay to the north. Natural recharge on the moraine proper appears to be almost equivalent to the water surplus, because surface runoff is minimal. At the James Dick Construction Limited property, it was noted by Charlesworth & Associates (1991) that during the spring melt, surface runoff was minimal and infiltration was quick. Fine-grained deposits are more evident at the flanks of the moraine, and the headwaters of the Hawkestone Creek and Coldwater River tributaries and associated wetlands indicate groundwater discharge and surface runoff. A significant portion of the water surplus will be surface runoff in these wetland areas.

Natural infiltration rates at the height of the moraine are expected to be up to the average annual water surplus of 417 mm equivalent to an average of 11.4 m^3/day/Ha. On the flanks of the moraine, where surface materials are finer-grained and surface runoff is evident, annual infiltration likely will be less than 200 mm.

2.6 Water Table

The water table beneath the aggregate properties is at a measured geodetic elevation of approximately 315 to 327 masl, which is 25 to 39 m below ground level within the aggregate properties depending mainly on ground elevation. The thickness of the aquifer, where fully intersected, varies from 5 to 12 m.

The water table is highest in the central part of the moraine. This location is the groundwater drainage divide between the Coldwater River and Hawkestone Creek drainage basins. The drainage divide and water table are shown on Drawing 2 by means of equipotential lines or lines of equal water-level elevation. It generally follows the axis of the SW-NE oriented moraine. The groundwater divide and groundwater flow directions are discussed in Section 2.7.

There is a potential for perched water-table conditions in a moraine environment. Observation well DC1 on the James Dick Construction Limited property intersected saturated conditions above a till layer, at a depth of 32 m. This appears to be a perched water-table condition. Perched water was not found at DC5 (north-west of DC1), nor is a confining layer indicated at this depth at Well 8728 (to the south-east). Therefore, this condition does not appear to be extensive.

Reports of a possible spring in Lot 9, Concession 8 (County Forest) indicated a possibility of a perched water table. This possibility was investigated by the drilling of an observation well on the Alfa Aggregates Ltd. property, to a depth below the potential perched water-table condition. No confining layer was intersected, and the observation well remained dry. No spring was located in the county forest during field investigations. Staff of the MNR have reported that this is the location of a cistern and not a dug well, the purpose of which is to store water for fire protection. Therefore, there is no evidence of perched water-table conditions in the vicinity of the County Forest in Lot 9, Concession 8.

2.7 Groundwater Flow

A gravity flow system is evident in the upper aquifers within the Bass Lake Kame Moraine complex. This is illustrated in Drawing 2 by means of equipotential lines, or lines of equal water-level elevation, and groundwater flow lines showing the direction of groundwater flow as inferred from the equipotential lines. The groundwater flow system depicted in Drawing 2 is based on water levels monitored at observation wells constructed within the aggregate properties, and in the records of private wells filed with the MOE (Appendix A). Local flow details will be complex because of the variations in the moraine deposits, as indicated in the sections (Figures 3 through 6).

The flow system, as depicted in Drawing 2, indicates that the groundwater flow divide generally follows the axis of the moraine, and that the moraine is a recharge centre. Groundwater flow north of the drainage divide is northward to the Coldwater River basin, and groundwater flow south of the drainage divide is southward towards the Hawkestone Creek and Lake Simcoe drainage basin. The groundwater drainage divide, which generally follows the summit of the moraine, is between the 320 m equipotential lines. It is a broad area about 300 to 1500 m wide.

The flow system is sustained by recharge from the infiltration of precipitation to the mainly sandy soils and the upper overburden deposits, which are mainly granular. The recharge is estimated to be up to the annual water surplus of 417 mm (Section 2.1). Of this, most of the infiltration will take place in the spring as the winter snow melts and the ground thaws.

Boundaries to the flow system include the termination of the upper aquifer at or near the flanks of the moraine, and the fine-grained deposits which mark the base of the upper aquifer system and retard the vertical seepage of groundwater.

Discharge takes place along the flanks of the moraine, where it sustains the base flow to the tributary streams of the Coldwater River to the north and Hawkestone Creek to the south (Section 2.2).

Vertical hydraulic gradients are downward within the area of the moraine. The differences in groundwater elevation are in the range of 2 to 12 m within the upper aquifer system, and 6 to 37 m between the upper aquifers and the lower aquifers. The equivalent downward hydraulic gradients are in the range of 0.2 to 0.7 m/m. The log of TW8/91, in the southern part of The Sarjeant Co. Ltd. property, indicates a confining layer approximately 20 m thick which is composed of clay and sandy clay and which probably has a vertical hydraulic conductivity of 10^{-7} cm/s or less. A hydraulic conductivity of 10^{-7} cm/s or less, together with a vertical hydraulic gradient of 0.4 m/m, indicates a potential seepage of recharge to the lower aquifers of up to 0.3 m^3/day/Ha. This is about 2% of the estimated recharge to the upper aquifer system and indicates that, where the confining layer has a hydraulic conductivity of 10^{-7} cm/s or less, most of the flow in the upper aquifer system discharges to the surface along the flanks of the moraine.

Groundwater flow in the lower aquifer system is similar to that in the upper aquifers. This flow is sustained by seepage from the upper aquifers through the intervening confining layers. The amount of this recharge probably varies from place to place and will depend on the vertical hydraulic conductivity of the confining layer(s).

2.8 Local Wells

There are 34 house wells located on or between the Sixth, Seventh and Eighth Lines, between County Road 11 and Bass Lake Sideroad. Wells 3268 and 3302 could not be located in the field. It is possible that they have been abandoned or that the locations given in the records are incorrect.

Locations of local private wells are shown on Drawing 1. The wells have been located from records filed with the MOE and field verification of all wells within 500 m of the aggregate properties. All local wells are constructed in the overburden aquifers.

Private wells in the area have been drilled to a depth of between 11 and 121 m. Recorded yields are in the range of 20 to 136 L/~~s~~ min (4 to 30 IGM).

All well records indicate fresh water.

Many wells constructed in the upper aquifers of the moraine are confined, although interconnection between the upper confined aquifer and the water-table aquifer is evident as indicated on Section B-B. Wells constructed in the lower aquifers and most of the wells located north and south of the moraine are constructed in confined aquifers.

3. SITE SPECIFIC HYDROGEOLOGICAL ASSESSMENTS

Individual site specific hydrogeological assessments have been undertaken for the five privately-owned existing and proposed aggregate extraction properties.

Seeley & Arnill Aggregates Ltd., Concession 7, Part East Half Lots 10 and 11.
A hydrogeological assessment of this property was completed by Henderson, Paddon and Associates (1990). The investigation included testing of a water-supply well for a washing operation. Seeley & Arnill Aggregates Ltd. has a Permit to Take Water from two on-site wells at a combined rate of up to 2618 m^3/day (400 IGM). There is no record for one of the wells. The other, 1/89, was constructed in 1989 and is located in the south-east part of the property. It is a 200 mm diameter well constructed in a 15.5 m thick confined sand and gravel aquifer, at a depth of 44 m at this location. The well was tested at 22.7 L/s for 24 hours. Water levels were monitored at the production well, a nearby observation well, an existing on-site well, and the Musicco private dug well. Interference was monitored at the on-site wells and observation well, but not at the Musicco well. The drawdown data indicated leaky aquifer conditions. An average transmissivity of 5.8×10^{-3} m^2/s and a storativity of 4.4×10^{-4} were estimated from the test data (Henderson, Paddon, 1990).

Alfa Aggregates Limited, proposed Roehner pit, Concession 7, Part East Half Lot 9.
A hydrogeological assessment was undertaken by Dixon Hydrogeology Limited (1991). It was based on existing information augmented by the drilling of a borehole, OW1/91, to determine whether a perched water-table aquifer was present on the east side of the property, as suggested by observations made by a local resident. Perched groundwater was not identified at this location and is not indicated in well records of the two house wells located on the property. The locations of the observation well and the two house wells are shown on Drawing 1. One well (13106) is constructed in the lower confined aquifer, and the other well (11628) is constructed in the upper water-table aquifer.

James Dick Construction Limited, Concession 7, West Half Lots 7 and 9, Part Lot 8, and East Half Lot 8.

Assessment of hydrogeological conditions on this property includes existing information augmented by the drilling and construction of five observation wells (Charlesworth & Associates, 1991). Grain-size analyses were conducted on three samples from one of the boreholes. An analysis of the data using the Hazen formula indicates a hydraulic conductivity of 10^{-2} to 10^{-4} cm/s for the sand at this location. A step test was run on the on-site house well (19519) constructed in the upper aquifer to assess its yield capabilities. The data suggested a specific yield of 0.7 L/s/m for this well (Charlesworth & Associates, 1991). Water levels were monitored during the spring, summer and fall of 1991. The monitoring data are contained in Table B-3.

The Sarjeant Co. Ltd., Concession 8, West Half Lot 8.

The site specific hydrogeologic assessment conducted for this property by Dixon Hydrogeology Limited (1992) included the drilling of eight locations to identify a well site for a washing operation. Four of these are test wells, two are observation wells, and two were abandoned. One well was pump tested at 4.5 L/s (60 IGM) for 24 hours. The production well, three on-site observation wells, and private Well 20959 were monitored during the test. A transmissivity value in the range of 22 to 92 m^2/day was calculated for aquifer A2 using the test data. Single well response tests were conducted on two wells constructed in the upper aquifer. The calculated hydraulic conductivity, using the Hvorslev method, is approximately 4×10^{-3} cm/s. Water levels were monitored in the water table and lower confined aquifer (Table B-3).

Allan G. Cook Limited, Concession 8, West Half Lot 7.

A hydrogeologic assessment for this property, conducted by Dixon Hydrogeology Limited (1992), included the drilling and construction of one observation well, OW1/91, to assess conditions for a washing operation well and to identify the water-table elevation. A single well response test was conducted on this well using a PVC rod slug. A hydraulic conductivity of 5×10^{-3} to 7×10^{-3} cm/s was calculated using the Hvorslev method. The water-table aquifer is approximately 5 m thick at this location. The Ontario Geological Survey drilled and logged a borehole (OGS90-8) on this property, the log of which is contained in Section B-B.

4. EXTRACTION AND ASSOCIATED OPERATIONS

4.1 Extraction

Extraction of the aggregate pits will involve the removal of existing vegetation and soil within the pit areas. Sixty-one percent of the existing cover is predominantly deciduous forest and pine plantation, 34% is agricultural pasture and early succession, and 5% is open pits (Young, 1992).

The proposed total extraction area is 320 Ha. Individual licence and extraction areas are given in Table B-1. The proposed licensed annual tonnages and maximum average extraction rates are included in Table B-1. The proposed licensed annual tonnage represents the maximum allowable extraction. The maximum average extraction rate is equivalent to 50% of the licensed rates. It is the maximum expected extraction averaged over the six pits.

Extraction will remain above the water table at all the properties, with the possible exception of the James Dick Construction Limited property. James Dick Construction Limited proposes to investigate the potential for extraction below the water table at a later date. If they do extract below the water table, it will be by dragline operation and there will be no dewatering. Extraction below the water table will require a site plan amendment and review by all appropriate authorities, including the municipality.

The estimated available resource is approximately 145.5 million tonnes. The annual operating period is expected to average 190 days, with some shipping in the winter. The pits are expected to be in operation for 15 to more than 75 years, depending on size and market conditions.

4.2 Crushing Operation

The crushing and sizing of product is a dry process, save and except for dust control by wetting of the product. These operations will have no impact on groundwater or surface water.

4.3 Washing Operation

Five of the six licensed and proposed aggregate operations plan to wash a portion of the aggregate they produce. The operators anticipate washing a maximum of 25% of the aggregate which they extract, with the exception of The Sarjeant Co. Ltd., which proposes to wash 90% of its production. Seeley & Arnill Aggregates Ltd. have two on-site production wells and a Permit to Take Water (PTTW) from the MOE, at rates up to 30.3 L/s (400 IGM). They will not be operating continuously at the permitted rate. The wells will be operated for short periods at rates up to that indicated in the PTTW, as discussed in Section 5.3. A Permit to Take Water will be required by each of the other four operators before they can set up washing operations.

Water requirements for aggregate washing operations vary depending on the type and size of operation. Water requirements consist of the filling of storage tanks or pond(s) at the start of the operating season, and then replenishment of water lost to the recirculation system during the operating season.

At the start of the operating season, the storage tanks or ponds will be filled. Some water stored in pond(s) may remain from the previous season, depending on permeability of the pond liner. This storage replenishment will likely require the greatest pumpage of water. In most cases, the beginning of the operating season will coincide with the spring high water table, which will offset some of the interference from washing operation wells.

Water flows per operator for washing operations is expected to be up to 4000 m^3/day (1200 IGM) operating 12 hours per day, as used at the Seeley & Arnill Aggregates Ltd. operation in the Township of Medonte. Most of the washing operation water will be recirculated. Water lost in the flow system must be replenished. This makeup water is estimated to be 655 m^3/day for the combined operations, assuming makeup water requirements of 131 m^3/day per operation as indicated for the Seeley and Arnill Township of Medonte operation. Some of this lost water will return as seepage to the groundwater system. The only losses to the aquifer system will be water evaporated from pond surfaces and stockpiles, and water retained and exported in the product.

Evaporation from the pond surfaces will exceed replenishment by precipitation during the summer months (June through August). An estimate of the average evaporation from the pond surfaces has been made by subtracting the Potential Evapotranspiration from the precipitation indicated in the water budgets. Actual evaporation is expected to be slightly greater because the Potential Evapotranspiration is calculated for a vegetated surface. The average pond evaporation indicated from the three climate stations is 117 mm, equivalent to 12.8 m^3/day/Ha for the summer months. Evaporation from the stockpiles of washed product will vary depending on how regularly aggregate is added. This evaporation is expected to be minimal. An assumed value of 32 m^3/day for the combined operations has been used based on one hectare of surface area of washed product per operation, with a wet cover for half of the operating period.

The exported water is estimated to be 7 to 10% of the sand by volume (Todd, 1963), or 3 to 5 % by weight assuming a saturated sand density of 2100 kg/m^3. Exported water is calculated in Table C-4. Exported water is expected to be 140 to 234 m^3/day for all five pits operating at their expected average annual extraction rate. This would increase to 280 to 467 m^3/day with all pits at their proposed licensed tonnage.

Water evaporated from wash pond surfaces is estimated to be 64 m^3/day, assuming a one-hectare pond per property. Evaporation from stockpiles is estimated to be 32 m^3/day.

The exported water from the combined operations is estimated to average 234 m^3/day with a maximum of 460 m^3/day (Table C-4). Therefore, the average loss to the aquifer from the washing operations is approximately 330 m^3/day and the maximum loss is approximately 563 m^3/day over the operating period of 190 days.

The capture or recharge area required to sustain the losses to the aquifer complex (equivalent to evaporated and exported water) would be 30 to 49 Ha, which is 9 to 15% of the licensed areas, assuming an infiltration rate equivalent to the natural water surplus of 417 mm/year. Losses do not include water which re-infiltrates and returns to the aquifer system.

The average amount of water which is lost to the system as infiltration from wash ponds and stockpiles is estimated to be 325 m^3/day. This estimate is based on washing operations at Seeley & Arnill Aggregates Ltd. in the Township of Medonte. The water lost to the washing operations by infiltration from the wash ponds and stockpiles will recharge the aquifer and ultimately recirculate to the washing operation.

4.4 Stockpiles

Both washed and unwashed product will be stockpiled. There will be some drainage of water from the washed product which will re-infiltrate and return to the groundwater system. Some of the moisture near the surface of the pile will evaporate, resulting in a loss to the aquifer system. These losses have been discussed in Section 4.3.

4.5 Shipping

Most of the product shipped from the sites will be dry sand and gravel. The washed product shipped from the sites will contain water which adheres to the sand and gravel particles. This exported water is discussed in Section 4.3.

4.6 Dust Suppression

Dust suppression within the existing and proposed pits will be by the application of water or approved chemicals such as calcium chloride. Spraying of water or approved chemicals will occur on unpaved site roads and crushed product. Paving of the entrances to the site will reduce the need for dust suppression.

Application of calcium chloride would result in an increase of calcium and chloride in the underlying groundwater as the chemical is dissolved in infiltration. There is no water quality objective for calcium. Chloride is an aesthetic-related water quality parameter with a maximum desirable concentration of 250 mg/L, as indicated in the Ontario Drinking Water Objectives (ODWO). The MOE Central Region Barrie District office has advised that Policy No. 15-08 (MOE, 1986) would apply to the use of calcium chloride as a dust suppressant, which will limit the amount of calcium chloride or other chemicals used. This is discussed in Section 5.8.

4.7 Fuelling and Equipment Maintenance

The properties which intend to store fuel on-site have included an impermeable based containment area on their respective site plans.

To ensure protection of the groundwater, the operators have prepared a spill contingency plan and will do everything practical to prevent, eliminate, and ameliorate spills which may have an adverse impact on the environment, in accordance with The Environmental Protection Act, Part IX. All waste oil from on-site equipment maintenance will be taken off-site and disposed of in accordance with the applicable regulations.

5. IMPACTS OF OPERATIONS

5.1 Water Budget

Components of a water budget include precipitation, evaporation from soils and transpiration from vegetation (combined as evapotranspiration), surface runoff, and infiltration to recharge groundwater. The runoff and infiltration make up the water surplus.

There will be changes in the water budget as a result of the extraction operations. The changes will be the amount of evapotranspiration and water surplus as the natural vegetation is removed. The water surplus is a combination of the amount of water available for infiltration to recharge groundwater, and for runoff (Section 2.1). The excavations resulting from the extraction of aggregate will intercept all the potential runoff within the area of the excavations, and therefore all of the available water surplus will infiltrate to recharge groundwater. There is very little evidence of significant surface runoff in the upland moraine area, and therefore an increase in the amount of groundwater recharge may not be significant as a result of the containment of all runoff within the excavation.

Various water budget models have been developed to provide water budgets for both regions and localized areas. The Canadian Climate Centre of Environment Canada uses the Thornthwaite model (1944) to provide water budgets based on data from climate stations and adjusted for various soil types. This model is not adjusted for different vegetation covers. A summary of the results of this model for the Orillia and Midhurst climate stations is included in Table C-1.

The Hargreaves model (1956) includes a coefficient for vegetation types. This model was used to provide an indication of the differences between potential evapotranspiration from a forest and from an open pasture. The coefficients used were calculated for a pasture and a deciduous orchard in Davis, California. The data are for the frost-free season only and are contained in Table C-2.

Both the Thornthwaite and Hargreaves models can be solved using climate data collected at most climate stations. Other models, discussed below, require more detailed climate data which is not available for the Midhurst or Orillia stations.

Shiau and Davis (1973) used a modified Penman model (1948) to assess the potential evapotranspiration rate from a deciduous forest in New Brunswick. They compared their results with various models, including the Thornthwaite and Hargreaves models, and found that the modified Penman model agreed closely with the Thornthwaite model, and that the Hargreaves model indicated higher values of potential evapotranspiration.

Various studies have been undertaken to estimate potential evapotranspiration rates from forests and to assess changes to evapotranspiration rates as a result of deforestation. Johnston (1976) compared soil moisture losses over the growing season from a mature Aspen forest, a plot of grasses and annuals, and a bare plot located in Utah. Minimal runoff occurred from the plots, with the exception of the bare plot, where the measured runoff was discounted from precipitation. The study results indicated that the estimated evapotranspiration from the bare plot was approximately 53% of evapotranspiration from the mature Aspen plot, and evapotranspiration from the herbaceous plot was 73% of evapotranspiration from the mature Aspen plot.

Swift *et al* (1975) modelled evapotranspiration and drainage from a mature deciduous forest, a pine plantation, and a clear cut area. The model indicated greater evapotranspiration losses from the pine plantation than the deciduous forest, as a result of a greater rate of evapotranspiration during the winter season. Evapotranspiration losses were indicated to decrease as a result of clear cutting the deciduous forest. The model results agreed closely with measured stream flow changes that were produced by clear cutting hardwood forests and converting to pine plantation.

The climatological data available from the closest climate stations is insufficient to produce a detailed water budget model for the existing vegetation covers and an open pit. The differences in evapotranspiration for the various covers, as indicated in the References and calculated using the Hargreaves equation, have been used as a guide in assessing potential changes to the local water budget as a result of clearing and excavating the pits.

The Hargreaves model indicates that the difference in potential evapotranspiration rates between a deciduous orchard and a pasture averages approximately 208 mm per growing season (Table C-2). The Johnston (1976) study indicated an evapotranspiration reduction of 47% between the mature Aspen and bare soil plots. The Swift *et al* (1975) study noted a predicted and measured increase in stream flow of 36 to 41 cm as a result of clear cutting a mature deciduous forest.

The maximum indicated change in evapotranspiration is an approximate 50% reduction as a result of clear cutting, equivalent to 250 mm (50% of the average evapotranspiration indicated in Table C-1). This value has been used as a maximum expected decrease in evapotranspiration and equivalent increase in water surplus. Although the decrease in evapotranspiration may not be equivalent to this maximum impact, some decrease in evapotranspiration will occur as a result of removal of vegetation. A decrease in evapotranspiration and increase in water surplus of approximately 10% (50 mm/annum) has been assumed as a minimum impact, representing the difference between evapotranspiration from a herbaceous plot and evapotranspiration from a bare plot. An average value of 150 mm has been included in the calculations presented in Table C-3.

The operation of wells to provide water for washing operations will result in a removal of water from the aquifer system. Only the evaporated and exported water will be lost to the local groundwater. These losses will be realized over each operating season and are discussed in Section 4.3.

If aggregate is extracted below the water table as ultimately proposed by James Dick Construction Limited, a pond will form within the excavated area, the level of which will represent the water table. A localized change in the water budget will result. The change will be an increase in evaporation to the potential evaporation rate, which will be greater than in the naturally-vegetated areas and the pit areas which are above the water table.

The net impacts on the local water budget are summarized in Table C-3. The average net increase in groundwater recharge is expected to be 572 m^3/day resulting from the combined properties.

Changes to the local water budget will be progressive as extraction of the pits begins and washing operations start. Additional infiltration or groundwater recharge, resulting from clearing and pit excavation, will increase as the size of the pits increases, until rehabilitation begins and the vegetation cover thickens. Water removal resulting from washing operations will remain steady throughout the life of the pits, assuming steady market conditions.

After pit operations are complete, the recharge gains will be limited to capture of all surplus water to infiltrate within the extraction areas. Evapotranspiration will return to pre-extraction rates, assuming the properties are rehabilitated approximately to their existing vegetated conditions; however, evaporation from ponds created by extraction below the water table will continue. Water losses resulting from washing operations will cease.

5.2 Water Tables

The removal of vegetation and soil and the excavation of pits will result in an increase in groundwater recharge, as discussed in Section 5.1. This increased recharge will be partly offset by water losses resulting from washing operations, and therefore the average net impact on the local water budget is expected to be 572 m^3/day.

An increase in the amount of groundwater recharge is expected to result in a mounding of the water table beneath the excavations and, to a lesser extent, in the surrounding areas. The mounding will apply to the main water table, as described in Section 2.6 and as illustrated in Drawing 2, and to local perched water tables if and where they exist (Section 2.6).

Mounding of a perched water table would occur until the excavation extends to depths below the perched water table and the underlying confining layer was removed. The perched water table in the area of the excavation would be removed, and drainage of at least part of the perched water table in adjacent areas would occur.

Perched water was intersected at DC1 on the James Dick Construction Limited property, as discussed in Section 2.6. There are no known wells constructed in this aquifer, and this perched water table is at too great a depth to influence local vegetation; therefore, a loss of part or all of this perched condition is not expected to have a detrimental impact on water supplies or the natural environment.

The potential mounding of the main water table has been assessed based on the anticipated increase in groundwater recharge (Section 5.1) and a range of transmissivity and storativity values representing the upper aquifer (Section 2.4).

The extent and degree of water table mounding has been assessed using the Theis and Darcy formulae. The Darcy formula is based on equilibrium conditions and indicates a potential mounding of up to 0.7 m beneath the pits (Table C-6), decreasing away from the pits to an extent of 7 to 30 m, assuming an average recharge increase. Theis calculations are based on non-equilibrium conditions, and therefore a period of one year has been assumed to represent equilibrium conditions. The equations are included in Table C-5.

Theis calculation results agree with the Darcy results. The low transmissivity values indicated to represent the aquifer (Section 2.4) will limit the extent of mounding away from the excavations. After rehabilitation, the increased recharge will be reduced as evapotranspiration returns to natural levels, and therefore mounding will also decrease.

James Dick Construction Limited proposes to investigate the potential for extraction below the water table. Aggregate extraction below the water table will result in a small lowering of the water table as water replaces the extracted volume of aggregate. As extraction proceeds and the size of the pond increases, the effect on water levels will decrease. Pond level declines are expected to be minimal, and therefore water-table lowering in the surrounding area is expected to be negligible.

5.3 Water Supply Wells

Wells which are operated to provide water for washing operations will cause a decline in the water table or potentiometric surface as the wells are operated. The water levels will recover when the wells are not operating. The water level declines will be greatest at the wells, and will decline with increased distance from the wells.

Most of the time, the wells would be operated for short intervals to provide makeup water to replace the water not recirculated within the system. Makeup water replaces water which has evaporated, been exported with the product, and re-infiltrated the ground surface. Actual water losses to the area will be as evaporation from the wash ponds and stockpiles, and as water retained in the product. Makeup water requirements, including re-infiltrating water, are estimated to be 655 m^3/day for the combined operations. The indicated losses are equivalent to average daily flows of 7.6 L/s (100 IGM). In practice, the wells would be operated for only short periods, depending on their equipped yields. With efficient washing operations designed to conserve water, the amount of water which would re-infiltrate the ground would be minimized. The average cumulative water loss is approximately 37% of the average cumulative recharge increase resulting from vegetation clearing and pit excavations.

The most prolonged well operations will be in the spring or at the beginning of the operating season, when water is pumped into storage for the washing operations.

Assuming water for each washing operation is stored in a one-hectare, 0.2 m deep pond, the following time periods would be required to fill the storage at each operation at the start of the operating season:

Storage ($2000\ m^3$)				
Pumping Rate (L/s) (IGM)	3.7 50	7.6 100	15.2 200	30.3 400
Time (days)	6	3	1.5	0.8

Seeley & Arnill Aggregates Ltd. have an on-site washing operation. Water use has been limited to less than 50,000 L/day due to limited production, but greater water use is anticipated by the operator when the permanent washing operation is set up. Seeley & Arnill Aggregates Ltd. anticipate water use to be similar to an operating pit they own in the Township of Medonte. This operation includes 227 m^3 of storage in holding tanks, approximately 1575 m^3 of storage in a wash pond, and some additional storage in a sludge pond, for a total of approximately 2000 m^3. The recirculated flow is approximately 91 L/s (1200 IGM). Estimated makeup water requirements for this operation are 131 m^3/day (20 IGM) during the summer months.

The extent of interference resulting from pumping washing operation wells has been estimated using the Theis equation. Aquifer transmissivity and storativity values indicated from pump test data for the Seeley & Arnill Aggregates Ltd. and The Sarjeant Co. Ltd. properties have been used for these calculations, which are contained in Table C-7. The low transmissivity values indicated from testing on The Sarjeant Co. Ltd. property will limit the extent of interference away from the wells. Water level drawdowns in the vicinity of extractions will be partially offset by water table mounding beneath the pits.

Interference in the range of 0.3 to 1.0 m is indicated at a distance of one kilometer from the well, for the pumpage to refill storage at the start of the season. The potential impacts on private wells is discussed in Section 5.4.

5.4 Private Wells

Five of the six aggregate properties propose to wash a portion of the aggregate they extract. Water to supply these washing operations will be obtained from wells, as discussed in Section 5.3. Pumping these wells will result in a drawdown of the water. The drawdown will be at a maximum at the well and will decrease at increased distance from the well. Water level drawdowns may interfere with water levels at nearby private wells. An interference of 0.8 m on Well 20959 (located as shown on Drawing 1) was indicated at the end of a 24-hour pumping test of The Sarjeant Co. Ltd. well TW8/91.

The potential interference with private wells from individual washing operations is addressed in the individual reports and/or will be evaluated when washing operation wells are drilled and tested.

The private wells located on the Seventh Line have the potential to be impacted by more than one operation. The potential combined interference on these private wells, from pumping at the five properties, is estimated in Table C-8. The estimates are for storage refilling at the start of the season and replenishment of operating losses. Storage refilling at each property is anticipated to require a pumping period of one to six days, for rates of 3.7 to 30.3 L/s (Section 5.3), assuming 2000 m^3 storage. Makeup water requirements vary depending on the type and size of the washing operation. Estimated makeup water requirements (including re-infiltrating water) for the five operations is 655 m^3/day, based on requirements indicated at the Seeley & Arnill Aggregates Ltd. pit in the Township of Medonte. Pumpage of makeup water will likely take place for short periods throughout the day.

The maximum cumulative interference at the four closest wells is estimated to be 5 to 7 m (Table C-8) when storage is filled for the washing operations. This will be in the spring when natural water levels will be highest. The estimate is based on the assumption that all wells are operating at the same time, and on assumed pumping well locations, yields, and aquifer characteristics. The recorded static water levels for these wells is greater than 20 m above the screen levels. A loss of water supply is not anticipated. Actual impacts on private wells will have to be evaluated when the wash wells are drilled and tested.

The potential interference for each washing operation well will have to be assessed when the wells are drilled. These estimates should include impacts of other washing operation supply wells that have been constructed to date, to indicate the cumulative impact on private wells. A Permit to Take Water will be required by each of the operators proposing to set up a washing operation. Such Permits will require a pumping test to assess yield and interference with private wells. It will be necessary under each Permit to replace any private water supplies lost as a result of the operation of these wells.

5.5 Hawkestone Creek

Flow in Hawkestone Creek is sustained in part by drainage from the extraction area south of the drainage divide (Drawing 2).

The aggregate properties within this drainage basin are those of the Township of Oro, Seeley & Arnill Aggregates Ltd., Alfa Aggregates Limited, and the southern approximately 35 Ha of the James Dick Construction Limited property.

These properties are approximately 17% of the kame moraine area which drains to Hawkestone Creek.

There are no defined tributary streams of Hawkestone Creek which originate on or adjacent to these properties, and discharge to the creek is mainly groundwater providing base flow.

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Expected increases in groundwater recharge are described in Section 5.1. The expected increases in recharge are in part realized at the Oro Township and Seeley & Arnill Aggregates Ltd. properties, and expected at the Alfa Aggregates Limited and part of the James Dick Construction Limited property, are estimated to be 422 m^3/day as an average and 781 m^3/day as a maximum. This will be a measure of a direct increase in the base flow to Hawkestone Creek and increased recharge to underlying aquifers. This is 2 to 4% of flow monitored at the Fifteenth/Sixteenth Sideroad (Section 2.2). Actual increased recharge is expected to be less because of progressive rehabilitation. The estimates provide an approximate indication of increases in the flow of the stream. Precise estimates are not possible with the information. Impacts on the swamp are not expected to be significant and would only be noticeable during the dry season, if at all.

5.6 Coulson Swamp and Coldwater River Basin

Flow within the Coldwater River basin is sustained in part by infiltration within the aggregate properties north of the drainage divide (Drawing 2). The aggregate properties within this drainage basin include The Sarjeant Co. Ltd., Allan G. Cook Limited, and the majority of the James Dick Construction Limited property (approximately 135 Ha). These properties comprise approximately 5% of the kame moraine area which drains to the confluence of the tributaries which follow the Seventh and Eighth Lines of the Township of Oro (Drawing 2). These tributaries have their headwaters approximately 600 m north of the properties. Coulson Swamp forms part of the headwaters to the Eighth Line tributary.

A stream gauge station is located on the Coldwater River in Coldwater, and data are available for the period 1965 to 1988. Spot flow monitoring at the bridge on the Eighth Line tributary to the Coldwater River and at the culvert beneath Rowanwood Road, provide an indication of flow near the headwaters of these tributaries (Section 2.2). The average potential increase to base flow for this basin is estimated to be 310 m^3/day. The expected maximum increase is 640 m^3/day, equivalent to less than 1% of base flow at the Coldwater River gauging station. Flow in the Seventh Line tributary to the Coldwater River was measured at 3076 m^3/day on 26 November 1991. Flow in the Eighth Line tributary was measured at 14221 m^3/day on the same date. Increased recharge to the west tributary is estimated to average 124 m^3/day with a maximum increase of 256 m^3/day or 8% of the flow monitored on 26 November 1991. The average increased recharge to the east tributary is estimated to be 186 m^3/day with a maximum increase of 384 m^3/day or 3% of the monitored flow.

5.7 Soil Moisture

The excavations are in areas where the water table (and intersected perched water table) are 25 to 39 m below ground level and below the expected root zones of the vegetation which relies on retained soil water for growth.

The soil moisture will be depleted immediately adjacent to the excavations. The excavation setbacks will provide buffer zones between the excavations and the property lines, and maintenance of vegetation within the buffer zone will limit the extent of drying from the pit edge.

5.8 Water Quality

The water quality has been analyzed at the Seeley & Arnill Aggregates Ltd. and The Sarjeant Co. Ltd. properties as shown in Table B-4. The water was within Ontario Drinking Water Objective (ODWO) standards for all parameters tested.

The water-table aquifer is unconfined over most of the moraine and is therefore susceptible to contamination. Servicing of equipment will involve portable oil collection systems. Waste oil will be taken off-site and disposed of according to applicable regulations. If fuels are stored on-site, they will be on concrete containment pads.

Dust suppression will be achieved by the spraying of water, or MNR approved chemicals such as calcium chloride. The applications of calcium chloride must be limited to comply with the MOE Reasonable Use Policy 15-08, which states that the application of a contaminant must be limited to ensure the water quality is not deteriorated by more than 50% of the difference between the ODWO and the background concentration. Under the Reasonable Use Policy, the maximum allowable application of calcium chloride is 808 kg/Ha, assuming an annual precipitation infiltration rate of 417 mm (Table C-9), which is the existing water surplus. Increased recharge within the pits will further dilute the chloride concentration in the infiltration.

Salting of the Seventh Line will also introduce an increase in chloride to the surface and shallow groundwater, similar to salting of other roads in Simcoe County. The Township minimizes salting on the roads by limiting the application to 95% sand and 5% salt.

The water surplus within the pits will infiltrate the pit floor quickly during periods when the ground is thawed, and therefore the water will not be at a greater temperature than the existing infiltration. The temperature of groundwater discharging to the Coldwater River and Hawkestone Creek basins will not change as a result of the pit excavations.

CONCLUSIONS

1. The six existing and proposed aggregate properties are mostly within an Aggregate Resource Area of Primary Significance.

2. The estimated reserves for the six properties are 145.5 million tonnes. Depending on market conditions and property size, the operations have a life expectancy of 15 to more than 75 years.

3. The total proposed extraction area is 320 Ha. The extraction properties range in size from 25 Ha to 149 Ha.

4. Extraction will remain above the water table, with the possible exception of the James Dick Construction Limited property, which will investigate the potential of a dragline extraction below the water table. Dewatering will not occur.

5. The on-site operations will include clearing and extraction, crushing and sizing, stockpiling and shipping, and washing at five of the properties.

6. Removal of vegetation and soil and the creation of pits will decrease evapotranspiration and contain all surface runoff, resulting in an increase in infiltration.

7. Most of the water used in the washing operations will be recirculated or will re-infiltrate to the groundwater system. Some water will evaporate from the wash ponds and washed product and will be retained in the product exported from the site. This water will be lost to the local groundwater flow system.

8. The net impact on the local water budget will be an increase in infiltration. As operations start up and cleared and extracted areas are limited, water losses from the washing operation may exceed recharge increases resulting from clearing.

9. A slight increase in base flow to the Hawkestone Creek and Coldwater River basins is expected as a result of increased recharge within the aggregate pits. The extractions will not result in a change in temperature of groundwater discharging to the streams.

10. Five properties propose to wash a portion of the aggregate extracted. Seeley & Arnill Aggregates Ltd. has a Permit To Take Water from two wells for their washing operation. The other four operators will have to apply for a Permit To Take Water, and three of the operators will have to drill and test a well or wells. A condition included in Permits to Take Water requires that private water supplies be replaced if lost as a result of the permitted operation.

11. Water losses resulting from the washing operations are expected to remain relatively constant throughout the operating period.

12. Operation of wells to provide water for washing operations will result in a drawdown in water levels in the vicinity of the wells. This may result in a drawdown in water levels at local wells. Anticipated interference resulting from five washing operations is estimated to be up to 7 m at private wells on the Seventh Line, assuming simultaneous storage refilling at all properties. This will have to be verified by testing of wells when they are drilled. Interference will be limited to short periods, and all storage filling will not necessarily be simultaneous. The recorded static level in the wells on the Seventh Line are greater than 20 m above the screen levels. The estimated interference is not expected to result in a loss of water supplies. It will be necessary to obtain Permits to Take

Water from the Ministry of the Environment in order to operate these washing systems. A condition of the Permits will protect private water supplies.

13. Application of dust suppressants, such as calcium chloride, will result in an increase in calcium and chloride concentrations in the infiltrating water. The applications should be limited to comply with Policy 15-08 of the Ministry of the Environment.

RECOMMENDATIONS

1. The water-table elevation should be monitored at each property. Initially, measurements should be taken bi-monthly to establish seasonal fluctuations, after which at least quarterly measurements should be taken to assess/verify impacts on the water levels. If impacts warrant, the monitoring schedule should be altered. Observation wells should be located at the upgradient and downgradient sides of the property. Existing wells constructed on some of the properties would be used in a monitoring network.

2. At properties with a washing operation, water levels should be monitored at an observation well constructed in the same aquifer as the production well. Monitoring should be monthly during the operating season.

3. Extractions should remain at least 1.5 m above the high water table elevation in the spring plus an allowance for the anticipated water-table mounding which is estimated to be up to 1 m and should be verified by monitoring water levels.

4. The cumulative impact on pertinent private wells should be assessed when washing operation wells are tested, prior to applying for a Permit To Take Water.

5. Water samples should be obtained from existing and proposed wells and observation wells on each property and analyzed to document background water quality. The analysis should include general chemical parameters and phenols. Water quality monitoring should be conducted on a yearly basis.

B-H

6. With the permission of the owners, background water quality should be established for private wells located within 300 m of the extraction properties, and additionally for private wells on the Sixth, Seventh and Eighth Lines between County Road 11 and Bass Lake Sideroad. The analyses should include general

chemical parameters, phenols, fuels, lubricants, and solvents. If on-site water quality monitoring indicates an impact on the water quality, downgradient private wells should be monitored, again with the permission of the owners.

7. If calcium chloride is used as a dust suppressant, its annual application should be limited to 808 kg/Ha to meet the Ministry of the Environment Policy 15-08. Chloride concentrations should be analyzed annually at the downgradient property boundary where calcium chloride is being used as a dust suppressant. This would be included in the annual monitoring discussed in Recommendation 5 above.

DIXON HYDROGEOLOGY LIMITED

per: Sharon J. Lee, B.Sc.

per: V. R. Dixon, P.Eng.

January 11, 1992.
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REFERENCES

Butler, S. S., 1957.
"Engineering Hydrogeology", Prentice-Hall, Inc. N.J., United States.

Canadian Climate Centre.
Water Budget Values, Orillia, Orillia T.S. and Midhurst Climate Stations

Chapman, L. J. and D. F. Putnam, 1984.
"The Physiography of Southern Ontario", Ontario Geologic Survey, Special Volume 2.

Charlesworth & Associates, 1991.
Hydrogeological Assessment of Proposed Sand and Gravel Pit, West Half Lots 7, 8, and 9, Concession 7, Oro Township, Report to James Dick Construction Limited.

Chow, V. T., 1964.
"Handbook of Applied Hydrology", McGraw-Hill Book Company, pp. 11-25 to 11-30.

Dixon Hydrogeology Limited, 1992.
The Sarjeant Co. Limited Pit No. 3, West Half Lot 8, Concession 8, Township of Oro Hydrogeological Investigation.

Dixon Hydrogeology Limited, 1992.
Allan G. Cook Limited Proposed Aggregate Pit Expansion West Half Lot 7, Concession 8, Township of Oro Preliminary Hydrogeological Study.

Dixon Hydrogeology Limited, 1991.
Alfa Aggregates Limited Roehner Pit, Part East Half Lot 9, Concession 7, Township of Oro Hydrogeological Study.

Henderson Paddon and Associates, 1990.
Seeley & Arnill Aggregates Limited Edgar Pit Hydrogeological Assessment, Lot 10, Concession 7, Township of Oro, County of Simcoe.

Johnston, R. S., 1976.
"Evapotranspiration from Bare, Herbaceous, and Aspen Plots: A Check on a Former Study", Water Resources Research, Vol. 6, No. 1, pp 324 - 327.

Ministry of the Environment.
Water Well Records, Toronto, Ontario.

Ministry of the Environment
The Incorporation of the Reasonable Use Concept into the Groundwater Management Activities of the Ministry of the Environment.

Ontario Geological Survey, 1984.
Aggregate Resources Inventory of Oro Township, Simcoe County, Southern Ontario, Ontario Geological Survey, Aggregate Inventory Paper 65.

Ontario Geological Survey.
Preliminary Report on the Stratigraphic Drilling of Quaternary Sediments in the Barrie Area, Simcoe County, Open File Report 5755, 80p.

Shiau, S. Y. and K. S. Davis, 1973.
"Modified Penman Method For Potential Evapotranspiration From Forest Regions", Journal of Hydrogeology, 18, pp 349 - 365.

Swift, L. W., W. T. Swank, J. B. Mankin, R. J. Luxmoore and R. A. Goldstein, 1975.
"Simulation of Evapotranspiration and Drainage from Mature and Clear-Cut Deciduous Forests and Young Pine Plantation", Water Resources Research, Vol II, No. 5, pp 667 - 673.

Todd, D. K., 1963.
"Groundwater Hydrogeology", John Wiley & Sons Inc.

Young, V. H. and M. F. Foy, 1992.
"Cumulative Impact Assessment - Biological Environment, Township of Oro, 7th Line Aggregate Extraction and Upgrade of 7th Line Road". For the 7th Line Pit Operators. LGL Limited.

ORO SEVENTH LINE AGGREGATE PITS

HYDROGEOLOGICAL STUDY

GLOSSARY OF TECHNICAL TERMS

AESTHETIC

Refers to those aspects of drinking water quality that are perceivable by the senses, namely taste, odour, colour and clarity.

AQUIFER

An aquifer is a formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

AQUIFER, CONFINED

A confined aquifer is under pressure significantly greater than atmospheric and its upper limit is the bottom of a bed of distinctly lower hydraulic conductivity (aquitard) than that of the material in which the confined water occurs.

AQUIFER, PERCHED

A perched aquifer is unconfined groundwater separated from an underlying body of groundwater by an unsaturated zone. Its water table is a perched water table. It is held up by a perching bed (aquitard) whose permeability is so low that the water percolating downward through it is not able to bring water in the underlying unsaturated zone above atmospheric pressure.

AQUIFER, UNCONFINED

An unconfined aquifer is bounded by a water table at its upper surface.

AQUITARD

An aquitard is a body of "impermeable" material stratigraphically adjacent to one or more aquifers. Its hydraulic conductivity, relative to that of the aquifer it confines, should be specified such as relatively impermeable or moderately permeable.

CONFINING LAYER

A layer or strata of rock or soil of low hydraulic conductivity which is stratigraphically adjacent to one or more aquifers.

DIAMICTIC

Unconsolidated, unstratified, poorly-sorted material of variable soil particle sizes.

HEAD, STATIC (h)

The static head is the height above a standard datum of the surface of a column of water than can be supported by the static pressure at a given point. The static head is the sum of the elevation head, he; and the pressure head, hp; that is,
h = he + hp. Head is usually measured in metres.

HYDRAULIC CONDUCTIVITY (K)

Ratio of flow velocity to driving force (hydraulic gradient) for viscous flow under saturated conditions of a specified liquid in a porous medium. Hydraulic conductivity is commonly measured in units of cm/s or ft/day.

HYDRAULIC GRADIENT (i)

Maximum increase in hydraulic head per unit length of flow path.

HYDROGEOLOGIC UNIT

An aquifer, an aquiclude, or a combination of aquifers and aquicludes that compose a framework for a reasonably distinct hydraulic system.

PERMEABILITY

The ability of a porous medium (i.e. soil, rock) to transmit water.

PIEZOMETER

A tube or pipe placed into water-bearing zones in soil or rock to enable measurement of water level.

POROSITY (n)

The porosity of a rock or soil is its property of containing interstices, or voids. With respect to the movement of water, only the system of interconnected interstices is significant. Porosity is the ratio of void volume to total rock volume and is expressed as a percentage.

POTENTIOMETRIC SURFACE

The potentiometric surface, replacing the term piezometric surface, is a surface which represents the static head or groundwater level. As related to an aquifer, it is defined by the levels to which water will rise in sealed piezometers or observation wells. The water table is a particular potentiometric surface.

SATURATED ZONE

In the saturated zone, all voids are ideally filled with water. The water table is the upper limit of this zone and the water in it is under pressure greater than atmospheric.

SINGLE WELL RESPONSE TEST

A test designed to determine the hydraulic conductivity of formation materials adjacent to a piezometer screen. The method typically is initiated by causing an instantaneous change in piezometer water levels and measuring the subsequent change in water level with time.

SPECIFIC YIELD (S_y)

The specific yield of a rock or soil is the ratio of (1) the volume of water which, after being saturated, will yield by gravity, to (2) its own volume. The definition implies that gravity drainage is complete. In the natural environment, specific yield is generally observed as the change in the amount of water in storage per unit area of unconfined aquifer that occurs as the result of a unit change in head.

STORAGE COEFFICIENT (S)

The storage coefficient is the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. In a confined water body, the water derived from storage with decline in head comes from expansion of water and compression of the aquifer. Similarly, water added to storage with a rise in head is accommodated partly by compression of the water and partly by expansion of the aquifer. In an unconfined water body, the amount of water derived from or added to the aquifer generally is negligible compared to that involved in gravity drainage or filling of pores. In an unconfined water body, the storage coefficient equals specific yield. The storage coefficient is usually regarded as a dimensionless characteristic of aquifers.

TILL

Heterogeneous, non-stratified sediment deposited by a glacier. It is characterized by its wide spectrum and variable ratio of soil particle sizes and by its high density.

TRANSMISSIVITY (T)

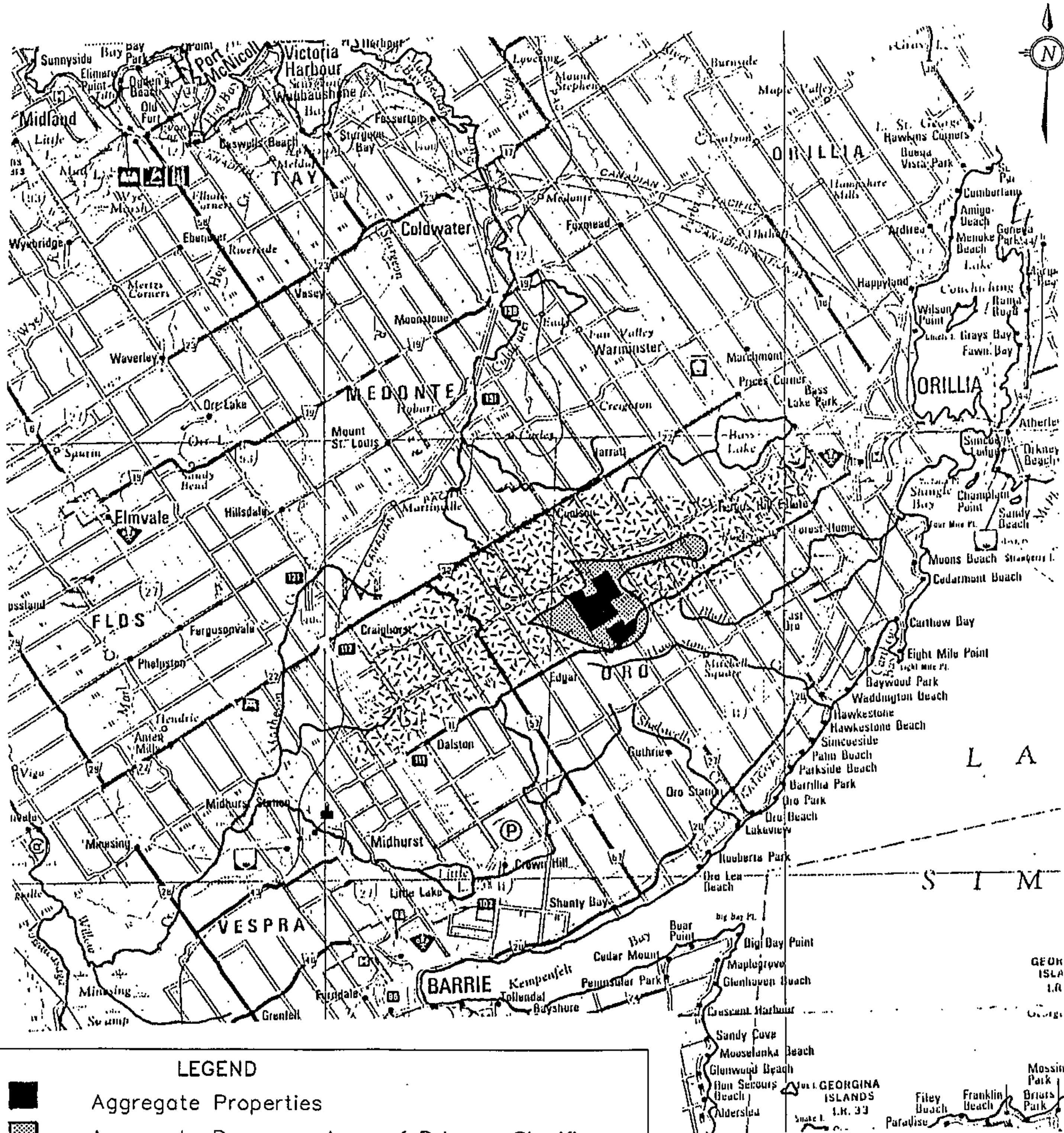
Transmissivity is the rate at which water is transmitted through a unit width of the aquifer under a unit hydraulic gradient. It is the product of hydraulic conductivity and aquifer thickness. The units of transmissivity are gallons/day/foot, ft^2/day, or m^2/second.

UNSATURATED ZONE

The unsaturated zone is the zone between the land surface and the water table. It includes the capillary fringe. This zone contains liquid water under less than atmospheric pressure and gases usually at atmospheric pressure. The term "unsaturated zone" replaced the terms "zone of aeration" and "vadose zone".

WATER TABLE

The water table is that surface in an unconfined water body at which the pressure is atmospheric. It is defined by the levels at which water stands in wells that penetrate the water body just far enough to hold standing water.



LEGEND

Aggregate Properties

Aggregate Resource Area of Primary Significance

Bass Lake Kame Moraine (Oro Sandhills)

metres

0 2500 5000 10000 20000

SCALE 1: 250000

SOURCES: Base Map from Ministry of Transportation, ONTARIO TRANSPORTATION MAP SERIES; Map 5, 1984.
Aggregate Resources from Ontario Geological Survey, AGGREGATE RESOURCES INVENTORY, ORO TWP., Map 2.
Physiography from THE PHYSIOGRAPHY OF SOUTHERN ONTARIO, L.J. Chapman & D.F. Putnam, 1984.

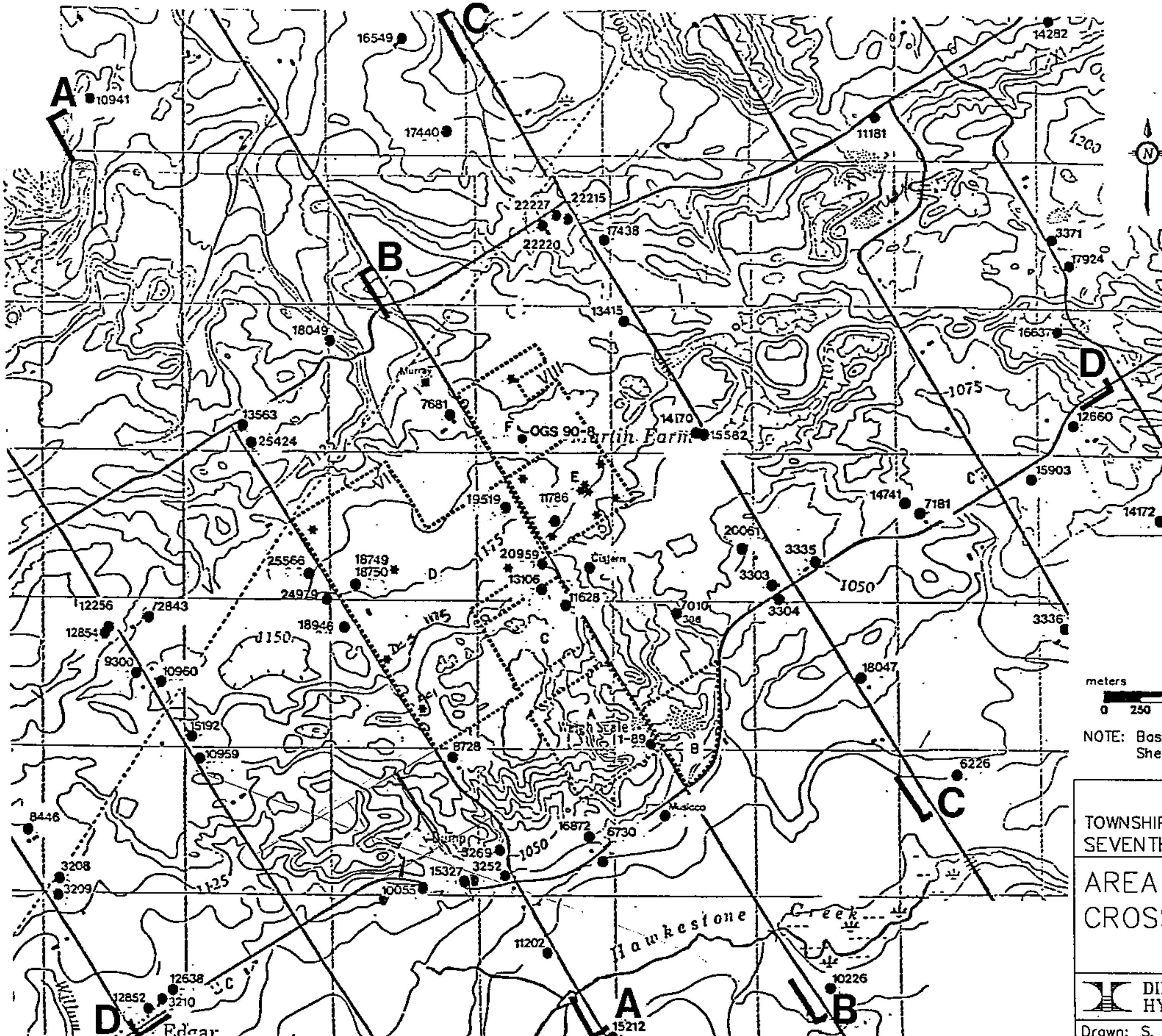
TOWNSHIP OF ORO
ORO SEVENTH LINE AGGREGATE PITS

PROPERTIES LOCATION & AGGREGATE RESOURCE AREA MAP

DIXON HYDROGEOLOGY

FIGURE 1

Drawn R. Draper	Job No. H09 Q01	Date: 30 Dec 91
Approved	ACAD: H09PI RFG	Dwg No. 91314



LEGEND

- Property Boundaries
- Line of Section
- MOE Recorded Well
- Observation Well

Aggregate Properties

- A Seeley and Arnill
- B Oro Township
- C Alfa Aggregates
- D J Dick Construction
- E Sargeant Co. Ltd
- F Allan G. Cook

meters

0 250 500 1000 2500

NOTE: Base Map Enlarged from 1:50000 Topographic Sheet 31 D/12 (ELMVALE).

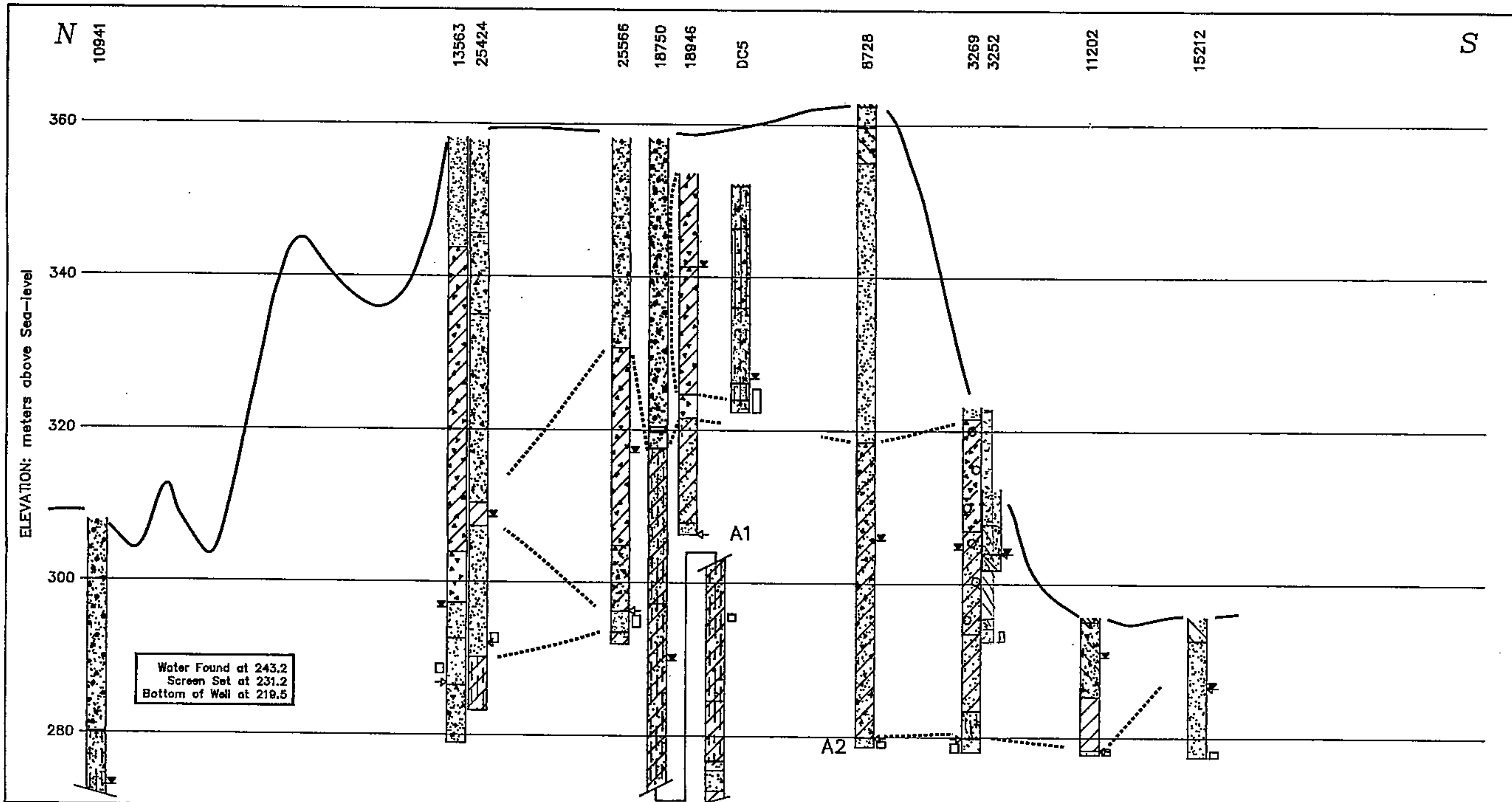
TOWNSHIP OF ORO
SEVENTH LINE AGGREGATE PITS

AREA LOCATION MAP
CROSS SECTION LINES

DIXON HYDROGEOLOGY

FIGURE 2

Drawn: S. Lee	Job No. H09 Q01	Date: 31 Dec 91
Approved:	ACAD: H09SECT	Dwg No. 91315



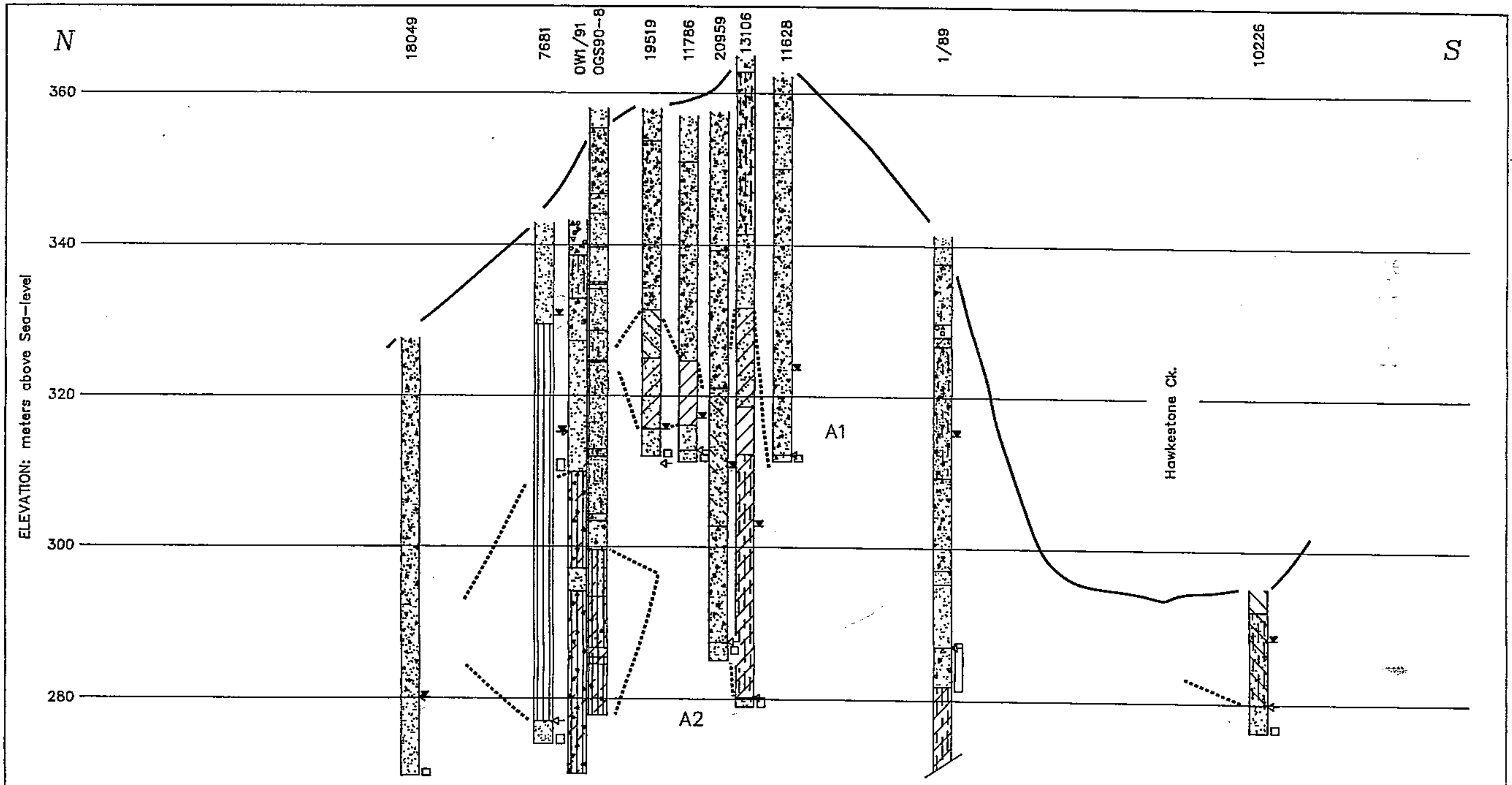
TOWNSHIP OF ORO
SEVENTH LINE AGGREGATE PITS
HYDROGEOLOGICAL STUDY

DIXON HYDROGEOLOGY

FIGURE 3

SECTION A—A
ORO 6th LINE

Drawn: S. Lee	Job No. H09 Q01	Date: 28 Nov 91
Approved:	ACAD:	Dwg No. 91308



TOWNSHIP OF ORO
SEVENTH LINE AGGREGATE PITS

HYDROGEOLOGICAL STUDY

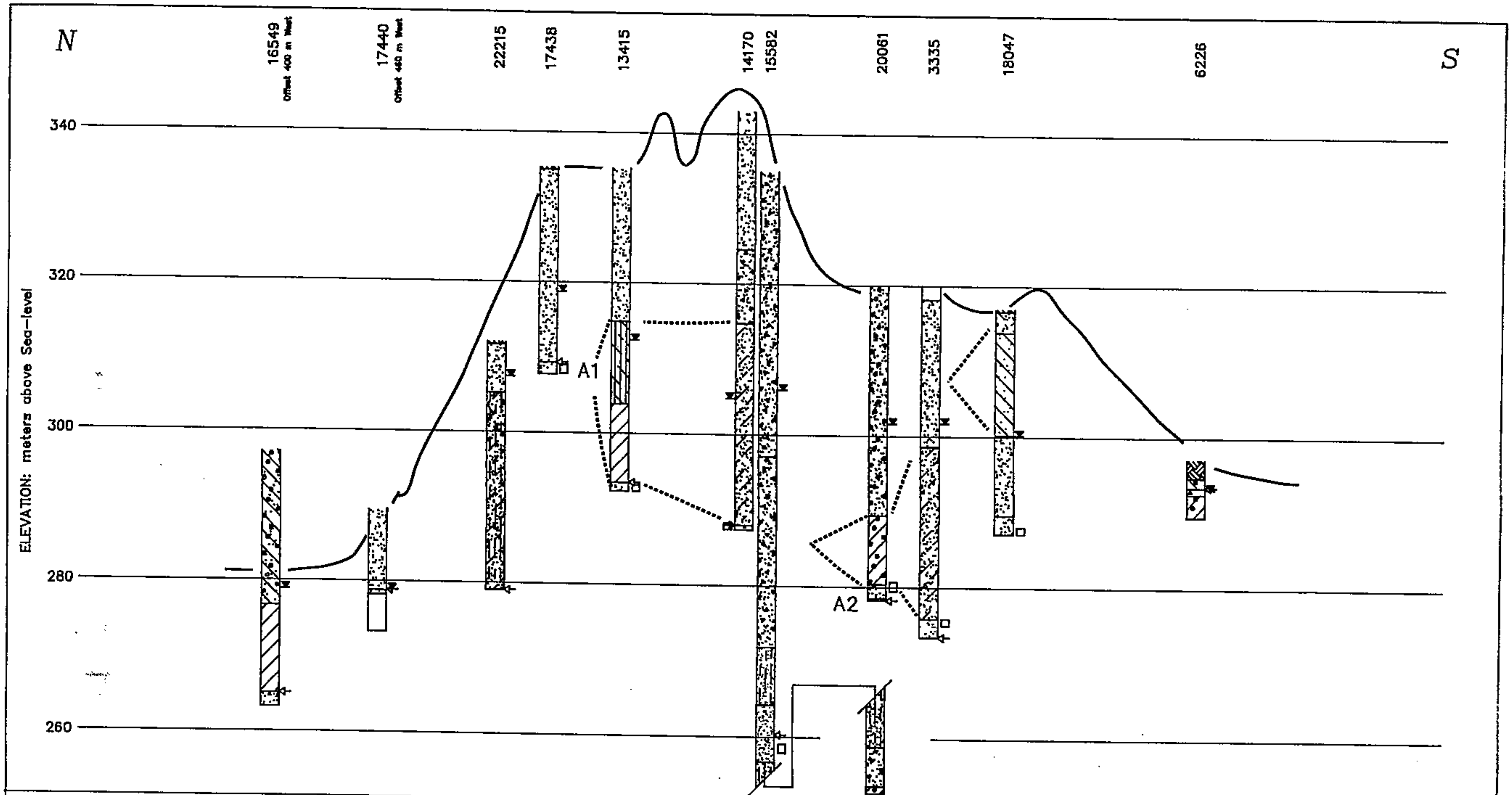
DIXON HYDROGEOLOGY

FIGURE 4

SECTION B–B

ORO 7th LINE

Drawn: R. Draper	Job No. H09 Q01	Date: 28 Nov 91
Approved:	ACAD: H09S-BB	Dwg No. 91309



TOWNSHIP OF ORO
SEVENTH LINE AGGREGATE PITS

HYDROGEOLOGICAL STUDY

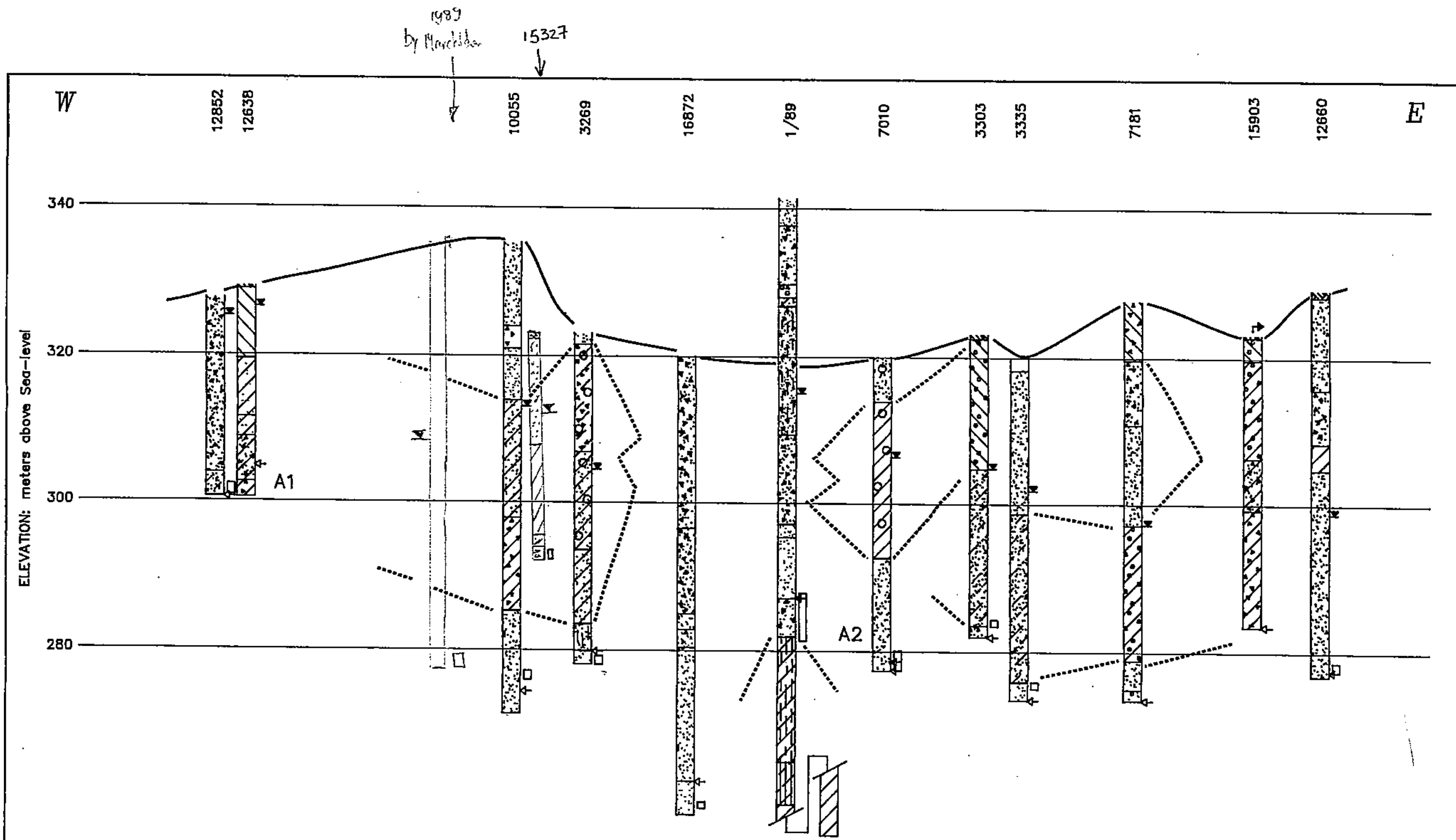
DIXON HYDROGEOLOGY

FIGURE 5

SECTION C–C

ORO 8th LINE

Drawn: R. Draper	Job No. H09 Q01	Date: 28 Nov 91
Approved:	ACAD: H09S-CC	Dwg No. 91310



TOWNSHIP OF ORO
SEVENTH LINE AGGREGATE PITS

HYDROGEOLOGICAL STUDY

DIXON HYDROGEOLOGY

FIGURE 6

SECTION D–D

COUNTY RD 11

Drawn: J. Regier	Job No. H09 Q01	Date: 28 Nov 91
Approved:	ACAD: H09S-DD	Dwg No. 91311

Unoxidized CLAY, Blue, Grey, White, or Undefined CLAY

Oxidized CLAY, Brown, Red, Yellow

SILT

SAND

GRAVEL

STONES, Rounded GRAVEL, PEBBLES

BOULDER

SHALE

SANDSTONE

DOLOSTONE

LIMESTONE

CRYSTALLINE ROCK

Screen

Recorded Static Water Level

Water Producing Zone

Q Test Pumping Rate

Flowing Well

Water Table

Inferred Geologic Contact

WATER QUALITY

Fr	Fresh
Mn	Mineral
Sa	Salty
Su	Sulphur

HYDROGEOLOGICAL SYMBOLS

NOTE: On all sections, boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven, but are assumed from geological evidence.

Dixon Hydrogeology Limited

Drawn J P R	Job No.	Date: 19 Jan 89
Approved	ACAD: HYDSYM	Dwg No. 88999

APPENDIX A

WATER WELL RECORDS

MUNICIPALITY CODE 57010 (CONTINUED...)

SLTY 0227 CLAY DNSE 0272 CLAY SLTY 0307 CLAY DNSE 0315

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CON 5	1	57- 11472	606575 4934065	1275	05/74	4713	6	FR	153	150	165	5	2/30	DO	VUSTALLO ALBERT BRWN SAND GRVL STNS 0150 (S 0147 24) BRWN SAND LOOS 0153 BRWN SAND GRVL DNSE 0171
CON 5	5	57- 15967	606050 4931950	1190	04/79	3660	5	FR	215	204	210	5	2/00	DO	BOWMAN H BLCK TPSL 0006 BRWN MSND 0040 BRWN FSND HARD LYRD 0060 BRWN CLAY 0108 GREY CLAY GRVL HARD 0118 GREY SAND GRVL CMTD 0222 (S 0119 03)
CON 5	6	57- 3207	608196 4931487	1180	06/52	5510	4	FR	234	226	230	5	1/00	ST DO	HUTCHINSON E TPSL 0006 GRVL STNS 0048 MSND 0081 CLAY 0086 FSND 0092 CLAY MSND 0104 MSND 0131 CLAY 0139 MSND 0142 CLAY 0143 MSND 0191 MSND CLAY 0230 MSND 0244 (S 0234 10)
CON 5	6	57- 7841	608200 4931520.	1175	12/70	4816	6	FR	260	214	251	8	24/00	ST DO	BIDWELL GLENN MSND 0022 MSND GRVL 0086 CLAY GRVL 0188 FSND 0226 MSND FSND 0265 (S 0258 06) GREY CLAY 0270
CON 5	7	57- 9300	609670 4931500	1175	07/72	4816	6	FR	260	197	206	12	1/00	DO	ROSS A SAND 0140 SAND SILT 0188 SAND 0201 SILT 0213 SAND 0256 FSND MSND 0265 (S 0257 08) GREY CLAY 0335
CON 5	7	57- 12256	609435 4931775	1220	06/75	3660			DRY						KING J-WINGER P BLCK TPSL 0001 RED SAND 0020 YLLW SAND DRY 0095 BRWN SAND 0115 BRWN CLAY 0205 BRWN CLAY STNS 0234 BRWN SAND DRY 0272 GREY CLAY 0330
CON 5	7	57- 12854	609435 4931775	1220	10/75	4816	6	FR	456	239		30	3/00	DO	WINGER PAUL SAND GRVL CMTD 0082 MSND 0108 GREY CLAY 0113 SAND 0245 GREY CLAY SILT 0442 CSND 0456 (S 0447 04)
CON 5	7	57- 17027	608550 4930900	1225	09/80	3660	5	FR	285	275	284	5	1/00	DO	HILL S BRWN SAND DRY 0265 YLLW MSND FSND 0300 (S 0296 03) GREY CLAY 0300
CON 5	7	57- 17429	608450 4931050	1200	04/81	3660	5	FR	267	255	275	4	1/00	DO	HACKETT G BLCK TPSL 0001 BRWN SAND GRVL 0085 BRWN SAND 0267 YLLW FSND WBRG 0285 (S 0282 03)
CON 5	8	57- 8446	608900 4930400	1170	10/71	1204	5	FR	153	137	151	2	1/30	ST DO	HAYES H BRWN CLAY MSND 0068 GREY MSND GRVL 0073 GREY MSND CLAY 0105 GREY CLAY 0153 BRWN MSND 0159 (S 0156 03)
CON 5	9	57- 3208	609096 4930080	1145	10/52	5510	4		DRY						BIDWELL G TPSL 0002 FSND CLAY 0300
CON 5	9	57- 3209	609091 4929979	1135	06/66	4816	6	FR	150	65	95	11	24/00	DO	BIDWELL G GRVL HPAN 0078 MSND CLAY 0145 CSND 0155

- CONTINUED -

MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
															(S 0147 04)
CON 5	10	57- 3210	609823 4929275	1080	07/63	4816	4	FR FR	21 60	6	69	3	3/00	DO	OCKENDEN H TPSL MSND STNS 0008 BLUE CLAY 0012 GRVL 0016 BRWN CLAY 0021 GRVL 0025 BRWN CLAY MSND STNS 0060 MSND GRVL 0075 (S 0071 03)
CON 5	10	57- 12638	609900 4929335	1080	11/75	3660	5		80	9	50	2	2/00	DO	CLACK BLCK TPSL 0001 BRWN CLAY 0032 GREY CLAY SNDY 0058 BRWN CLAY SNDY 0067 GREY CLAY SAND GRVL 0087 BLUE CLAY GRVL 0094
CON 5	10	57- 12852	609725 4929215	1075	09/75	4816	6	FR	89	8	80	3	8/00	DO	BIDWELL ROSS SAND GRVL CMTD 0078 SAND CLAY 0089 (S 0083 05)
CON 5	10	57- 13890	609500 4929260	1090	11/76	4816	6	FR	120	3		15	1/00	DO	WEST ORO BAPTIST CH FILL 0002 BRWN CLAY GRVL 0014 SAND GRVL CMTD 0090 SAND CLAY LYRD 0132 (S 0115 05) CLAY GRVL 0145
CON 5	10	57- 14160	609950 4929380	1080	01/76	3203	6	FR	151	75	120	10	4/00	DO	SPROULE R BRWN TPSL 0001 BRWN CLAY SAND 0052 GREY SAND CLAY 0084 GREY CLAY 0151 GREY SAND 0154 (S 0151 03) GREY SAND CLAY 0154
CON 5	10	57- 14189	609960 4929350	1080	06/76	3203	5	FR	98	10	80	5	1/30	DO	SPROULE RON BRWN CLAY SAND 0008 GREY CLAY SAND 0098 GREY SAND GRVL 0101 (S 0098 03)
CON 5	10	57- 16523	609850 4929300	1075	11/79	3660	5	FR	194	77	77	10	3/00	DO	CLACK J PRDG 0080 GREY CLAY GRVL 0115 BRWN GRVL CLAY 0135 GREY CLAY 0186 GREY SAND CLAY 0194 BRWN MSND FSND 0197 (S 0194 04)
CON 5	11	57- 3211	609647 4929075	1075	10/66	4816	6	FR	109	7	110	3	48/00	DO	ASH E HPAN 0062 GREY FSND 0069 CLAY MSND 0103 GRVL 0104 CLAY 0106 FSND 0109 CSND 0118 (S 0109 03)
CON 5	11	57- 16084	610950 4929350	1030	04/79	4816	6	FR	395	230		25	1/00	DO	WILKINSON J SAND 0019 SAND GRVL CLAY 0076 CLAY 0100 SAND CLAY CMTD 0255 SAND CMTD 0395 CSND 0406 (S 0399 03)
CON 5	12	57- 3212	610328 4928562	1035	08/66	4816	6	FR	190	45	165	2	24/00	ST DO	DOBSON R HPAN 0018 BLUE CLAY 0022 HPAN 0043 BLUE CLAY SILT 0073 MSND GRVL CLAY 0086 BLUE CLAY 0181 GRVL 0182 CLAY 0190 GRVL CLAY 0194 (S 0190 04)
CON 5	13	57- 15909	611500 4928400	990	06/78	3135	5	FR	108	FLW	48	7	18/00	ST DO	MACARTHUR D TPSL 0001 BRWN CLAY SAND STNS 0022 GREY CLAY 0108 SAND WBRG 0111 (S 0108 03)
CON 5	14	57- 15986	610800 4927150	960	04/79	3660	5	FR	96	FLW	20	10	20/00	DO	HAYES D BRWN CLAY 0012 BLUE CLAY STNS 0096 GREY SAND GRVL LOOS 0099 GREY SAND GRVL CMTD 0105
CON 5	15	57-	611930	1000	10/71	2514	6	FR	30	8	28	5	3/00	DO	JUNEAU D

- CONTINUED -

MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTH EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
		17428	4920400												
CON 5	28	57- 17490	516400 4920350	750	06/61	3660	5	FR	73	10	58	5	1/00	DO	BLCK TPSL 0001 BRWN CLAY BLDR 0018 GREY CLAY GRVL 0045 GREY CGVL CSND 0046 DESROCHES S
CON 6	7	57- 12843	609750 4931875	1170	06/75	4816	6	FR	385	212		30	3/00	DO	PRDG 0045 GREY CGVL CSND 0046 GREY GRYL CMTD 0073 YLLW SAND WBRG 0076 (S 0073 03) SUTHERLAND ED
CON 6	8	57- 10960	609844 4931437	1175	04/74	3660	5	FR	219	193	193	5	2/00	DO	SAND GRVL 0030 CLAY GRVL 0084 SAND GRVL CMTD 0247 CLAY DNSE 0308 SAND CMTD 0376 CSND 0395 (S 0377 04) CRITTENDEN WM
CON 6	8	57- 15192	610050 4931050	1190	05/78	4816	6	FR	200	161	195	4	2/00	DO	RED SAND BLDR 0096 GREY SILT CLAY 0168 GREY CLAY 0221 YLLW SAND GRVL 0225 (S 0222 03) HILTZ M
CON 6	9	57- 10959	610106 4930920	1190	04/74	3660	5	FR	255	206	239	3	2/00	DO	CLAY SAND 0005 SAND GRVL 0072 GRVL 0077 SAND GRVL 0120 CLAY GRVL 0127 SAND CMTD 0177 SAND GRVL CLAY 0216 (S 0205 04) BLUE CLAY 0229 SAND CMTD 0320 BOLECHOWSKY M
CON 6	11	57- 3252	612183 4930144	1025	01/65	4008	30	FR	28	28		2		DO	BRWN TPSL 0001 RED SAND 0045 GREY CLAY SILT 0160 GREY CLAY 0255 BRWN MSND 0260 (S 0257 03) EENHOORN P
CON 6	11	57- 10055	611603 4930054	1100	06/73	4816	6	FR	200	73		30	2/00	DO	MSND 0025 CLAY MSND 0035 SIMEK P
CON 6	11	57- 15327	611900 4930100	1060	06/78	3660	5	FR	97	39		10	2/00	DO	SAND 0037 GRVL 0047 FSND 0070 CLAY SAND 0123 CLAY GRVL 0164 MSND 0210 (S 0191 04) DERKS J
CON 6	12	57- 11202	612511 4929618	970	03/74	3203	5	FR	57	17	52	2	2/30	DO	BLCK TPSL 0001 BRWN SAND 0050 BLUE CLAY 0090 BRWN SAND CLAY 0097 BRWN SAND FGVL LTCL 0100 (S 0097 03) MALLINSON J
CON 6	14	57- 9422	612880 4928800	1000	10/72	4608	30	FR	27	27	30	2	1/00	DO	BRWN TPSL 0002 BRWN SAND GRVL CLAY 0034 GREY CLAY 0057 (S 0056 03) GREY FSND 0059 HOFFMAN J M
CON 6	14	57- 16191	613000 4928800	1000	07/79	3660	5	FR	57	31	55	4	2/00	DO	BRWN CLAY STNS 0015 GREY CLAY STNS 0035 HILL H
CON 6	16	57- 3253	612868 4927229	990	08/64	2514	6	FR	195	65	180	6	3/00	ST DO	BRWN SAND 0005 BRWN CLAY 0043 GREY CLAY HARD 0050 GREY CLAY SOFT 0056 BRWN SAND GRVL CLAY 0064 GREY MGVL MSND 0067 BRWN SAND GRVL 0071 THERRIEN L
CON 6	16	57-	612800	990	05/70	4713	6	FR	157	45	50	20	2/30	DO	FILL 0005 BRWN CLAY MSND 0038 BLUE MSND GRVL 0055 BLUE CLAY FSND 0194 YLLW MSND 0198 (S 0195 03) HECTOR MARY

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
		7616	4927250												BRWN GRVL BLDR 0020 BRWN CLAY GRVL 0040 BLUE CLAY MSND 0150 (S 0149 08) BRWN MSND 0157
CON 6	17	57- 3254	613241 4926099	975	11/64	4608	30	FR	25	32		2		ST DO	SCHLANB BRWN CLAY 0004 GRVL 0007 BRWN CLAY 0040 MSND 0045
CON 6	17	57- 56?7	614120 4926870	975	12/68	2514	6	FR	123	30	110	15	36/00	ST DO	BEERS J D PRDG 0028 GRVL MSND CLAY 0045 GREY CLAY GRVL 0065 BLUE CLAY 0071 GREY CLAY 0123 MSND GRVL STNS 0127 (S 0124 03)
CON 6	19	57- 3255	614676 4925893	965	12/60	4713	6	FR	177	56	100	5	8/00	ST DO	CUNNINGTON J TPSL 0002 CLAY STNS 0060 MSND 0090 CLAY 0173 (S 0168 09) FSND 0177
CON 6	19	57- 11210	614795 4925800	975	05/74	3203	5	FR	90	40	80	3	1/45	DO	SIESLING R BRWN TPSL 0001 BRWN CLAY SAND STNS 0039 GREY CLAY SAND GRVL 0065 GREY GRVL SAND 0090 SAND 0094 (S 0090 04)
CON 6	19	57- 12849	614650 4925950	965	09/75	4816	6	FR	185	34	133	12	2/00	DO	HARRINGTON PAT CLAY SAND GRVL 0092 CLAY 0167 SAND CMTD 0178 MSND 0185 (S 0178 03)
CON 6	20	57- 3256	614239 4924492	955	08/62	1614	4	FR	78	34	39	20	2/00	DO	JAMIESON M HPAN BLDR 0078 GRVL 0079
CON 6	20	57- 10858	615053 4925374	940	10/73	4715	4	FR	200	17	160	2	4/00	DO	CUNNINGTON R GREY CLAY 0200 (S 0198 04) GREY CLAY SILT 0238
CON 6	20	57- 14181	614200 4924500	950	05/76	3203	5	FR	114	27	65	10	1/30	DO	TERMIAL HOLD BRWN TPSL 0001 BRWN GRVL STNS SAND 0038 GREY CLAY SILT FSND 0065 GREY CLAY 0105 BRWN SAND CLAY 0114 BRWN SAND GRVL 0118 (S 0115 03)
CON 6	21	57- 4789	614339 4924448	935	09/66	2514		FR	77	22	40	10	2/00	CO	BENT T PRDG 0015 MSND CLAY BLDR 0077 MSND GRVL SILT 0080 (S 0077 03)
CON 6	21	57- 7169	614180 4924370	950	05/70	4608	30	FR FR	18 25	10	18		1/15	DO	STEPHENSON R W BRWN CLAY STNS 0018 GREY CLAY MSND 0025
CON 6	21	57- 10595	614521 4923881	895	08/73	1204	5	FR	40	1	40			DO	FORSYTHE J BRWN CLAY 0010 GREY GRVL 0020 BRWN SAND 0030 BRWN SILT SAND 0040 GREY SAND GRVL 0050 (S 0044 03)
CON 6	21	57- 18089	614200 4924450	950	05/82	3602	6	FR	102	20	85	8	5/00	DO	LOWNDES M BRWN TPSL 0001 GREY CLAY STNS 0020 GREY CLAY SNDS 0040 BRWN SAND CLAY 0050 GREY CLAY STNS HARD 0065 GREY CLAY SNDS 0102 BRWN SAND CLN WBRG 0109 (S 0102 07)
CON 6	22	57- 9687	614550 4923700	890	08/72	4713	6	FR	76	FLW		20	2/30	ST DO	RATTLE JEAN BRWN CLAY LOOS 0010 BRWN BLDR CLAY DNSE 0014 BLUE CLAY GRVL STNS 0074 BRWN GRVL SAND LOOS 0076
CON 6	23	57-	615086	860	07/64	2514		FR	43	15	35	14	2/00	ST DO	MCARTHUR M

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC		LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CON	6	28	57- 16717	616700 4920400	725	10/79	2514	6	FR	32		16	20	1/00	DO	0120 GREY BLDR GRNT LMSN 0134 GREY CLAY SAND DNSE 0234 GREY LMSN DNSE LYRD 0260 SHOOK J
CON	7	2	57- 10941	609321 4935376	1010	12/73	4816	6	FR	212	114	125	50	5/00	MU	BRWN SAND STNS 0002 BRWN SILT SAND BLDR 0007 GREY SILT CLAY SAND 0032 GREY SAND GRVL SILT 0036 GREY GRVL 0036 ABASCO INC
CON	7	6	57- 13563	610400 4933200	1175	07/76	4816	6	FR	234	202		10	2/00	DO	SAND GRVL STNS 0091 SAND SILT 0122 GREY CLAY SAND 0212 MSND 0285 (S 0247 09) CLAY 0290 HAIDLE'S ANTIQUES
CON	7	6	57- 18049	611000 4933750	1075	06/81	3135	5	FR	156	156	180	5	3/00	DO	FSND 0047 CLAY GRVL 0178 GRVL 0200 MSND 0215 CSND 0235 (S 0226 04) SAND GRVL CMTD 0260 HOLMES B
CON	7	7	57- 7681	611820 4933250	1125	07/70	5206	5	FR	216	40	200	8	6/00	ST	SAND GRVL DRY 0156 SAND 0190 (S 0187 03) BOLTON W
CON	7	9	57- 3268	612523 4932086	1125	07/55	5510	4	FR	149	130	133	1	/30	DO	BRWN MSND 0044 SILT 0216 FSND 0226 (S 0222 04) MCNIVEN W
CON	7	9	57- 11628	612650 4931965	1190	09/74	3203	6	FR	164	127	153	2	1/00	DO	TPSL 0002 MSND STNS 0014 CLAY MSND STNS 0031 CLAY GRVL 0101 CLAY MSND 0142 MSND 0149 PORTER MARG
CON	7	9	57- 13106	612600 4932030	1125	05/75	2514	6	FR	278	204	268	6	24/00	DO	BRWN SAND GRVL STNS 0022 BRWN SAND LOUS 0040 BRWN SAND GRVL PCKD 0164 BRWN GRVL SAND WBPG 0167 (S 0164 03) ROEHNER GORDEN
CON	7	10	57- 8723	611820 4930930	1190	08/71	4715	4	FR	272	187	190	4	2/00	DO	GRVL SAND 0007 GRVL SAND SILT 0077 YLLW SAND 0109 BRWN CLAY SAND 0152 GREY CLAY 0173 GREY CLAY SILT 0278 SAND LYRD PCKD 0282 (S 0278 04) PARKE D
CON	7	11	57- 3249	612158 4930305	1060	10/65	4715	4	FR	142	61	62	10	2/30	DO	TPSL 0001 MSND 0010 CLAY MSND GRVL 0025 MSND 0145 CLAY MSND GRVL 0272 FSND 0276 (S 0273 03) NICHOLS J
CON	7	11	57- 16872	612800 4930400	1050	05/80	4616	6	FR	190			30	3/00	DO	MSND 0005 GRVL CLAY BLDR 0053 CLAY MSND BLDR 0097 CLAY MSND 0130 MSND SILT 0142 MSND 0148 (S 0144 04) STARR T
CON	7	12	57- 6730	612950 4930350	1015	09/69	4608	30	FR	48	44	48	2	1/00	DO	CGVL SAND 0077 SAND GRVL LYRD 0115 MSND 0122 FSND GRVL 0130 MSND 0190 CSND 0205 (S 0199 03) STARR T E
CON	7	13	57- 15212	612950 4929050	970	04/77	3203	5	FR	30	30	40	5	1/10	DO	GREY GRVL 0054 VOUSDAN D BRWN CLAY SAND 0010 BRWN SAND 0060 (S

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC		LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
● CON	7	15	57- 3270	614669 4928639	1000	11/64	4715	4	FR	46	30	42	5	2/00	ST DO	0057 03) BRIGGS R TPSL 0001 TPSL MSND 0008 BRWN CLAY MSND GRVL 0046 MSND GRVL 0050 (S 0046 04)
● CON	7	15	57- 10931	613461 4928329	1000	09/73	4816			DRY						BRWN CLAY MSND GRVL 0055 VANDERHAARDT J SAND 0016 CLAY GRVL 0044 CLAY 0101 CLAY SILT 0471 LMSN 0475
● CON	7	16	57- 3271	614156 4927914	990	09/66	4715		FR FR	113 150	38	40	5	2/00	ST DO	GOSS A PRDG C030 CLAY MSND 0047 GREY CLAY 0077 CLAY SILT 0113 GREY CLAY 0118 FSND 0123 GREY CLAY 0130 MSND SILT 0150 MSND 0155 (S 0151 04)
CON	7	16	57- 5793	615050 4928130	985	10/68	4608	30	FR	8	8				DO	ROBINSON D BRWN CLAY STNS 0008 MSND GRVL 0015
CON	7	16	57- 7995	614650 4928310	990	05/71	3203	5	FR FR	69 72	10	45	8	1/30	DO	THOMSON I BRWN TPSL 0001 BRWN CLAY GRVL STNS 0068 CLAY GRVL SAND 0069 SAND 0072 (S 0069 03)
CON	7	16	57- 8495	614450 4928050	1000	09/71	3203	5		48 52	20	39	10	1/00	ST DO	ROBINSON E BRWN TPSL 0001 BRWN CLAY GRVL 0009 GREY CLAY STNS SAND 0027 GREY SAND 0046 BRWN CLAY SAND 0048 BRWN CSND 0053 (S 0049 03)
CON	7	16	57- 10494	615154 4927918	985	04/73	4608	30	FR	10	12		3	/30	DO	GRAY J BRWN CLAY 0010 SAND 0022
CON	7	18	57- 15808	614700 4926200	950	08/78	2514	6	FR	84	3	28	20	1/00	DO	LEONARD V TPSL DKCL 0001 BRWN SAND CLAY 0015 GREY SAND GRVL SILT 0081 GREY GRVL SILT 0084
CON	7	20	57- 3272	616421 4925734	935	04/56	4515	8	FR FR	75 225	12	50	5			BRWN GRVL CSND 0084 CARIBOO MOTEL PRDG 0018 BLDR CLAY 0037 MSND 0052 HPAN 0075 MSND GRVL 0080 CLAY STNS 0125 CLAY
CON	7	20	57- 3273	616460 4925770	935	04/56	4515	6	FR	55	6	12	5	24/00	CO	0225 GRVL 0232 CARIBOO MOTEL
CON	7	20	57- 3274	615079 4925520	930	08/63	1312	6	FR	56	9	53	4	5/00	DO	BLDR CLAY 0035 MSND CLAY 0055 GRVL 0060 MARSHAL T BRWN CLAY 0010 GREY CLAY HPAN 0035 GREY CLAY HPAN BLDR 0045 GREY CLAY 0056 GRVL
CON	7	20	57- 5800	616310 4926100	940	09/68	4608	30	FR	18	18				DO	MSND 0057 GREY CLAY HPAN 0062 MCGUIRE R
CON	7	20	57- 8881	616400 4925750	930	07/72	4608	30	FR	15	15	21	2	1/00	DO	BRWN CLAY STNS 0018 GREY CLAY STNS 0028 HOTEL CARIBOU
CON	7	21	57- 3276	616232 4925488	927	10/55	4526	6	FR	50	7	30	5	3/00	CO	GREY SAND STNS 0025 BRITISH PETROLEUM CLAY MSND BLDR 0035 GRVL 0040 GRVL 0045
CON	7	21	57-	616057	925	10/60	3512	6		220	110	480	1	2/00	CO	SHLE 0049 GRVL 0052 TOMPKINSON V

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CONCESSION ETC		LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
MUNICIPALITY CODE 57010 (CONTINUED...)																
																SOFT 0223 (S 0222 03) BRWN SAND CLAY 0226 GREY CLAY SOFT 0226
CON	7	27	57- 15899	618200 4922050	725	06/78	3135		FR	215	FLW	3	7	6/00	DO	KUCK K TPSL 0001 BRWN CLAY STNS 0011 GREY CLAY STNS 0048 GREY CLAY SAND GRVL 0115 GREY CLAY 0215 GREY GRVL SAND 0215
CON	7	27	57- 15905	618350 4922350	750	09/78	3135	5	FR	213		22	5	18/00	DO	MARCH C BRWN CLAY STNS 0010 GREY CLAY STNS 0033 GREY CLAY 0190 GREY CLAY SILT SAND 0213 GREY SAND GRVL 0215 GREY GRVL 0215
CON	7	27	57- 16547	617500 4921600	750	11/79	3203	6	FR	189	6	19	8	1/30	DO	BOORMAN V PRDG 0015 BRWN CLAY SAND 0019 GREY CLAY 0123 GREY CLAY GRVL 0142 GREY CLAY 0189 GREY SAND 0197 (S 0194 03) GREY FSND 0199
CON	8	1	57- 11183	609915 4936550	920	07/74	3203	6	FR	60	40	52	8	1/00	DO	NEWELL NORMAN BRWN CLAY 0015 BRWN SAND STNS CLAY 0040 BRWN SAND HBRG 0070 (S 0067 03)
CON	8	1	57- 17597	609900 4936600	925	03/78	3413	30	FR	25	22	32	5	4/00	DO	ORR F BRWN CLAY 0025 CGVL 0030 BRWN CLAY 0048
CON	8	2	57- 8508	611400 4936640	950	10/71	3203	5	FR FR	75 77	40	63	2	1/30	DO	HARE J BRWN TPSL 0001 CLAY STNS 0031 SAND 0077 (S 0074 03)
CON	8	2	57- 14203	610250 4936030	925	08/76	3203	5	FR	150	47	55	15	2/00	DO	TORPEY LARRY BRWN SAND 0017 BRWN CLAY 0020 GREY CLAY 0121 BRWN CLAY SAND 0126 GREY CLAY 0170 GREY CSND 0156 (S 0153 03)
CON	8	3	57- 16549	611550 4935800	975	11/79	3203	6	FR	105	60	78	15	1/25	DO	MCNIVEN E BRWN CLAY STNS SAND 0067 GREY CLAY 0105 BRWN SAND GRVL 0111
CON	8	4	57- 17440	611850 4935200	950	06/80	3135	5	FR	35	35	42	5	1/30	DO	ATWOOD K BRWN SAND DRY 0035 SAND 0037 UNKN 0053 (S SAND 04)
CON	8	7	57- 3302	612485 4933245	1160	04/57	1510	2	FR	135	125	125	5		ST DO	GRAVES W PRDR 0090 CLAY STNS 0135 MSND 0145 (S 0141 04)
CON	8	7	57- 13415	613090 4833900	1100	01/75	3203	5	FR	137	75	120	7	1/30	DO	WALSH PETER BRWN SAND DRY 0067 BRWN SILT CLAY 0103 GREY CLAY 0137 BRWN SAND 0141 (S 0138 03) BRWN SAND CLAY 0141
CON	8	8	57- 11786	612450 4932625	1170	12/74	3660	5	FR	145	131	140	4	2/00	ST DO	MIDDLETON ROBERT RED SAND 0020 BRWN SAND GRVL LYRD 0106 BRWN CLAY 0134 BRWN SAND CMTD 0145 YLLW SAND 0150 (S 0147 03)
CON	8	9	57- 14170	613640 4933100	1000	03/76	3203	5	FR	180	125		3	2/00	DO	CLIME DARRELL BRWN SAND DRY 0060 BRWN SAND GRVL 0092 BRWN SAND CLAY 0180 (S 0179 03) BRWN SAND 0182
CON	8	9	57-	613600	1050	08/78	4816	6	FR	245	95		15	2/00	DO	ASIMI A

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
			15522 4933100												SAND GRVL 0124 SAND GRVL CMTD 0207 FSND SILT 0232 FSND MSND 0257 (S 0249 04) FSND SILT 0287 SAND GRVL CMTD 0304 BLUE CLAY STNS 0307
● CON 8	10	57-3303	614124 4932118	1060	07/66	4713	6	FR	135	60	120	10	3/00	ST DO	WOODROW G TPSL 0002 CLAY STNS 0060 MSND CLAY 0130 (S 0127 03) MSND GRVL 0135
● CON 8	10	57-7010	613450 4931900	1050	06/69	4713	6	FR FR	136 140	45	100	25	2/30	DO	BEATON E BRWN MSND BLDR 0020 BRWN CLAY BLDR 0050 BRWN MSND 0140 (S 0131 09)
● CON 8	11	57-3304	614164 4932008	1060	03/66	2514		FR	103	46	90	7	2/00	ST DO	MERKUS I PRDG 0075 BRWN CLAY MSND GRVL 0102 CSND GRVL 0103
● CON 8	14	57-10226	614490 4929375	968	08/73	1204	5	FR	50	22	50	4	2/00	DO	BULMER H GREY CLAY 0010 GREY CLAY SILT SAND 0050 BRWN SAND 0062 (S 0059 03)
CON 8	15	57-3305	614330 4928729	1010	02/62	3715	30	FR	50	30	40	2	24/00	DO	PROPER A MSND 0054
CON 8	15	57-3306	614845 4928684	1000	05/65	4713	6	FR	77	40	70	10	3/00	PS	ORO TWP GARAGE TPSL 0002 CLAY MSND 0040 FSND 0070 CSND 0077 (S 0070 07)
CON 8	15	57-10229	614702 4928993	1005	08/73	1204	5	FR	90	40	90	4	2/00	DO	PROPER A BRWN CLAY SAND 0010 GREY CLAY 0030 GREY CLAY SILT 0040 BRWN SAND 0050 GREY SILT 0070 GREY CLAY 0090 BRWN SAND 0101 (S 0097 03)
CON 8	16	57-3307	615071 4928789	1000	10/65	4715	4	FR	99	18	55	10	6/00	ST DO	BRIGGS N TPSL 0001 BRWN CLAY BLDR 0040 GREY CLAY 0065 MSND GRVL CLAY 0099 MSND 0103 (S 0099 04)
CON 8	16	57-16014	614950 4928700	1000	05/79	3660	5	FR	60	FLW	25	15	1/00	DO	CARDIFF W BRWN CLAY 0005 GREY CLAY BLDR 0045 GREY CLAY SLTY 0058 GREY SAND 0060 BRWN SAND 0063 (S 0060 03)
CON 8	17	57-10505	616434 4928512	980	07/73	4608	30	FR	15	25		4	/30	DO	FINLAYSON L BRWN CLAY STNS 0049
● CON 8	17	57-18206	615250 4928050	1000	09/82	1467	6	FR	92	14	41	5	9/00	DO	VICIC J BLCK TPSL 0001 BRWN SAND CLAY STNS 0034 GREY CLAY SAND 0062 GREY GRVL CLAY 0092 GREY CSND CMTD 0100 (S 0095 05)
CON 8	21	57-3275	616903 4925507	930	11/61	4102	30	FR	18	10		1		DO	MCLEAN A BRWN CLAY STNS 0022
CON 8	21	57-3278	616651 4925741	935	08/63	1312	6	FR	45	16	25	20	16/00	CO	BELL TELEPHONE CO BRWN CLAY 0012 GREY CLAY STNS 0035 GRVL HPAN 0045 GRVL MSND 0050 GREY CLAY 0055
CON 8	21	57-3308	616731 4925781	935	03/64	1312	6	FR	116	68	106	15	3/00	CO	JOHGMANS J CLAY GRVL 0010 BRWN CLAY 0024 GRVL 0025 GREY CLAY 0030 FSND 0043 GREY CLAY 0060

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
		15598	4921700					FR	155						CLAY GRVL LYRD 0034 CLAY STNS HARD 0059 CLAY 0110 CLAY GRVL 0134 CSND 0155 (S 0144 03) CLAY SAND 0185
CON 8	27	57- 15700	618950 4922600	725	10/78	1452		FR	98	4	12	10	21/00	DO	CANCILLA F BLCK TPSL 0001 GREY SAND STNS CMTD 0047 GREY GRVL CGRD 0062 GREY SAND GRVL CMTD 0104 BRWN SAND STNS 0105
CON 8	27	57- 16192	619550 4923100	750	07/79	3660	5	FR SU	212 242	15	175	5	48/00	DO	CRAWFORD W BLCK TPSL 0002 BRWN CLAY 0015 GREY CLAY 0093 BRWN SAND 0096 GREY CLAY GRVL BLDR 0206 GREY FSND CLAY 0208 YLLW LMSN FCRD 0212 GREY LMSN ROCK 0242
CON 8	27	57- 16712	619650 4923200	750	10/79	2514	6							DO	WINCH E TPSL DKCL 0001 BRWN SAND SILT BLDR 0027 GREY SILT SAND GRVL 0149
CON 8	27	57- 16715	619650 4923200	750	10/79	2514	6	FR	29	12	25	7	1/00	DO	WINCH E TPSL DKCL 0001 GREY SAND CLAY SILT 0012 GREY SILT SAND BLDR 0029 GREY GRVL SAND SILT 0032
CON 8	27	57- 17439	619100 4922750	750	05/81	3135	5	FR	115	18	100	3	15/00	DO	FEATHERSTONE J PRDG 0029 GREY CLAY STNS 0115 GREY SAND 0118 (S 0115 03)
CON 8	27	57- 17464	619250 4922750	750	10/79	3660	5	FR	203	FLW	150	4	3/00	DO	HELMAKAY W BLCK TPSL 0001 GREY CLAY BLDR 0083 BLUE CLAY GRVL LYRD 0195 BRWN FSND 0203 BRWN MSND MGVL 0209 (S 0204 03) GREY GRVL CMTD 0212 GREY LMSN ROCK 0212
CON 8	27	57- 17542	619450 4923250	750	07/81	3660	5	FR	227	6	75	15	1/00	DO	VANIN L BRWN CLAY 0015 GREY CLAY GRVL BLDR 0227 GREY SAND GRVL 0230 (S 0227 03) GREY LMSN ROCK 0230
CON 8	27	57- 17992	619700 4923250	750	10/80	3203	6	FR	212	10	58	18	2/00	DO	COWARD W BRWN SAND 0009 BRWN CLAY STNS 0048 BRWN SAND CLAY STNS 0062 GREY CLAY STNS GRVL 0078 GREY CLAY STNS PCKD 0148 GREY CLAY SILT LYRD 0208 GREY CLAY GRVL PCKD 0210 GREY LMSN 0211 GREY CGVL 0212
CON 8	27	57- 18046	618900 4922700	750	04/82	3203	6	FR	221	3	20	15	2/00	DO	DUNN D TPSL 0002 BRWN CLAY SAND 0006 GREY CLAY HARD 0042 GREY CLAY SAND SLTY 0182 GREY CLAY 0210 GREY CLAY SAND 0221 GREY GRVL CLAY 0224 GREY GRVL 0226 GREY CLAY 0226
CON 8	27	57- 18057	618750 4922600	750	11/81	3203		FR	148	10	70	10		DO	GREER E BLCK TPSL 0002 BRWN CLAY SNDY 0018 GREY CLAY STNS 0029 GREY CLAY SNDY 0101 GREY CLAY STNY 0119 GREY CLAY 0148 GREY GRVL CLAY 0159 GREY GRVL 0166 GREY CLAY GRVL STNS 0166
CON 9	1	57-	611500	925	11/69	4816	6	FR	170	44	86	11	24/00	ST DO	MACKAY GEO

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
		6974	4937570												GREY CLAY 0B0N 0015 GREY CLAY STNS 0066 MSND 0104 GREY CLAY 0115 CSND 0118 GREY CLAY 0168 GRVL 0175 (S 0171 03)
CON 9	2	57- 7621	611650 4936480	925	06/70	4713	6	FR	54	7	25	40	2/30	DO	SHUMACHER B BRWN CLAY STNS GRVL 0046 BRWN MSND GRVL 0054 (S 0046 08)
CON 9	4	57- 15475	612400 4935400	1000	08/78	3660	5	FR	125	33	33	10	2/00	DO	YOUNG W A BRWN SAND CLAY 0018 GREY CLAY 0048 GREY CLAY SAND GRVL 0075 BLUE CLAY 0093 GREY CLAY 0115 BRWN CLAY SAND HARD 0122 GREY SAND CLAY 0125 BRWN SAND CLAY 0129 (S 0125 04)
CON 9	4	57- 16522	612450 4935350	1000	11/79	3660	5			43	100	40	3/00	DO	YOUNG W BRWN CLAY SAND 0031 GREY CLAY STNS 0070 BLUE CLAY 0133 BRWN MSND 0140 (S 0137 03)
● CON 9	6	57- 17438	612950 4934450	1100	06/79	3135	5		85	54	78	4	2/30	DO	WIEDMAN J TPSL 0001 BRWN SAND PCKD 0085 BRWN SAND LOOS 0090 (S 0086 04)
● CON 9	10	57- 3335	614415 4932288	1050	05/66	4713	6	FR	153	60	90	15	2/00	ST DO	WILSON J PRDG 0006 MSND 0070 MSND CLAY 0145 CSND 0153 (S 0145 03)
● CON 9	10	57- 14741	615050 4932650	1070	09/77	2517	6	FR FR	150 168			5	3/00	DO	JEREMY LES BRWN SAND 0045 BRWN CLAY GRVL 0140 (S 0064 04) BRWN CLAY 0147 GREY GRVL CMTD 0164 GREY SAND 0168 GREY CLAY GRVL 0175
● CON 9	11	57- 7181	615140 4932580	1075	08/69	4713	6	FR	178	100	120	10	2/00	ST DO	HOLLIS STEEVES BRWN CLAY GRVL 0026 BRWN GRVL MSND 0055 BRWN MSND 0100 BLUE CLAY STNS 0160 BRWN MSND 0173 BRWN CSND STNS 0178
● CON 9	12	57- 3336	616191 4931823	1015	12/64	4608	30	FR	28	28		1		ST DO	MCKAY B BRWN CLAY 0012 GREY CLAY 0023 MSND 0029 GREY CLAY 0065
● CON 9	12	57- 18047	614750 4931500	1040	09/81	3135	5			55	78	12	1/30	ST DO	KOZAK P TPSL 0001 SAND CLAY 0010 CLAY SNDY 0055 SAND HARD PCKD 0090 SAND 0098 (S 0095 03)
● CON 9	13	57- 6226	615420 4930850	975	03/69	4608	30	FR	12	13				ST DO	STRACHAN GEORGE BLCK FILL 0008 BRWN CLAY STNS 0012 GRVL 0015 GREY CLAY STNS 0025
● CON 9	17	57- 11665	616575 4928575	970	10/74	2514	6	FR	125	12	20	25	1/30	DO	LUCAS G BRWN CLAY PCKD 0002 YLLW CLAY BLDR LOOS 0004 BRWN CLAY BLDR PCKD 0009 GREY CLAY BLDR PCKD 0017 GREY CLAY GRVL STKY 0046 GREY CLAY STKY 0072 GREY CLAY GRVL BLDR 0121 GREY CLAY GRVL HARD 0125 GREY GRVL SAND HARD 0128
● CON 9	17	57-	617500	975	04/80	2104	6	FR	418	25	60	30	15/00	IN	SHERIDAN NURSERIES

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MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
			16711 4929400												BRWN TPSL SAND LOOS 0001 BRWN CLAY BLDR DNSE 0040 BRWN SAND CLAY DNSE 0080 BRWN SAND SILT DNSE 0200 BRWN SAND GRVL DNSE 0227 BLUE CLAY DNSE 0418 BRWN GRVL SAND LOOS 0419 GREY LMSN PORS 0420
CON 9	20	57-3337	617926 4926907	930	07/67	4608	30	FR	46	39		2		DO	MCPHERSON H BRWN CLAY 0026 GREY CLAY STNS 0064
CON 9	20	57-10264	618700 4927710	925	02/73	4713	6	FR	72	15	30	40	2/30	DO	BATHOLEMEN L BRWN CLAY BLDR 0054 BRWN SAND GRVL 0072
CON 9	20	57-12982	617600 4927000	950	02/76	3660	5	FR	44	17	36	4	2/00	DO	MCPHERSON KEN BLCK TPSL 0001 BRWN SAND CLAY 0025 BRWN CLAY 0044 BRWN MSND GRVL 0048 (S 0045 03)
CON 9	21	57-3338	618954 4926889	900	12/61	4713	6	FR	170	6	100	10	4/00	ST DO	MCDOUGALL H TPSL 0002 CLAY STNS 0027 BLUE CLAY 0168 CLAY GRVL 0170
CON 9	21	57-3339	617854 4926445	910	01/62	3715	30	FR	35	5	35	2	24/00	DO	JOHNSTON R CLAY 0035 GRVL 0042
CON 9	23	57-3340	618613 4925413	880	02/65	4713	6	FR	205	70	90	20	2/00	ST DO	JOHNSTONE N PRDG 0069 CLAY STNS MSND 0200 (S 0198 04) GRVL MSND 0205
CON 9	23	57-3341	619834 4925807	810	09/66	4608	30	FR	22	22		2		DO	PIHLAJA P BRWN CLAY 0020 MSND 0037
CON 9	23	57-7343	619850 4925880	820	07/70	4608	30	FR FR	8 15	7	15		1/00	DO	VALIZUETTE GEO BRWN CLAY STNS 0005 GREY GRVL STNS 0015
CON 9	23	57-17879	619700 4925950	840	07/81	2514	6	FR	151	40	50	15	3/00	DO	MOORE D BLCK TPSL 0001 BRWN CLAY STNS 0034 BRWN SAND GRVL CLAY 0040 YLLW MSND 0043 GREY CLAY BLDR 0151 GREY GRVL SAND 0154 (S 0151 03)
CON 9	24	57-3342	619719 4925954	835	06/60	3414	4	FR	113	23	61	10	6/00	DO	PIHLAGA T PRDG 0040 BRWN CLAY 0108 MSND 0113 (S 0109 04)
CON 9	24	57-3343	618662 4925489	880	12/63	4102	30	FR	60	60		6		ST DO	JOHNSTON E BLUE CLAY 0042 CSND 0070
CON 9	24	57-9379	620040 4925600	790	09/72	2514	6	FR FR	124 129	FLW	20	32	1/00	DO	BAZZO V PRDG 0008 GREY HPAN BLDR 0039 GREY GRVL CLAY SAND 0071 GREY CLAY 0115 GREY FSND 0124 GRVL SAND SILT 0129
CON 9	24	57-14539	619300 4924200	755	08/77	4241	6	FR	29	1	9	20	2/30	DO	WALSH DOROTHY DAVID BLCK FILL 0002 BRWN SAND SILT GRVL 0027 BRWN SAND CGRD 0029
CON 9	25	57-7006	619900 4924460	740	06/69	4713	6	FR	95	FLW	60	20	2/30	DO	FOLLEY E GREY CLAY BLDR 0090 BLUE MSND GRVL 0095
CON 9	25	57-7625	619750 4924450	740	07/70	4713	6	FR	79	FLW	60	20	2/30	DO	GERASUNCHUK U BLUE CLAY BLDR GRVL 0078 BLUE GRVL MSND 0079
CON 9	25	57-7930	620400 4924800	725	04/71	4608	30	FR	55	10	62	4	1/00	DO	MONACO S BRWN CLAY STNS 0010 GREY HPAN 0065

MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
															CLAY 0194 GREY GRVL CLAY BLDR 0201 GREY GRVL CHTD WBRG 0201
CON 9	27	57- 10783	619950 4923750	720	02/74	1204	5	FR	190	5	170	4	3/00	DO	DATES R J BRWN CLAY SAND BLDR 0042 BRWN GRVL CLAY SAND 0050 GREY CLAY GRVL BLDR 0060 GREY CLAY GRVL 0190 BRWN SAND GRVL 0195 (S 0191 03)
CON 9	27	57- 12063	619800 4923250	725	11/74	3203	5		215	16	90	8	10/00	DO	BOWDEN R BRWN TPSL 0001 BRWN GRVL SAND 0026 BRWN CLAY 0035 GREY CLAY STNS 0130 GREY GRVL SAND CLAY 0178 GREY CLAY 0214 LMSN 0215
CON 9	27	57- 14200	619700 4923610	745	08/76	3203	5	FR	189	20	80	5	2/30	DO	STEWARD BILL BLCK TPSL 0001 BRWN CLAY STNS 0009 GREY CLAY STNS 0120 GREY CLAY 0189 GREY GRVL SAND CLAY 0192 (S 0191 03) GREY GRVL SAND 0194 CLAY 0194
CON 10	1	57- 7195	612620 4938280	955	12/69	4713	6	FR	70	42	65	8	2/00	ST DO	EGG ROBERT BRWN CLAY STNS 0027 BLUE CLAY STNS 0068 BLUE GRVL 0070
CON 10	5	57- 8529	614730 4936440	970	11/71	3203	6	FR FR	24 42	24	32	6	1/00	DO	SAILA BRWN TPSL 0002 BRWN SAND GRVL 0024 BRWN SAND GRVL 0042 (S 0039 03)
CON 10	7	57- 11181	614875 4935300	1045	05/74	3203	6	FR	156 184	110	174	3	3/00	DO	DUNCAN B I BLCK TPSL 0002 BRWN SAND LOOS DRY 0018 BRWN GRVL STNS HARD 0065 BRWN SAND CLAY 0130 GREY CLAY 0160 BRWN GRVL CLAY 0166 (S 0183 06) BRWN GRVL SAND WBRG 0138
CON 10	8	57- 10342	615288 4934821	1200	07/73	3203	6	FR	275	140	170	8	4/00	DO	BARNETT D PRDG 0025 BRWN SAND 0062 BRWN CLAY SAND 0095 BRWN GRVL STNS 0140 BRWN SAND CLAY 0180 GREY CLAY 0186 BRWN SAND CLAY 0188 GREY CLAY 0260 GREY CLAY SILT 0275 GREY GRVL 0277
CON 10	9	57- 3354	615532 4934048	1155	03/58	4713	6	FR	140	80	120	20	3/00	DO	GILLESPIE K TPSL 0002 BRWN CLAY 0020 MSND 0080 QSND 0130 BLUE CLAY 0135 GRVL MSND 0140
CON 10	9	57- 16638	615950 4934100	1100	11/79	3135	5	FR	217	193	208	9	1/30	DO	HOLDSWORTH W BRWN SAND GRVL STNS 0032 BRWN SAND DRY 0130 BRWN SAND STNS DRY 0138 BRWN SAND DRY 0172 GREY CLAY 0217 BRWN SAND 0225 (S 0222 03) CLAY 0225
CON 10	10	57- 16637	616150 4933850	1100	08/79	3135	5	FR	151	133	144	8	1/30	DO	FOREMAN D SAND DRY PCKD 0101 CLAY STNS 0108 SAND GRVL HARD 0151 SAND GRVL WBRG 0155 (S 0152 03)
CON 10	11	57- 12660	616285 4933215	1080	10/75	4715	6	FR	170	100	108	7	1/00	DO	TEMPLETON ROBERT BRWN TPSL 0003 BRWN SAND 0044 GREY GRVL SAND 0068 GREY CLAY 0080 BRWN SAND 0172

- CONTINUED -

MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC		LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CON	10	11	57- 15075	616750 4933100	1075	08/77	2514	6	FR	210	148	190	15	3/30	DO	(S 0166 04) BENNETT CLIFF BRWN TPSL SAND 0001 BRWN SAND CLAY MGRD 0120 GRVL STNS HARD 0133 BRWN SAND GRVL CLAY 0185 BRWN SAND CLAY 0210 BRWN SAND CGRD 0216 (S 0211 05)
CON	10	11	57- 15903	615950 4932850	1060	07/78	3135	5	FR	130	FLW	11	6	2/30	DO	KALJU P TPSL 0001 BRWN CLAY STNS 0011 GREY CLAY STNS 0055 GREY CLAY GRVL SAND 0078 GREY CLAY 0130 GREY GRVL 0130
CON	10	12	57- 14172	616900 4832550	1025	03/76	3203	5	FR	97	50	90	5	2/00	DO	SPARROW RUSS PRDG 0063 BRWN SAND PCKD 0097 SAND LOLS 0103 (S 0100 03) SAND CLAY 0103
CON	10	14	57- 3355	616857 4931145	965	06/59	4713		FR	57	6	30	50	2/00	DO	CRAWFORD W PRDG 0022 BLUE CLAY 0056 GRVL 0057
CON	10	15	57- 5796	617960 4931180	925	08/68	4608	30	FR	18	17				DO	ARNOLD B MSND 0004 BRWN CLAY STNS 0027
CON	10	15	57- 8507	617970 4930900	955	11/71	3203	5	FR FR	45 48	25	34	4	1/00	DO	MERCER J BRWN TPSL 0001 BRWN CLAY STNS 0017 GREY CLAY STNS 0045 BRWN SAND 0048 (S 0045 03)
CON	10	16	57- 9737	617920 4930670	970	02/73	3203	5	FR	44	30	35	10	1/00	DO	HART BRWN TPSL 0001 BRWN SAND 0046 BRWN SAND 0057 (S 0054 03)
CON	10	20	57- 3357	619621 4928247	890	02/64	1614	6	FR	89	14	25	4	4/00	CO DO	BEARDWOOD G GRVL FILL 0002 GRVL MUCK CLAY 0018 HPAN BLDR 0040 CLAY 0046 HPAN STNS 0089 GRVL 0093
CON	10	20	57- 11952	619550 4928250	930	12/74	4713	6	FR	214	95	150	20	2/30	DO	PROHPET DAVID PRDG 0015 BRWN CLAY STNS GRVL 0130 BLUE CLAY GRVL LYRD 0200 BLUE CLAY SAND STNS 0212 (S 0206 08) BRWN GRVL SAND LOCS 0214
CON	10	20	57- 14175	619850 4928300	885	04/76	3203	6	FR	178		165	5	48/00	CO DO	IMP OIL BRWN TPSL 0001 BRWN SAND GRVL 0019 GREY CLAY GRVL 0062 GREY CLAY HARD 0167 GREY SAND CLAY 0178 SAND 0184 (S 0179 05)
CON	10	20	57- 15866	618850 4927850	925	12/78	2653	6	FR	80	35		7	2/00	DO	HAWSLER K HPAN BLDR 0035 SAND 0070 SAND GRVL 0080
CON	10	21	57- 3358	619203 4927116	885	01/62	3715	30	FR	35	5	35	2	24/00	DO	JOHNSTON R CLAY 0035 GRVL 0042
CON	10	21	57- 3359	619870 4928038	875	11/65	2514		FR	237	45	125	14	3/30	ST DO	ROE H PRDG 0035 BRWN CLAY MSND 0044 BLUE CLAY MSND BLDR 0125 BLUE CLAY 0160 BLUE CLAY MSND SILT 0200 MSND GRVL SILT 0230 MSND GRVL 0236 GREY MSND 0242 (S 0238 03)
CON	10	21	57- 3360	619193 4927041	885	01/62	3715	30	FR	40	30	38	3	24/00	ST	JOHNSTON R CLAY 0040 GRVL 0042
CON	10	21	57-	619600	885	12/77	4241	6	FR	230	78	105	14	6/00	DO	FOTEVSKI BORIS VERKA

- CONTINUED -

MUNICIPALITY CODE 57010 (CONTINUED...)

CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
		14391	4925500												SAND GRVL CMTD 0102 CLAY SILT 0128 CLAY GRVL 0175 LMSN FCRD 0188 CLAY 0192 LMSN 0216
CON 10	25	57-14993	621300 4925700	725	12/77	3135	5	FR	118	FLW				DO	BRISTOW JOHN TPSL 0001 BRWN CLAY STNS 0011 GREY CLAY STNS GRVL 0055 GREY CLAY 0105 GREY CLAY SILT LYRD 0111 GREY CLAY GRVL HARD 0118 GREY GRVL 0118
CON 10	25	57-15000	621050 4925400	725	12/77	3135	5	FR	123	7	100	4	3/00	DO	HOSICK RALPH TPSL 0001 BRWN CLAY STNS 0013 GREY CLAY GRVL HARD 0063 GREY CLAY 0102 GREY CLAY SILT LYRD 0123 SAND 0126 (S 0123 03)
CON 10	25	57-15908	620650 4925300	750	10/78	3135	5	FR	170		144	5	48/00	DO	HECKROTH W TPSL 0001 BRWN CLAY STNS 0010 GREY CLAY GRVL HARD 0120 GREY CLAY BLDR GRVL 0135 GREY GRVL CLAY 0170 GREY GRVL WBRG 0170
CON 10	25	57-16632	621050 4925700	750	06/79	3135	5	FR	100	19	30	10	1/00	DO	NURMING M PRDG 0053 GREY CLAY SOFT 0101 GREY SAND WBRG 0104 (S 0101 03)
CON 10	25	57-16710	620750 4925200	750	04/80	1467	5	FR	136	FLW		3	4/00	DO	COLEMAN J BLCK TPSL 0002 GREY CLAY STNS GRVL 0029 GREY CLAY GRVL LYRD 0131 GREY CGVL 0136 BRWN SAND 0139 (S 0136 03)
CON 10	25	57-16716	620950 4925400	750	10/79	2514	6	FR	112	14	109	10	1/30	DO	SCHIELE R PRDG 0022 GREY SILT SAND BLDR 0080 GREY CLAY SOFT 0108 GREY FSND CLAY 0115 (S 0112 03)
CON 10	25	57-17880	621400 4925850	725	05/81	2514	6	FR	114	7	98	20	1/00	DO	VOGELMANN M BRWN CLAY SAND BLDR 0012 GREY CLAY SILT SAND 0035 GREY SAND SILT 0056 GREY CLAY SOFT 0114 GREY MSND 0118 (S 0115 03)
CON 10	26	57-14112	620600 4925150	735	04/77	2104	6	FR	134		110	20	4/30	DO	WESTON TED BLCK TPSL STNS LOOS 0003 BLUE CLAY STNS DNSE 0132 BRWN GRVL SAND LOOS 0134
CON 11	1	57-3370	613433 4938779	960	03/66	4608	30	FR	20	16		2		PS	COMMUNITY HALL MSND 0010 GREY CLAY 0020
CON 11	3	57-8536	614320 4937380	975	12/71	4608	30	FR	25	25	30	2	1/00	DO	BIEZER J E BRWN CLAY STNS 0025 GRVL 0032
CON 11	4	57-18203	615350 4937550	875	09/82	4816	11			FLW		10	2/00	ST DO	JOHNSTON A SAND GRVL CLAY 0003 BRWN CLAY 0018 GREY CLAY 0083 CSND 0095 (S 0087 05)
CON 11	5	57-13565	615050 4936200	950	07/76	3663	6	FR	35	15	23	6	2/30	DO	TUDHOPE STEPHEN BRWN TPSL LOOS 0003 BRWN SAND DNSE 0023 BRWN GRVL SAND LOOS 0035 (S 0029 03)
CON 11	7	57-14232	616040 4935950	1000	05/77	3660	5	FR	152	127		5	2/00	DO	GRANT JIM BRWN TPSL 0006 RED SAND 0028 GREY SAND GRVL DRY 0090 BRWN SAND CLAY 0095 BRWN SAND CLAY 0105 BRWN SAND GRVL 0152 BRWN GRVL CMTD 0161 (S 0158 03)

CONCESSION ETC		LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR/MN	WATER USE	OWNER/LOG/SCREEN DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
MUNICIPALITY CODE 57010 (CONTINUED...)																
• CON	11	9	57- 3371	616110 4934463	1165	01/66	5206	4	FR	230	230	235	4	10/00	ST DO	GOODFELLOW H BRWN MSND 0006 BRWN MSND GRVL 0248
• CON	11	9	57- 17924	616250 4934300	1150	11/79	2653	6			100	100	10		DO	FLEMMING B SAND CLAY 0095 GRVL SAND 0160 CLAY 0240 GRVL 0269
• CON	11	11	57- 10258	617175 4933850	1050	08/73	4713	6	FR	101	80	80	20	2/30	DO	HANZLIK RICHARD BRWN SAND CLAY LYRD 0060 BRWN GRVL STNS DNSE 0100 BRWN GRVL LOOS 0101
• CON	11	11	57- 10259	617500 4934075	1005	06/73	4713	6	FR	85	60	80	4	2/30	DO	CRESSWELL HARRY BRWN SAND CLAY LYRD 0060 (S 0077 08) BRWN SAND LOOS 0085
CON	11	11	57- 11483	617320 4933957	1050	07/74	4713	6	FR	92	75	75	25	2/30	DO	ROACH B BRWN FSND CLAY BLDR 0035 BRWN GRVL 0091 BRWN GRVL 0092
CON	11	11	57- 14255	617150 4933600	1075	05/77	2104	6	FR	157	112	150	8	8/30	DO	WAGG WILLIAM BRWN SAND DNSE 0150 (S 0143 04) BRWN SAND LOOS 0157
CON	11	11	57- 16988	616800 4933600	1025	11/75	1312	6	FR	104	96	100	6	2/00	DO	ABBOTT W BRWN HPAN SNDY 0050 BRWN SAND GRVL 0104
CON	11	12	57- 3372	618171 4933486	1010	07/60	4713	6	FR	406	135	240	10	6/00	ST DO	HORN A TPSL 0002 CLAY STNS 0080 MSND GRVL CLAY 0160 BLUE CLAY STNS 0390 GRVL MSND 0406 (S 0399 07)
CON	11	12	57- 3373	617231 4932790	1035	07/66	4713	6	FR	76	40	70	10	2/00	ST DO	HARN H TPSL 0002 CLAY STNS 0035 FSND CLAY 0073 CSND 0081 (S 0074 04)
CON	11	13	57- 3374	618526 4932868	935	04/60	4713	6	FR	380	101	248	10	6/00	ST DO	HORN E TPSL 0002 CLAY STNS 0050 MSND 0240 BLUE CLAY 0373 GRVL 0380
CON	11	13	57- 16124	617500 4932200	1000	07/79	2104	6	FR	61	12	30	20	5/00	ST	HORNE E BLCK TPSL LOOS 0002 BRWN SAND DNSE 0058 BRWN SAND GRVL LOOS 0061 BRWN SAND GRVL CLAY 0061
CON	11	15	57- 7011	618800 4931360	940	06/69	4713	6	FR	47	10	40	5	2/30	DO	ONASCHUCH W BRWN CLAY MSND STNS 0040 (S 0039 08) BRWN MSND GRVL STNS 0047
CON	11	15	57- 15627	619100 4931800	981	11/78	4241	6	FR	46	27	39	8	2/30	DO	MOULD W BRWN CLAY TILL 0010 BRWN SAND GRVL CLAY 0041 BRWN FSND MSND 0043 BRWN FSND CSND GRVL 0046 BRWN MSND GRVL 0049 (S 0046 03)
CON	11	15	57- 15631	619100 4931800	981	11/78	4241	6	FR	41	25	35	10	2/00	DO	BUTLER A PRDG 0026 BRWN SAND GRVL CLAY 0039 BRWN FSND MSND GRVL 0040 BRWN MSND GRVL CLAY 0041 BRWN MSND CSND FGVL 0044 (S 0041 03)
CON	11	16	57- 3375	619501 4931680	931	03/58	4713		FR	46	30	38	10	2/00	DO	HARDING R PRDG 0030 BLUE CLAY 0044 GRVL 0046
CON	11	16	57-	619564	930	10/64	4816	6	FR	80	30	60	2	2/00		EAST ORO SCHOOL

- CONTINUED -

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5722696 | MUNICIP | CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Oro	6	5

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Fran Booth	RR Oro Station	DAY 23 MO 11 YR 87

21 | ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Sand			0	6
Brown	Clay			6	85
Brown	Sand		Course	85	101
	Sand	Silt		101	156
Gray	Clay			156	195
	Sand	Clay		195	235
	Sand		Med course	235	282
Brown	Sand	Clay		285	298

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
281	☒ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6 1/4	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC	.188	0	276
5	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC	.188	273	276
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
20	6 Tele INCHES	5 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
Stainless Steel	276 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	25	Hole Plug

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
Air Lift ☐ PUMP ☐ BAILER	12 GPM	2 HOURS 36 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
221 FEET	270 FEET	270 FEET	270 FEET	270 FEET	270 FEET

WATER LEVELS DURING ☐ PUMPING ☐ RECOVERY

IF FLOWING, GIVE RATE ___ GPM | PUMP INTAKE SET AT ___ FEET | WATER AT END OF TEST ☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 270 FEET | RECOMMENDED PUMPING RATE 12 GPM

FINAL STATUS OF WELL

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED ☐ DEWATERING

WATER USE

☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

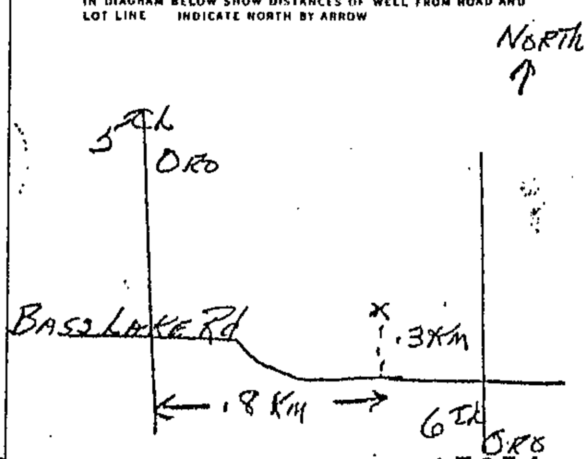
METHOD OF CONSTRUCTION

☐ CABLE TOOL ☒ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING ☐ DIGGING ☐ OTHER

1583

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW



17354

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Clearwater Drilling	1583

ADDRESS: RR1 Barrie

NAME OF WELL TECHNICIAN	WELL TECHNICIAN'S LICENCE NUMBER
Allan Wright	T0250

SIGNATURE OF TECHNICIAN/CONTRACTOR | SUBMISSION DATE DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED DEC 23 1987
DATE OF INSPECTION | INSPECTOR
REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK [X] CORRECT BOX WHERE APPLICABLE

11 | 5725566 | MUNICIP 57019 | CON. CON | 06

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	ORO	6	7

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
DOVER GARY	24 Barrett Crs. Barrie Ont	DAY 11 MO 09 YR 89

21 | ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	SAND	GRAVEL		0	90
GREY	CLAY	GRAVEL		90	175
BROWN	GRAVEL	SAND CLAY		175	203
GREY	SAND		fine w/B	203	212
GREY	CLAY	SAND		212	217

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
203-212	1 [X] FRESH 3 [ ] SULPHUR 2 [ ] SALTY 4 [ ] MINERALS 6 [ ] GAS
	1 [ ] FRESH 3 [ ] SULPHUR 2 [ ] SALTY 4 [ ] MINERALS 6 [ ] GAS
	1 [ ] FRESH 3 [ ] SULPHUR 2 [ ] SALTY 4 [ ] MINERALS 6 [ ] GAS
	1 [ ] FRESH 3 [ ] SULPHUR 2 [ ] SALTY 4 [ ] MINERALS 6 [ ] GAS
	1 [ ] FRESH 3 [ ] SULPHUR 2 [ ] SALTY 4 [ ] MINERALS 6 [ ] GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 [X] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE 5 [ ] PLASTIC	.188	+1'6"	205
	1 [ ] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE 5 [ ] PLASTIC			
	1 [ ] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE 5 [ ] PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
4	5 INCHES	5 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
JOHNSON	205 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
203	205	K-PACKER LEAD
5	10	BenSeal

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 [ ] PUMP 2 [X] BAILER	4 GPM	2 HOURS MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
135 FEET	200 FEET	160 FEET	145 FEET	135 FEET	135 FEET

WATER LEVELS DURING: 1 [ ] PUMPING 2 [X] RECOVERY

IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 [X] CLEAR 2 [ ] CLOUDY

RECOMMENDED PUMP TYPE: [ ] SHALLOW [X] DEEP | RECOMMENDED PUMP SETTING: 300 FEET | RECOMMENDED PUMPING RATE: 4 GPM

FINAL STATUS OF WELL

1 [X] WATER SUPPLY
2 [ ] OBSERVATION WELL
3 [ ] TEST HOLE
4 [ ] RECHARGE WELL
5 [ ] ABANDONED, INSUFFICIENT SUPPLY
6 [ ] ABANDONED, POOR QUALITY
7 [ ] UNFINISHED
[ ] DEWATERING

WATER USE

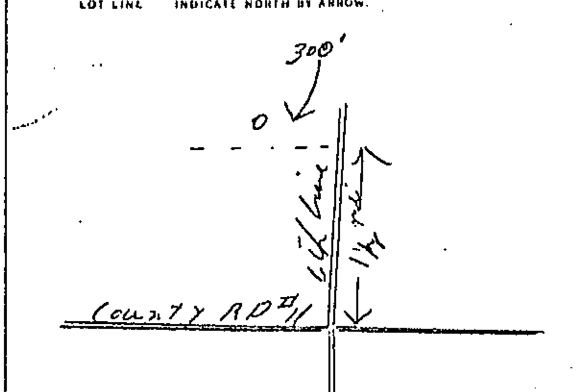
1 [X] DOMESTIC
2 [ ] STOCK
3 [ ] IRRIGATION
4 [ ] INDUSTRIAL
[ ] OTHER
5 [ ] COMMERCIAL
6 [ ] MUNICIPAL
7 [ ] PUBLIC SUPPLY
8 [ ] COOLING OR AIR CONDITIONING
9 [ ] NOT USED

METHOD OF CONSTRUCTION

1 [X] CABLE TOOL
2 [ ] ROTARY (CONVENTIONAL)
3 [ ] ROTARY (REVERSE)
4 [ ] ROTARY (AIR)
5 [ ] AIR PERCUSSION
6 [ ] BORING
7 [ ] DIAMOND
8 [ ] JETTING
9 [ ] DRIVING
[ ] DIGGING [ ] OTHER

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



58195

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
MARCHILDON DRILLING	3660

ADDRESS: RR1 SHANTY BAY ONT

NAME OF WELL TECHNICIAN	WELL TECHNICIAN'S LICENCE NUMBER
PETER MARCHILDON	T2364

SIGNATURE OF TECHNICIAN/CONTRACTOR: Peter Marchildon | SUBMISSION DATE: DAY 15 MO 09 YR 89

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 3660 | DATE RECEIVED SEP 21 1989
DATE OF INSPECTION | INSPECTOR
REMARKS

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FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 5718946 MUNICIP CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT
Simcoe	Oro	6	8

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Vamer Gordon	R.R.I Oro Station	DAY 10 MO 8 YR 83

21 ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
		Hardpan		0	40
		Hardpan & clay		40	95
		Gravel		95	I05
		Sandy hardpan		I05	I50
		Fine sand		I50	I55

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
I55	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6¼	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	I88	0	I49
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SLOT NO.	DIAMETER	LENGTH
I8	6 INCHES	4 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
stainless steel	7'9 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☒ PUMP ☒ BAILER	2 GPM	1 week HOURS MINS

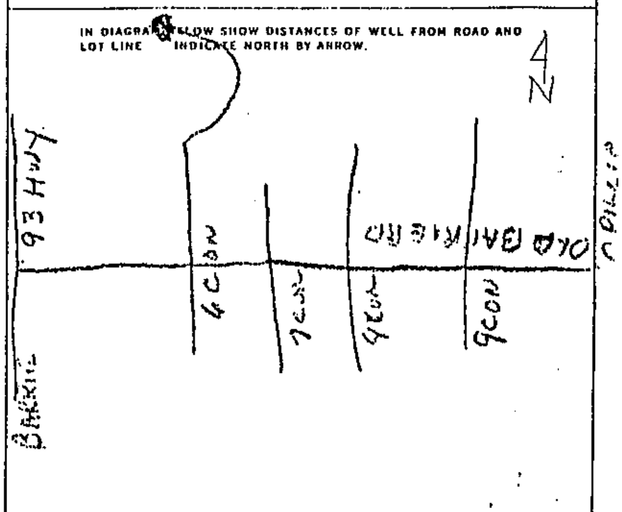
STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
40 FEET	40 FEET	40 FEET	40 FEET	40 FEET	40 FEET

WATER LEVELS DURING: ☐ PUMPING ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: I55 FEET
RECOMMENDED PUMPING RATE: 2 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL	
☒ WATER SUPPLY	☐ ABANDONED, INSUFFICIENT SUPPLY
☐ OBSERVATION WELL	☐ ABANDONED, POOR QUALITY
☐ TEST HOLE	☐ UNFINISHED
☐ RECHARGE WELL	

WATER USE	
☒ DOMESTIC	☐ COMMERCIAL
☐ STOCK	☐ MUNICIPAL
☐ IRRIGATION	☐ PUBLIC SUPPLY
☐ INDUSTRIAL	☐ COOLING OR AIR CONDITIONING
☐ OTHER	☐ NOT USED

METHOD OF DRILLING	
☒ CABLE TOOL	☐ BORING
☐ ROTARY (CONVENTIONAL)	☐ DIAMOND
☐ ROTARY (REVERSE)	☐ JETTING
☐ ROTARY (AIR)	☐ DRIVING
☐ AIR PERCUSSION	

CONTRACTOR

NAME OF WELL CONTRACTOR	LICENCE NUMBER
Walter Howell & Sons Limited	2653

ADDRESS: I65 Cedar Island Rd. Orillia Ontario

NAME OF DRILLER OR BORER	LICENCE NUMBER
Walter Howell	2653

SIGNATURE OF CONTRACTOR: Walter Howell
SUBMISSION DATE: DAY MO YR

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 170284
DATE OF INSPECTION | INSPECTOR
REMARKS

MINISTRY OF THE ENVIRONMENT COPY

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11 | 5725424 | MUNICIP 57910 | CON. CON | 197

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Oro	7	6

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Ginn, Jeff	RR 1 - ORO STATION	DAY 17 MO 08 YR 89

21 ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	sand	gravel streaks		0	40
	sand	gravel	coarse	40	75
brown	sand	gravel streaks	medium	75	156
gray	clay		dense	156	166
brown	sand		medium	166	222
gray	clay	silt		222	245

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
216	1 [X] FRESH

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼"	1 [X] STEEL	.188	0	212
5"	1 [X] STEEL	.188	209	212

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
10	6" tele INCHES	4 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
stainless steel	212 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	20	hole plug

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
airlifted	8 GPM	1 HOURS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
162 FEET		189 FEET	175 FEET	166 FEET	162 FEET

Water levels during: 2 [X] RECOVERY

WATER AT END OF TEST: 1 [X] CLEAR

RECOMMENDED PUMP TYPE: [X] DEEP | RECOMMENDED PUMP SETTING: 200 FEET | RECOMMENDED PUMPING RATE: 6 GPM

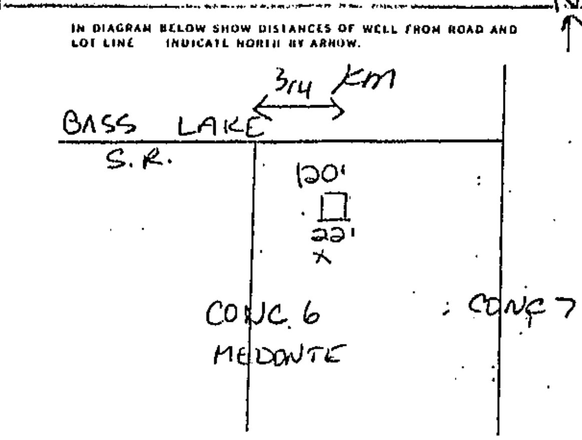
FINAL STATUS OF WELL: 1 [X] WATER SUPPLY

WATER USE: 1 [X] DOMESTIC

METHOD OF CONSTRUCTION: 2 [X] ROTARY (CONVENTIONAL)

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



64382

DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Clearwater DRilling	1583

ADDRESS: R.R. #1 Barrie Ont L4M 4Y8

NAME OF WELL TECHNICIAN	WELL TECHNICIAN'S LICENCE NUMBER
Allan Wright	T0250

SIGNATURE OF TECHNICIAN/CONTRACTOR | SUBMISSION DATE: DAY 31 MO 08 YR 89

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 1583 | DATE RECEIVED SEP 08 1989

DATE OF INSPECTION | INSPECTOR

REMARKS

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Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11 | 5720114 | MUNICIP | CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Oro	7	6

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Eric Bennett	RR 2 Hawkstone	DAY 10 MO June YR 85

21 | ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
			Top soil	0	1
			Brown clay	1	25
			Coarse sand	25	41

31

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
30	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
30"	☒ CONCRETE	2½	0	10
30"	☒ GALVANIZED	16 guage	10	30
24"	☒ GALVANIZED	16 guage	30	45

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10		ton Granular A cement sealed

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☐ PUMP ☒ BAILER	3 GPM	4 HOURS MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
25 FEET	36 FEET	36 FEET	36 FEET	36 FEET	36 FEET

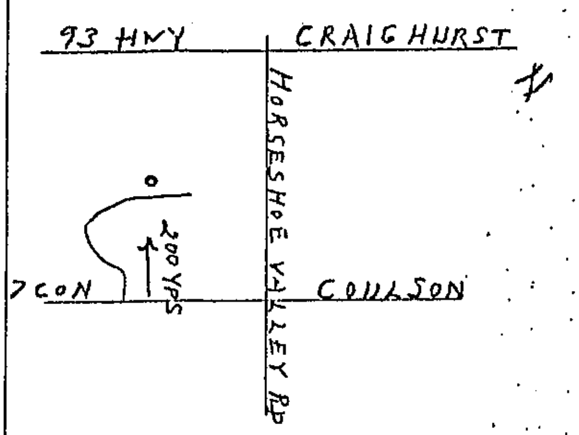
WATER LEVELS DURING: ☐ PUMPING ☐ RECOVERY

IF FLOWING, GIVE RATE: — GPM | PUMP INTAKE SET AT: — FEET | WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 38 FEET | RECOMMENDED PUMPING RATE: 3 GPM

6008 LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED

WATER USE

☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING

☐ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☒ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: LONE STAR WELL DIGGING | LICENCE NUMBER: 3413
ADDRESS: SITE 11, R.R. 6, BARRIE, ONTARIO, L4M 5P5, (705) 436-4359
NAME OF WELL TECHNICIAN: B. Moore | LICENCE NUMBER: 3744
SIGNATURE OF CONTRACTOR: B. Moore | SUBMISSION DATE: DAY 10 MO June YR 85

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: 25 09 85
DATE OF INSPECTION | INSPECTOR
REMARKS

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Ministry of the Environment
Ontario

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WATER WELL RECORD

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11 5718749 MUNICIP CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Oro	VII	8

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Garside, Bob	244 St. Vincent St., BARRIE, Ont. L4M 3Z8	DAY 31 MO 8 YR 83

21 ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	top soil			0	1
	sand			1	8
	fine gravel	& stone, cemented sand		8	65
	cemented sand	, gravel/stones		65	95
	sand & gravel			95	123
	fine gravel			123	126
grey	clay			126	142
	sand gravel/	streaks clay, silt		142	225
	silt, fine	gravel/clay, sand		225	260
	cemented sand	& gravel		260	299
	med.-coarse	sand		299	312
	cemented sand	& clay		312	320

31

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN: SIZE(S) OF OPENING (SLOT NO.) DIAMETER INCHES LENGTH FEET; MATERIAL AND TYPE; DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	320	drill cuttings

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER | PUMPING RATE GPM | DURATION OF PUMPING HOURS MINS

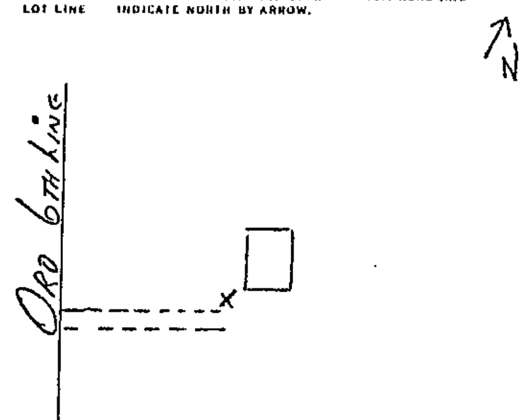
STATIC LEVEL FEET | WATER LEVEL END OF PUMPING FEET | WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY: 15 MINUTES FEET, 30 MINUTES FEET, 45 MINUTES FEET, 60 MINUTES FEET

IF FLOWING, GIVE RATE GPM | PUMP INTAKE SET AT FEET | WATER AT END OF TEST 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE ☐ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING FEET | RECOMMENDED PUMPING RATE GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL: 1 ☐ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☒ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE: 1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING: 1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Snider Drilling and Equipment Ltd. LICENCE NUMBER: 4816

ADDRESS: R. R. #1, (Craighurst), BARRIE, Ont. L4M 4Y8

NAME OF DRILLER OR BORER: Phillip Brown. LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Snider Drilling and Equipment Ltd. SUBMISSION DATE: MO ____ YR ____

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED 17 11 83

DATE OF INSPECTION | INSPECTOR

REMARKS

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Ministry of the Environment

Ontario

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WATER WELL RECORD

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11 5718750 MUNICIP. CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	ORO	VII	8

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Garside, Bob	244 St. Vincent St., BARRIE, Ont. L4M 3Z8	DAY 9 MO 9 YR 83

21 ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	sand & stones	& gravel		0	124
	clay			124	126
	medium sand			126	133
	clay & fine	sand & silt		133	200
	clay & silt/	fine sand		200	338
	clay & silt/	grey clay		338	364
	coarse sand	& clay		364	368
	medium sand			368	377
grey	clay			377	396
		total depth: 370 feet			

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41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
NOT TESTED	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	+6"	338
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	338	370
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
14	6 INCHES	3 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
stainless steel wire wound	Kpacker 301 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
370	396	drill cuttings

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER air	4 GPM	HOURS MINS

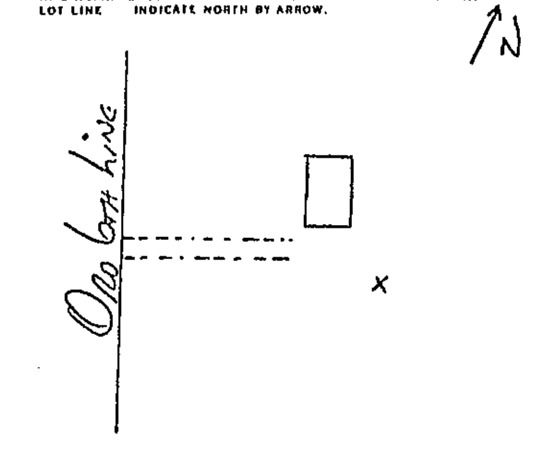
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
224 FEET	FEET	FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE: GPM — PUMP INTAKE SET AT: FEET — WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP — RECOMMENDED PUMP SETTING: 300 FEET — RECOMMENDED PUMPING RATE: 4 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL
1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING
1 ☒ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Snider Drilling and Equipment Ltd. — LICENCE NUMBER: 4816

ADDRESS: R.R.#1, (Craighurst), BARRIE, Ont. L4M 4Y8

NAME OF DRILLER OR BORER: Ronald Jensen & Allan Wright — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Snider Drilling and Equipment Ltd — SUBMISSION DATE: DAY MO YR

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR — DATE RECEIVED: 17 11 83

DATE OF INSPECTION — INSPECTOR

REMARKS

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Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

5719519

1. PRINT ONLY IN SPACES PROVIDED
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COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Oro	VII	8

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Alexander, E. R.	Box 514, BARRIE, Ont. L4M 4T7	DAY 25 MO 9 YR 84

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	top soil			0	3
	sand, gravel, stones			3	14
	sand & gravel			14	87
	clay & brown sand			87	108
	clay & medium grey sand			108	139
	medium brown sand			139	151

WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
154	☒ FRESH

CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6	☒ STEEL	.188	+1	148

SCREEN

SLOT NO.	DIAMETER	LENGTH
16	6 INCHES	3 FEET

MATERIAL AND TYPE: stainless steel wire wound

DEPTH TO TOP OF SCREEN: 148 FEET

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

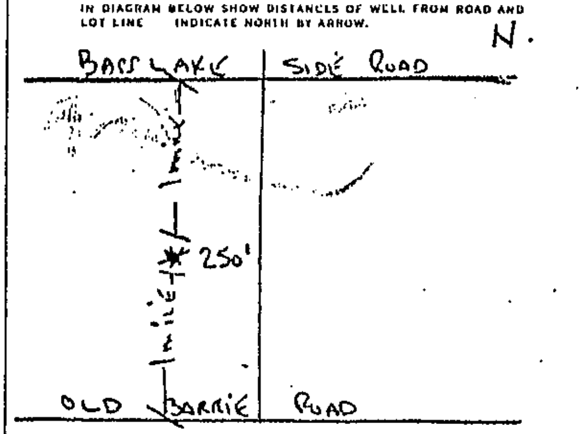
PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☒ BAILER	8 GPM	2 HOURS

STATIC LEVEL	WATER LEVEL END OF PUMPING	RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE	WATER AT END OF TEST
139 FEET	152 FEET	☒ DEEP	152 FEET	5 GPM	☒ CLEAR

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL: ☒ WATER SUPPLY

WATER USE: ☒ DOMESTIC

METHOD OF DRILLING: ☒ CABLE TOOL

CONTRACTOR

NAME OF WELL CONTRACTOR: Snider Drilling and Equipment Ltd. LICENCE NUMBER: 4816

ADDRESS: R. R. #1, (Craighurst), BARRIE, Ont. L4M 4Y8

NAME OF DRILLER OR BORER: Ronald Jensen

SIGNATURE OF CONTRACTOR: Snider Drilling and Equipment Ltd. SUBMISSION DATE: MO. ___ YR. ___

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: 10 1284

DATE OF INSPECTION | INSPECTOR

REMARKS

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 5720959

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT
SIMCOE	ORO	7	9

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
NORMAN, HARRY		DAY 7 MO 7 YR 86

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BLACK	TOP SOIL			0	6"
BROWN	SAND	GRAVEL		6"	60'
GREY	SAND	GRAVEL	HARD	60'	120'
BROWN	SAND	CLAY		120'	180'
GREY	SAND	GRAVEL		180'	230
YELLOW	SAND		MED - COARSE W/B	230'	238'

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
230-238	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
5	☒ STEEL	.188	0	230

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
14	5 INCHES	3 FEET

MATERIAL AND TYPE: JOHNSON SUPER — DEPTH TO TOP OF SCREEN: 232

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
224	232	K-PACKER & NIPPLE

71 PUMPING TEST

PUMPING TEST METHOD: AIR — ☒ PUMP ☐ BAILER
PUMPING RATE: 7 GPM
DURATION OF PUMPING: 2 HOURS

STATIC LEVEL: 154 FEET
WATER LEVEL END OF PUMPING: 220 FEET
WATER LEVELS DURING: ☐ PUMPING ☒ RECOVERY

WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 220 FEET
RECOMMENDED PUMPING RATE: 7 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE INDICATE NORTH BY ARROW.

DRILLERS REMARKS

FINAL STATUS OF WELL

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED POOR QUALITY ☐ UNFINISHED

WATER USE

☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING

☐ CABLE TOOL ☒ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: MARCHILDON DRILLING LTD — LICENCE NUMBER 3660
ADDRESS: RR#1 SHANTY BAY ONT L0L2L0
NAME OF DRILLER OR BORER: PETER MARCHILDON — LICENCE NUMBER 3660
SIGNATURE OF CONTRACTOR: Peter Marchildon — SUBMISSION DATE DAY __ MO 7 YR 86

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR — DATE RECEIVED 030986
DATE OF INSPECTION — INSPECTOR
REMARKS

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
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County or District	Township, Borough, City, Town, Village	Con., Block, Tract, Survey, etc.	Lot
Simcoe	Oro Twp.	Con. 7	11

Owner (Surname First)	Address	Date Completed
Seeley & Arnill Aggreg. Ltd.	c/o Henderson Paddon & Assoc, Ltd. 945 3rd. Ave.E., Owen Sound, ON N4K 2K7	Day 6 Mo Apr. Yr 89.

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

General Colour	Most Common Material	Other Materials	General Description	Depth - Feet From	To
Brown	Sand		Fine	0	12
	Sand	Gravel	Coarse	12	38
	Cobbles	Stones, Gravel		38	44
	Silty sand	Clay	Fine	44	48
	Silty sand	Gravel	Fine	48	105
	Cenented sand	Gravel, Clay		105	145
Brown	Sand		Fine	145	151
Brown	Sand		Coarse	151	178
	Sand	Gravel	Coarse	178	196
Grey	Clay	Silt till		196	200

PY

WATER RECORD

Water Found at - Feet	Kind of Water
178-196	☒ Fresh

CASING & OPEN HOLE RECORD

Inside Diam Inches	Material	Wall Thickness Inches	Depth - Feet From	To
8	☒ Steel	.250	-3	180

SCREEN

Slot No. / Material and Type	Diameter	Length
3' x 0 slot 11' x 16 slot 4' x 20 slot 3' x 0 slot Stainless Steel Telescope	8 inches	21 feet
	Depth to top of screen: 176 feet	

PLUGGING & SEALING RECORD

Depth Set At - Feet From	To	Material and Type (Cement Grout, Lead Packer, etc.)

PUMPING TEST

Pumping Test Method	Pumping Rate	Duration of Pumping
☒ Pump ☐ Bailer	300 Imp.	24 hours

Static Level	Water Level End of Pumping	15 Minutes	30 Minutes	45 Minutes	60 Minutes
86.71' feet	136.91' feet	133.73' feet	134.25' feet	135.04' feet	135.40' feet

Water levels during: X Pumping / Recovery

Pump intake set at: 160 feet. Water at end of test: ☒ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep. Recommended pump setting: 160 feet. Recommended pumping rate: 300 GPM

FINAL STATUS OF WELL

☒ Water supply

WATER USE

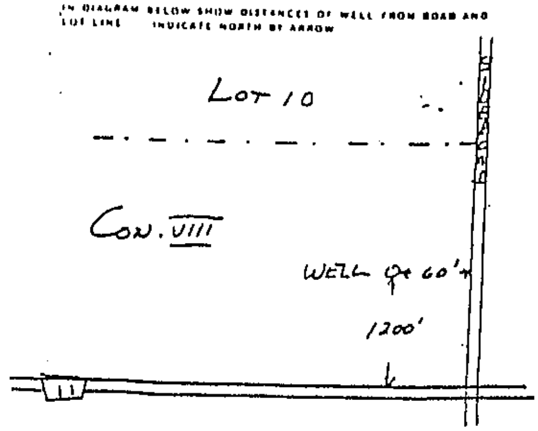
☒ Industrial

METHOD OF CONSTRUCTION

☒ Rotary (conventional)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



34609

Drillers remarks: PRODUCTION WELL

CONTRACTOR

Name of Well Contractor	Well Contractor's Licence Number
Davidson Well Drilling Limited	1737

Address: Box 486, Wingham, Ontario. N0G 2W0

Name of Well Technician	Well Technician's Licence Number
Clearwater Drilling	1597

Signature of Technician/Contractor: [signature] Submission date: Day 28 Mo Apr. Yr 89

OFFICE USE ONLY

Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

County or District	Township	Con.	Lot
Simcoe	Oro	7	12

Owner	Address	Date Completed
MUSICCO, Leon	R.R.#2 Oro Station LOL 2E0	11 07 89

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Colour	Common Material	Other Materials	General Description	From	To
brown	clay	stones, gravel		0	15
brown	clay			15	45
brown	sand	silt	fine	45	81
brown	sand		medium	81	115
	sand	gravel	coarse	115	135
brown	sand		medium	135	155

WATER RECORD

Water found at	Kind of water
74	X fresh

CASING & OPEN HOLE RECORD

Inside diam.	Material	Wall thickness	From	To
6¼"	X steel	.188	0	151
5"	X steel	.188	148	151

SCREEN

Slot No.	Diameter	Length
16	6" tele	3

Material and type: stainless steel — Depth to top of screen: 151

PLUGGING & SEALING RECORD

From	To	Material and type
0	20	hole plug

Pumping test method: Drifted — Pumping rate: 50+ — Duration of pumping: 1

Static level: 50 — Water levels during X pumping: 49.5, 49.7, 49.9, 50

X clear

Recommended pump type: X deep — Recommended pump setting: 120 feet — Recommended pumping rate: 10

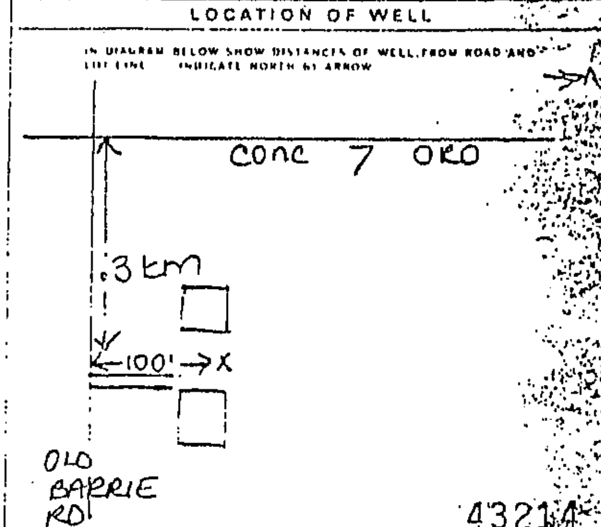
FINAL STATUS OF WELL: X water supply

WATER USE: X domestic

METHOD OF CONSTRUCTION: X rotary (conventional)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



43214

Drillers remarks

Name of well contractor: Clearwater Drilling — Licence number: 1583

Address: R.R.#1 Barrie, ont. L4M 4Y8

Name of well technician: Allan Wright — Well technician's licence number: T0250

Submission date: 31 07 89

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Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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11 5722215

County or District	Township, Borough, City, Town, Village	Con., Block, Tract, Survey etc.	Lot
Simcoe	ORO	5	6

Owner (Surname First)	Address	Date Completed
Cuthbertson B.	RR#2 Oro Station Ont	Day 1 Mo 10 Yr 84

21 Zone / Easting / Northing / RC / Elevation / RC / Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

General Colour	Most Common Material	Other Materials	General Description	Depth - Feet From	Depth - Feet To
	Topsoil			0	1
	Sand			1	22
	Sand	clay, silt		22	108
	Gravel		wet	108	–

31
32

41 WATER RECORD

Water Found at - Feet	Kind of Water
108	☐ Fresh ☐ Sulphur ☐ Salty ☐ Mineral
	☐ Fresh ☐ Sulphur ☐ Salty ☐ Mineral
	☐ Fresh ☐ Sulphur ☐ Salty ☐ Mineral
	☐ Fresh ☐ Sulphur ☐ Salty ☐ Mineral
	☐ Fresh ☐ Sulphur ☐ Salty ☐ Mineral

51 CASING & OPEN HOLE RECORD

Inside Diam Inches	Material	Wall Thickness Inches	Depth - Feet From	Depth - Feet To
5	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open Hole	.188	0	108
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open Hole			
	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open Hole			

SCREEN

Size(s) of Opening (Slot No.)	Diameter	Length
	Inches	Feet

Material and Type — Depth to Top of Screen — Feet

61 PLUGGING & SEALING RECORD

Depth Set At - Feet From	To	Material and Type (Cement Grout, Lead Packer, etc.)

71 PUMPING TEST

Pumping Test Method	Pumping Rate	Duration of Pumping
☐ Pump ☒ Bailer	5 GPM	2 Hours Mins

Static Level	Water Level End of Pumping	15 Minutes	30 Minutes	45 Minutes	60 Minutes
15 Feet	65 Feet	65 Feet	65 Feet	65 Feet	65 Feet

Water levels during: ☐ Pumping ☐ Recovery

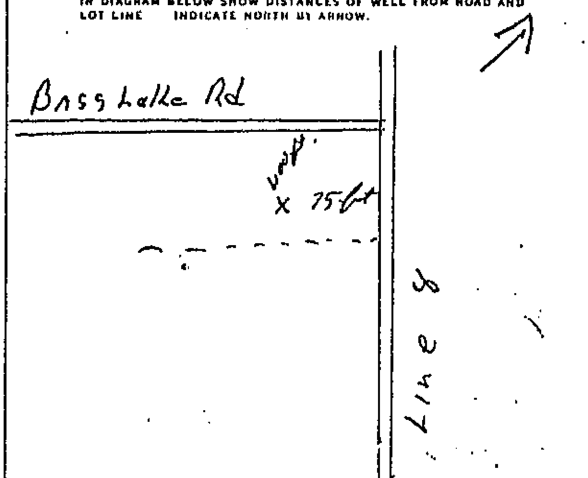
If flowing, give rate: GPM — Pump intake set at: Feet — Water at end of test: ☒ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep — Recommended pump setting: 90 Feet — Recommended pumping rate: 5 GPM

LOCATION OF WELL

650

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

☒ Water Supply ☐ Observation Well ☐ Test Hole ☐ Recharge Well ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Quality ☐ Unfinished

WATER USE

☒ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Other ☐ Commercial ☐ Municipal ☐ Public Supply ☐ Cooling or Air Conditioning ☐ Not Used

METHOD OF DRILLING

☒ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Rotary (Air) ☐ Air Percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving

3135

CONTRACTOR

Name of Well Contractor: Kent Well Drilling — Licence Number: 3135
Address: RR#1 Barrie Ont
Name of Driller or Borer: Ted Westray — Licence Number:
Signature of Contractor: [signature] — Submission Date: Day Mo. Yr.

OFFICE USE ONLY

Data Source: — Contractor: — Date Received: SEP 01 1987
Date of Inspection: — Inspector:
Remarks:

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Ministry of the Environment

Ontario

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WATER WELL RECORD

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11 · 5722220 MUNICIP CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	ORO	8	6

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Leach L	RR #2 Oro Station Ont	DAY 12 MO 5 YR 84

21 ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	Topsoil			0	1
	Sand	clay		1	52
	clay			52	105
	Clay	Layers o Sand		105	146
	Sand		Fine Wet	146	154

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
146 151	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
5	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	.198	0	148
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
6	5 INCHES	3+3 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
Johnson SS	148 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☐ PUMP ☒ BAILER	5 GPM	2 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING ☐ PUMPING ☐ RECOVERY 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
23 FEET	125 FEET	90 FEET	118 FEET	125 FEET	125 FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

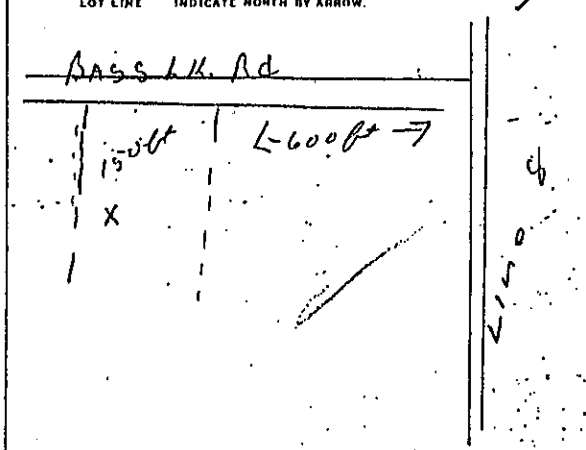
RECOMMENDED PUMP SETTING: 135 FEET

RECOMMENDED PUMPING RATE: 5 GPM

LOCATION OF WELL

638

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED

WATER USE

☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ OTHER ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ NOT USED

METHOD OF DRILLING

☒ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☐ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING

3135

CONTRACTOR

NAME OF WELL CONTRACTOR: Kort Well Drilling — LICENCE NUMBER: 3135

ADDRESS: RR #1 Barrie Ont

NAME OF DRILLER OR BORER: Ted Wanstas — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: [signature] — SUBMISSION DATE: DAY ___ MO. ___ YR. ___

OFFICE USE ONLY

DATA SOURCE — CONTRACTOR — DATE RECEIVED: SEP 01 1987

DATE OF INSPECTION — INSPECTOR

REMARKS

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Ministry of the Environment
Ontario

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WATER WELL RECORD

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COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	ORO	8	6

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Leach H	RR # 2 Oro Station	DAY 9 MO 5 YR 84

21 | ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Sand		dry, packed	0	35
	Sand		wet	35	45

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
35 115	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	42
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
10	5 INCHES	3 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
Johnson SS	42 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
		K Packer

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	7 GPM	1 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☐ RECOVERY): 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
12 FEET	30 FEET	30 FEET	30 FEET	30 FEET	30 FEET

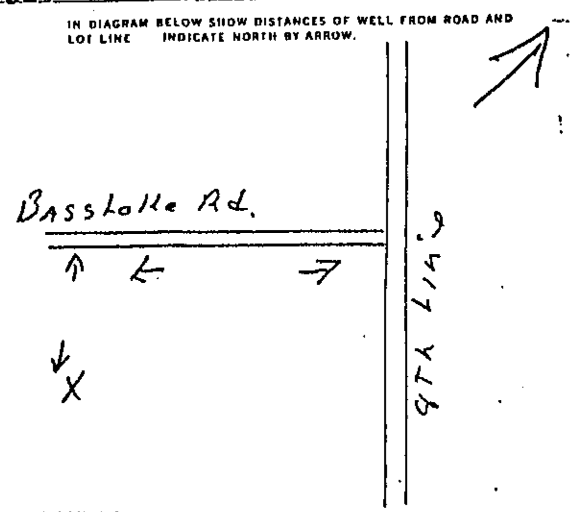
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	35 FEET	7 GPM

LOCATION OF WELL

639

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

3135

CONTRACTOR

NAME OF WELL CONTRACTOR	LICENCE NUMBER
Kent Well Drilling	3135

ADDRESS: RR #1 Barrie Ont

NAME OF DRILLER OR BORER	LICENCE NUMBER
Ted Woodward	

SIGNATURE OF CONTRACTOR	SUBMISSION DATE
[signature]	DAY ___ MO. ___ YR. ___

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
		SEP 01 1987

DATE OF INSPECTION | INSPECTOR

REMARKS

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WATER WELL RECORD

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11 | 5720061 | MUNICIP | CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT
Simcoe	Oro	8	10

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Peter Fluker Group Ltd	P. O. Box 994, Orillia, Ont. L3V 6K8	DAY 1 MO 8 YR 85

21 | ZONE | EASTING | NORTHING | RC | ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	sand	stones	dense	0	100
Grey	clay	stones	dense	100	130
Brown	sand		loose	130	137
Grey	clay	gravel	dense	137	
		Screen set from 133 to	137 ft.		

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
137 tested	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	133
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SLOT(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
18	6 INCHES	4 FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN
stainless steel	129 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	18 GPM	4 HOURS — MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
60 FEET	120 FEET	120 FEET	120 FEET	120 FEET	120 FEET

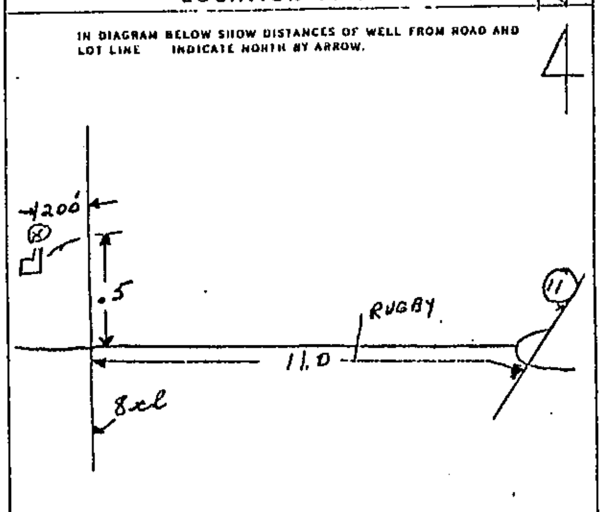
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: -- GPM | PUMP INTAKE SET AT: 120 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 120 FEET | RECOMMENDED PUMPING RATE: 18 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 5 Y W

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Faulkner Well Drilling Co. Ltd | LICENCE NUMBER: 2104
ADDRESS: 789 Erskine Ave., Peterborough, Ont.
NAME OF DRILLER OR BORER: Jack Miller | LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Tim Faulkner | SUBMISSION DATE: DAY 2 MO 8 YR 85

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: 230885
DATE OF INSPECTION | INSPECTOR
REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506-4-77 FORM 7

Tables

APPENDIX B

DATA TABLES

ORO SEVENTH LINE AGGREGATE PROPERTIES
TABLE B-1
PROPERTY LOCATIONS, EXTRACTION AREAS AND TONNAGES

DHL TBLB1

maximum probable 50%

OPERATOR	CON	LOT	PROPOSED LICENCE AREA (Ha)	EXTRACTION AREA (APPROX.) (Ha)	ASSUMED MAX. ACTIVE AREA (Ha)	PROPOSED LICENCE TONNAGE 50% (tonnes/yr)	PROPOSED AVERAGE TONNAGE (50 % OF LICENCE) 94% (tonnes/yr)
SEELEY & ARNILL AGGREGATES LTD.	7	E1/2 10,11	50.8	46	46	23 1750000	875000
ORO TOWNSHIP	8	W1/2 11	25	25	25	13	
ALFA AGGREGATES LIMITED	7	PART E1/2 9	32.2	26.65	26.65	14 750000	375000
JAMES DICK CONSTRUCTION LIMITED	7	W1/2 7,9, PT 8 E1/2 8	169.7	149	49	25 1000000	500000
THE SARJEANT CO. LTD.	8	W1/2 8	43.8	39	39	20 750000	375000
ALLAN G. COOK LIMITED	8	W1/2 7	38.8	34.16	34.16	17 900000	450000
TOTAL			360	320	220	5150000	2575000

Notes: Assumed maximum active area is maximum cleared area at any one time
Proposed licence tonnage is the maximum allowable extraction in any one year
Proposed average tonnage is the maximum expected average tonnage in any one year

ORO SEVENTH LINE AGGREGATE PITS
TABLE B-2
AQUIFER CHARACTERISTICS

DHL TBLB2

PROPERTY	LOCATION	AQUIFER	AQUIFER THICKNESS (m)	HYDRAULIC CONDUCTIVITY (cm/s)	METHOD OF CALC.	TRANSMISSIVITY (m2/dy)	STORATIVITY	TESTED RATE (m3/dy)	(l/s)	(IGM)
James Dick Construction Limited	M6	A1	5.9	0.01	HZ	51				
				0.0001	HZ	1				
The Sarjeant Co. Ltd.	TW5	A1	8.5	0.0037	HV	27				
	TW2	A2	12	0.02	HZ	207				
				0.04	HZ	415				
	TW8	A2	4.9		TS	22		393	4.5	60
					TS	92	5.6E-05			
Allan G. Cook Limited	OW1/91	A1	5.2	0.005	HV	22				
				0.007	HV	31				
Seeley & Arnill Aggregates Ltd.	1/89	A2	15.5		TS	500	4.4E-04	1964	22.7	300

Note Method of calculation

HZ	HAZEN	from grain size analysis
HV	HVORSLEV	from response testing of well
TS	THEIS	from pump testing of well

ORO SEVENTH LINE AGGREGATE PROPERTIES

TABLE B-3

WATER LEVEL AND STREAM FLOW MONITORING DATA

DHL TBLB3

PROPERTY	LOCATION	AQUIFER	GROUND LEVEL ELEVATION (masl)	WATER LEVEL (masl)					
				3 MAY 91	13 MAY 91	22 JUL 91	31 JUL 91	1 OCT 91	19 ma'
James Dick Construction (Charlesworth, 1991)	M6	A1	352.31	322.9	322.9	323.3		323.5	
	DC1	PERCHED	367.25	334.6	335.6	335.7		335.4	
	DC2	A1	354.08	320.2	320.3	320.3		320.5	
	DC4	A1	354.62	326.2	326.3	326.5		326.9	
	DC5	A1	352.03	325.9	326.2	327.2		327.2	
	11915						321.7		
				JUL 91	AUG 91	SEP 91	10 OCT 91	11 DEC 91	
The Sarjeant Co. Ltd. (Dixon Hydrogeology, 1992)	OW1	A1	354.73	320.0			318.5	318.5	
	TW2	A2	358.10	314.5			314.5		40.6
	OW3	A1	356.24	317.5					
	TH4		347.67						
	TW5	A1	356.22		317.2		316.1	317.2	
	TH6		362.74						
	TW7	A1	356.22		317.5			317.3	
	TW8	A2	342.88			309.3	309.9		
				14 NOV 91	11 DEC 91				
Allan G. Cook Limited (Dixon Hydrogeology, 1992)	OW1/91	A1	343.22	315.2	315.0				28.97
Alfa Aggregates Limited (Dixon Hydrogeology, 1991)	11628	A1	362.26	323.6					
	OW1/91			DRY					
				APR 89					
Seeley & Arnill Aggregates Ltd. (Henderson Paddon, 1990)	1/89	A2		316.00					
				STREAM FLOW (APPROX.) (m3/s)					
				26 NOV 91					
Coldwater R. west tributary	culvert beneath Rowanwood Rd.			0.03					
Coldwater R. east tributary	culvert beneath 8th Line			0.13					
Hawkestone Ck. 15/16 SR	bridge at 15/16th SR			0.23					

ORO SEVENTH LINE AGGREGATE PIT
TABLE B-4
WATER QUALITY ANALYSES

THE SARJEANT CO. LTD.
TEST WELL 8

REPORT OF ANALYSIS

ARECO CANADA INC., 28 CONCOURSE GATE, NEPEAN, ONTARIO, K2E 7T7
TELEPHONE: (613) 228 1145 FAX: (613) 228 1148

LABORATORY I.D.: 161091-4
SAMPLE MATRIX: Well Water
REPORT NUMBER: 3292810

CLIENTS JOB NUMBER: Dixon, SO9 Q03
DATE SUBMITTED: 16-10-91
DATE REPORTED: 28-10-91

DRINKING WATER CRITERIA	UNITS	RESULTS				
PARAMETERS		Well #8				
Colour	T.C.U.	<1				
Hardness($CaCO_3$)	mg/L	123				
Alkalinity($CaCO_3$)	mg/L	115				
Turbidity	N.T.U.	0.7				
Conductivity	uS/cm	250				
pH		8.07				
Fluoride	mg/L	<0.1				
Chloride	mg/L	<1				
Nitrite (N)	mg/L	<0.1				
Nitrate (N)	mg/L	<0.1				
Sulphate	mg/L	4.3				
Calcium	mg/L	16.1				
Magnesium	mg/L	20.1				
Sodium	mg/L	12.9				
Potassium	mg/L	1.1				
Ammonia (N)	mg/L	0.06				
TKN	mg/L	0.5				
Cyanide	mg/L	<0.02				
Phenols	mg/L	<0.002				
TOC	mg/L	2				
DOC	mg/L	2				

ORO SEVENTH LINE AGGREGATE PIT
TABLE B-4
WATER QUALITY ANALYSES

THE SARJEANT CO. LTD.
TEST WELL 8

REPORT OF ANALYSIS

ARECO CANADA INC., 28 CONCOURSE GATE, NEPEAN, ONTARIO, K2E 7T7
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SAMPLE MATRIX: Well Water
REPORT NUMBER: 3292810

CLIENTS JOB NUMBER: Dixon, SO9 Q03
DATE SUBMITTED: 16-10-91
DATE REPORTED: 28-10-91

DRINKING WATER CRITERIA	UNITS	RESULTS				
PARAMETERS		Well #8				
Barium	mg/L	0.11				
Cadmium	mg/L	<0.004				
Chromium	mg/L	<0.01				
Copper	mg/L	<0.01				
Arsenic	mg/L	<0.01				
Boron	mg/L	0.05				
Iron	mg/L	0.04				
Lead	mg/L	<0.04				
Manganese	mg/L	<0.005				
Selenium	mg/L	<0.01				
Silver	mg/L	<0.01				
Zinc	mg/L	<0.01				
Mercury	mg/L	<0.001				
Uranium	mg/L	<0.0002				

ORO SEVENTH LINE AGGREGATE PIT
TABLE B-4
WATER QUALITY ANALYSES

THE SARJEANT CO. LTD.
TEST WELL 8

REPORT OF ANALYSIS

ARECO CANADA INC., 28 CONCOURSE GATE, NEPEAN, ONTARIO, K2E 7T7
TELEPHONE: (613) 228 1145 FAX: (613) 228 1148

LABORATORY I.D.: 161091-4
SAMPLE MATRIX: Well Water
REPORT NUMBER: 3282810

CLIENTS JOB NUMBER: Dixon, SO9 Q03
DATE SUBMITTED: 16-10-91
DATE REPORTED: 28-10-91

DRINKING WATER CRITERIA	UNITS	RESULTS				
PARAMETERS		Well #8				
Total Coliform	/100ml	0				
Fecal Coliform	/100ml	0				
Fecal Strep.	/100ml	0				
Background	/100ml	TNTC				
Anion Sum	meq/L	2.81				
Cation Sum	meq/L	3.05				
% Difference	%	4.06				
Ion Ratio	AS/CS	0.92				
Conductivity (calc.)	uS/cm	255				
TDS (ion sum calc.)	mg/L	159				
SAR		0.51				
Langelier Index	S.I.	-0.16				

Greg Clarkin

Certified by
Greg Clarkin, B.Sc., GeoChem
Lab Manager

ORO SEVENTH LINE AGGREGATE PIT
TABLE B-4
WATER QUALITY ANALYSES

SEELEY & ARNILL AGGREGATES LTD.
WELL 1/89

HENDERSON, PADDON & ASSOCIATES
MR. IAN FLEMING

LAB NUMBER.................... 128
SAMPLE NAME................... HENDERSON, PADDON
SAMPLE LOCATION............... EDGAR GRAVEL PIT

CLIENT'S JOB NUMBER........... 88300
COLLECTION DATE............... April 21, 1989

DETERMINATION	DETECTION		RESULT
Sodium	0.5	mg/L	2.0
Potassium	0.1	mg/L	1.0
Calcium	0.005	mg/L	62.0
Magnesium	0.001	mg/L	14.0
Hardness	0.05	mg/L	213
Alkalinity (CaCO3)	1.0	mg/L	199
Carbonate	1.0	mg/L	1.7
Bicarbonate	1.0	mg/L	197
Sulphate	1.0	mg/L	12.6
Chloride	1.0	mg/L	1.4
Silica (SiO2)	0.5	mg/L	10.8
Ortho Phosphate (P)	0.01	mg/L	0.01
Nitrate+Nitrite (N)	0.05	mg/L	0.95
Ammonia (N)	0.05	mg/L	<0.05
Colour (true)	3.0	TCU	<3.0
Turbidity	0.1	NTU	<0.1
Conductivity (25C)	0.1	umho/cm	423
pH	0.0	units	7.9
Total Organic Carbon	0.5	mg/L	1.0
Iron (total)	0.02	mg/L	0.02
Copper (total)	0.01	mg/L	<0.01
Manganese (total)	0.01	mg/L	<0.01
Zinc (total)	0.01	mg/L	0.02

Cation Sum.................meq/L..	4.38
Anion Sum..................meq/L..	4.35
%Difference................%......	0.34
Ion Ratio.........................	1.01
TDS (ion sum, calculated)..mg/L...	349
Conductivity (calc.).......umho/cm	422
Saturation pH 5 C.................	7.77
Langelier Index 5 C...............	0.18

APPENDIX C

CALCULATION TABLES

ORO SEVENTH LINE AGGREGATE PROPERTIES
TABLE C-1
WATER BUDGET VALUES THORNTHWAITE MODEL

DHL TBLC1

15099 MIDHURST ONT. WATER BUDGET VALUES FOR THE PERIOD 1953 TO 1989

LAT.... 44.27 WATER HOLDING CAPACITY...100 MM HEAT INDEX... 33.90

LONG... 79.46 LOWER ZONE.............. 60 MM A........... 1.038

SUMMARY FROM 1953 to 1989

MONTH	TEMP (C)	PCPN	RAIN	MELT	PE	PCPN-PE	AE	DEF	SURP	SNOW	SOIL
1	-8.6	69	7	17	1	68	1	0	23	296	100
2	-7.8	61	14	24	1	60	1	0	37	422	100
3	-3.6	51	21	66	4	47	4	0	84	379	100
4	4.3	64	58	80	31	33	31	0	112	96	98
5	11.1	66	66	0	62	3	61	-1	18	0	86
6	16.2	73	73	0	96	-24	89	-7	5	0	63
7	19.5	89	89	0	144	-55	106	-38	5	0	44
8	19.0	75	75	0	104	-30	74	-31	0	0	34
9	15.0	113	113	0	92	21	75	-17	13	0	51
10	8.8	75	75	0	37	38	35	-2	19	0	76
11	3.1	73	62	6	14	59	14	-0	39	8	92
12	-4.5	94	33	21	3	92	3	0	49	135	99
	SUM	901	684	214	589	312	492	-96	407		

15810 ORILLIA ONT. WATER BUDGET VALUES FOR THE PERIOD 1929 TO 1961

LAT....44.37 WATER HOLDING CAPACITY... 100 MM HEAT INDEX... 33.92

LONG...79.24 LOWER ZONE..............60 MM A........... 1.038

15820 ORILLIA TS ONT. WATER BUDGET VALUES FOR THE PERIOD 1980 TO 1989

LAT....44.37 WATER HOLDING CAPACITY... 100 MM HEAT INDEX... 36.34

LONG...79.25 LOWER ZONE..............60 MM A........... 1.074

SUMMARY FROM 1929 to 1961 and 1980 to 1989

MONTH	TEMP (C)	PCPN	RAIN	MELT	PE	PCPN-PE	AE	DEF	SURP	SNOW	SOIL
1	-8.6	66	11	16	1	65	1	0	25	297	97
2	-8.4	56	10	20	1	55	1	0	29	445	98
3	-3.4	76	35	84	5	71	5	0	112	539	99
4	4.8	65	60	76	26	39	26	0	114	87	98
5	11.1	73	73	1	62	11	62	-0	28	0	86
6	16.4	66	66	0	97	-31	87	-10	3	0	64
7	19.8	89	89	0	146	-57	110	-36	2	0	41
8	19.4	70	70	0	106	-36	72	-34	1	0	30
9	16.1	97	97	0	80	17	64	-16	7	0	46
10	9.5	93	93	0	51	42	46	-5	24	0	70
11	2.9	74	62	6	14	60	14	-0	37	11	91
12	-5.0	97	30	21	2	95	2	0	46	164	98
	SUM	922	695	223	590	331	489	-101	427		
MEAN VALUES		911	690	219	589	322	491	-99	417		

Note: All measurements are in mm except where noted.

Source: CANADIAN CLIMATE CENTRE

PCPN	:Precipitation
MELT	:Snow Melt
PE	:Potential Evapotranspiration
PCPN-PE	:SURP/DEF (Water Body)
AE	:Actual Evapotranspiration
DEF	:AE-PE Difference between available and required water
SURP	:SURPLUS Precipitation in excess of Evapotranspiration
SNOW	:Water equivalent of accumulated snow
SOIL	:Water storage in Soil

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-2
WATER BUDGET VALUES HARGREAVES MODEL
POTENTIAL EVAPOTRANSPIRATION

PE=kd(.38-.0038h)(t-32)

PE Potential Evapotranspiration (in)

k vegetation coefficient

d monthly daytime coefficient

h mean monthly relative humidity (Muskoka Climate Station)

t mean monthly temperature (F)

DHL TBLC2

Deciduous Orchard / Pasture

15099 MIDHURST ONT.

MONTH	k	d	h	t	PE	MONTH	k	d	h	t	PE
1						1					
2						2					
3	0.14	0.99	65	25		3	0.11	0.99	65	25	
4	0.45	1.09	55	40	0.65	4	0.25	1.09	55	40	0.36
5	0.49	1.24	52	52	2.22	5	0.29	1.24	52	52	1.31
6	0.74	1.26	58	61	4.34	6	0.33	1.26	58	61	1.93
7	0.71	1.27	58	67	5.06	7	0.31	1.27	58	67	2.21
8	0.55	1.17	60	66	3.35	8	0.32	1.17	60	66	1.95
9	0.43	1.01	63	59	1.65	9	0.32	1.01	63	59	1.23
10	0.36	0.91	64	48	0.71	10	0.22	0.91	64	48	0.43
11						11	0.14	0.77	74	38	0.06
12						12					
					17.96 inches						9.48 inches
					456 mm						241 mm

15810 and 15820 ORILLIA ONT.

MONTH	k	d	h	t	PE	MONTH	k	d	h	t	PE
1						1					
2						2					
3	0.14	0.99	65	26		3	0.11	0.99	65	26	
4	0.45	1.09	55	41	0.72	4	0.25	1.09	55	41	0.40
5	0.49	1.24	52	52	2.22	5	0.29	1.24	52	52	1.31
6	0.74	1.26	58	61	4.39	6	0.33	1.26	58	61	1.96
7	0.71	1.27	58	68	5.13	7	0.31	1.27	58	68	2.24
8	0.55	1.17	60	67	3.41	8	0.32	1.17	60	67	1.98
9	0.43	1.01	63	61	1.77	9	0.32	1.01	63	61	1.32
10	0.36	0.91	64	49	0.77	10	0.22	0.91	64	49	0.47
11						11	0.14	0.77	74	37	0.06
12						12					
					18.41 inches						9.74 inches
					468 mm						247 mm

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-3
SUMMARY OF CHANGES TO THE LOCAL WATER BUDGET

DHL TBLC3

Dust Supp

Increased Recharge Clearing the Excavation m3/dy/Ha (mm/annum)			Maximum Extraction Area (Table B-1) Ha	Water Budget Gains equivalent avg. m3/dy			Evaporation Wash Pond m3/dy	Evaporation Stockpiles m3/dy	Exported Water (Table C-4) m3/dy			Water Budget Losses m3/dy		Net Change m3/dy		
Low	Avg.	High		Low	Avg.	High				Low	High	Low	High	Low	Avg.	High
1.4 (50)	4.1 (150)	6.8 (250)	220	308	902	1496	64	32	Max. Avg. Extraction	140	234	236	330	+72	+572	+1166
							12.8	6.4	Max. Licenced Extraction	280	467	376	563	-68	+339	+933

-100

Note: Evaporation loss from wash pond is equivalent to 12.8 m3/dy/Ha for June through Aug. assuming a 1 Ha pond per operation.

Evaporation loss from stockpiles is equivalent to a surface area of 1 Ha per operation and an evaporation rate of 12.8 m3/dy/Ha for half of the time during the period of June through Aug.

ORO 7th LINE AGGREGATE PITS
TABLE C-4
ESTIMATED EXPORTED WATER

DHL TBLC4

OPERATOR	PROPOSED LICENCE TONNAGE tonnes/yr	ESTIMATED TONNAGE OF WASHED PRODUCT	tonnes/yr	RETAINED WATER m3/yr 3 %	m3/yr 5 %	EXPORTED WATER (OPERATING 190 DAYS) m3/day 3 %	m3/day 5 %
SEELEY & ARNILL AGGREGATES LTD.	1750000	25 %	437500	13125	21875	69	115
ALFA AGGREGATES LIMITED	750000	25 %	187500	5625	9375	30	49
JAMES DICK CONSTRUCTION LIMITED	1000000	25 %	250000	7500	12500	39	66
THE SARJEANT CO. LTD.	750000	90 %	675000	20250	33750	107	178
ALLAN G. COOK LIMITED	900000	25 %	225000	6750	11250	36	59
TOTAL			1775000	53250	88750	280	467
	PROPOSED AVERAGE TONNAGE (50 % OF LICENCE)						
SEELEY & ARNILL AGGREGATES LTD.	875000	25 %	218750	6563	10938	35	58
ALFA AGGREGATES LIMITED	375000	25 %	93750	2812.5	4687.5	15	25
JAMES DICK CONSTRUCTION LIMITED	500000	25 %	125000	3750	6250	20	33
THE SARJEANT CO. LTD.	375000	90 %	337500	10125	16875	53	89
ALLAN G. COOK LIMITED	450000	25 %	112500	3375	5625	18	30
TOTAL			887500	26625	44375	140	234

230
303
237
116
152
119

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-5a
GROUNDWATER MOUNDING THEIS EQUATION
MINIMUM RECHARGE INCREASE (1.4 M3/DY/HA)

DHL TBLC5A

Q m3/day	Increased recharge
k m/day	Aquifer hydraulic conductivity
T m2/day	Aquifer transmissivity
S	Aquifer storativity
s m	Mounding at distance r
t days	Time since mounding started
r m	Distance from centre of property

THEIS

s = (Q/(4PIT) LN ((2.25Tt)/(r2S))

Q	T	S	t	MOUNDING (m)				
				r =	200	300	400	500
SEELEY & ARNILL AGGREGATES LTD. 46 Ha								
64	100	0.1	365		0.2	0.1	0.1	0.1
64	200	0.1	365		0.1	0.1	0.1	0.0
64	500	0.1	365		0.0	0.0	0.0	0.0
TOWNSHIP OF ORO 25 Ha								
35	100	0.1	365		0.1	0.1	0.0	0.0
35	200	0.1	365		0.1	0.0	0.0	0.0
37	400	0.1	365		0.0	0.0	0.0	0.0
ALFA AGGREGATES LIMITED 26.65 Ha								
37	50	0.1	365		0.1	0.1	0.1	0.0
37	100	0.1	365		0.1	0.1	0.0	0.0
37	200	0.1	365		0.1	0.0	0.0	0.0
JAMES DICK CONSTRUCTION LIMITED 50 Ha								
70	30	0.1	365		0.3	0.2	0.1	0.0
70	50	0.1	365		0.3	0.2	0.1	0.1
70	100	0.1	365		0.2	0.1	0.1	0.1
THE SARJEANT CO. LTD. 39 Ha								
55	30	0.1	365		0.3	0.1	0.1	0.0
55	50	0.1	365		0.2	0.1	0.1	0.0
55	100	0.1	365		0.1	0.1	0.1	0.1
ALLAN G. COOK LIMITED 34.16 Ha								
48	30	0.1	365		0.2	0.1	0.1	0.0
48	50	0.1	365		0.2	0.1	0.1	0.0
48	100	0.1	365		0.1	0.1	0.1	0.0

ORO SEVENTH LINE AGGREGATE PITS

TABLE C-5b

GROUNDWATER MOUNDING THEIS EQUATION

AVERAGE RECHARGE INCREASE (4.1 M3/DY/HA)

DHL TBLC5B

Q m3/day	Increased recharge
k m/day	Aquifer hydraulic conductivity
T m2/day	Aquifer transmissivity
S	Aquifer storativity
s m	Mounding at distance r
t days	Time since mounding started
r m	Distance from centre of property
THEIS	
s = (Q/(4PIT) LN ((2.25Tt)/(r2S))	

Q	T	S	t	MOUNDING (m)			
			r =	200	300	400	500
SEELEY & ARNILL AGGREGATES LTD. 46 Ha							
189	100	0.1	365	0.5	0.3	0.2	0.2
189	200	0.1	365	0.3	0.2	0.2	0.1
189	500	0.1	365	0.1	0.1	0.1	0.1
TOWNSHIP OF ORO 25 Ha							
102	100	0.1	365	0.2	0.2	0.1	0.1
102	200	0.1	365	0.2	0.1	0.1	0.1
102	400	0.1	365	0.1	0.1	0.1	0.1
ALFA AGGREGATES LIMITED 26.65 Ha							
109	50	0.1	365	0.4	0.3	0.2	0.1
109	100	0.1	365	0.3	0.2	0.1	0.1
109	200	0.1	365	0.2	0.1	0.1	0.1
JAMES DICK CONSTRUCTION LIMITED 50 Ha							
205	30	0.1	365	1.0	0.5	0.2	-0.0
205	50	0.1	365	0.8	0.5	0.3	0.2
205	100	0.1	365	0.5	0.4	0.3	0.2
THE SARJEANT CO. LTD. 39 Ha							
160	30	0.1	365	0.8	0.4	0.2	-0.0
160	50	0.1	365	0.6	0.4	0.2	0.1
160	100	0.1	365	0.4	0.3	0.2	0.2
ALLAN G. COOK LIMITED 34.16 Ha							
140	30	0.1	365	0.7	0.4	0.2	-0.0
140	50	0.1	365	0.5	0.3	0.2	0.1
140	100	0.1	365	0.3	0.2	0.2	0.1

DIXON HYDROGEOLOGY LIMITED

TABLE C-5c

GROUNDWATER MOUNDING   THEIS EQUATION

MAXIMUM RECHARGE INCREASE (6.8 M3/DY/HA)

DHL TBLC5C

Q m3/day	Increased recharge
k m/day	Aquifer hydraulic conductivity
T m2/day	Aquifer transmissivity
S	Aquifer storativity
s m	Mounding at distance r
t days	Time since mounding started
r m	Distance from centre of property
THEIS	
s = (Q/(4PIT) LN ((2.25Tt)/(r2S))	

Q	T	S	t	MOUNDING (m)			
				r = 200	300	400	500
SEELEY & ARNILL AGGREGATES LTD. 46 Ha							
313	100	0.1	365	0.8	0.6	0.4	0.3
313	200	0.1	365	0.5	0.4	0.3	0.2
313	500	0.1	365	0.2	0.2	0.2	0.1
TOWNSHIP OF ORO 25 Ha							
170	100	0.1	365	0.4	0.3	0.2	0.2
170	200	0.1	365	0.3	0.2	0.2	0.1
170	400	0.1	365	0.1	0.1	0.1	0.1
ALFA AGGREGATES LIMITED 26.65 Ha							
181	50	0.1	365	0.7	0.4	0.3	0.1
181	100	0.1	365	0.4	0.3	0.2	0.2
181	200	0.1	365	0.3	0.2	0.2	0.1
JAMES DICK CONSTRUCTION LIMITED 50 Ha							
340	30	0.1	365	1.6	0.9	0.4	-0.0
340	50	0.1	365	1.3	0.8	0.5	0.3
340	100	0.1	365	0.8	0.6	0.4	0.3
THE SARJEANT CO. LTD. 39 Ha							
265	30	0.1	365	1.3	0.7	0.3	-0.0
265	50	0.1	365	1.0	0.6	0.4	0.2
265	100	0.1	365	0.6	0.5	0.3	0.3
ALLAN G. COOK LIMITED 34.16 Ha							
232	30	0.1	365	1.1	0.6	0.3	-0.0
232	50	0.1	365	0.9	0.6	0.3	0.2
232	100	0.1	365	0.6	0.4	0.3	0.2

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-6
GROUNDWATER MOUNDING DARCY FORMULA

Hydrogeological Variables

Q (m3/day)	Rate of increased recharge
k (m/day)	Hydraulic Conductivity
b (m)	Aquifer Thickness
T (m2/day)	Aquifer Transmissivity
S	Storativity (Specific Yield)

Excavation Variables

L (m)	Length of Excavation
W (m)	Width of Excavation

Mounding Variables

Hm (m)	Maximum water table rise at equilibrium
Xm (m)	Maximum mound radius on X axis
Ym (m)	Maximum mound radius on Y axis
Tm (days)	Time to reach equilibrium
rx (m)	Distance From Center of Pit in X Direction
ry (m)	Distance From Center of Pit in Y Direction
hm (m)	Height of Mound (Water Table Rise)

Mounding Calculations

Maximum Mound	1. Hm =	Q/(2*PI*k*b)
Mound at Distance	2. hm =	Hm - Q/(PI*k) * ln(rx/(L/2))
Mounding at Time	3. hm =	Q/(2*PI*k*b) * (1 - exp((-2*PI*k*b*t)/(Lb*Wb*S)))

	Q	k	b	T	S	L	W	Hm	Xm	Ym	Tm	rx=	Mounding hm 325	330	340	350	375	400	ry=	Mounding hm 225	300	310	320	325	350
MINIMUM RECHARGE INCREASE (1.4 m3/dy/Ha)																									
Seeley & Arnill Aggregates	64	32.3	15.5	501	0.1	700	600	0.0	361	310	0		0.1	0.1	0.0	0.0	-0.0	-0.1		0.2	0.0	-0.0	-0.0	-0.0	-0.1
Alfa Aggregates	37	10.0	10.0	100	0.1	650	450	0.1	368	237	100		0.1	0.0	0.0	-0.0	-0.1	-0.2		0.1	-0.3	-0.3	-0.4	-0.4	-0.5
Township of Oro	35	30.0	15.0	450	0.1	650	450	0.0	362	233	0		0.0	0.0	-0.0	-0.0	-0.0	-0.1		0.0	-0.1	-0.1	-0.1	-0.1	-0.2
James Dick Construction	70	8.7	5.9	51	0.1	650	600	0.2	381	327	150		0.2	0.2	0.1	0.0	-0.1	-0.3		1.0	0.2	0.1	0.1	0.0	-0.2
The Sarjeant Co.	55	2.6	13.5	35	0.1	650	600	0.2	363	311	175		0.2	0.1	-0.1	-0.2	-0.7	-1.1		2.2	0.2	0.0	-0.2	-0.3	-0.8
Allan G. Cook	48	5.9	5.2	31	0.1	650	600	0.2	385	330	200		0.2	0.2	0.1	0.1	-0.1	-0.3		1.0	0.2	0.2	0.1	0.0	-0.2
AVERAGE RECHARGE INCREASE (4.1 m3/dy/Ha)																									
Seeley & Arnill Aggregates	189	32.3	15.5	501	0.1	700	600	0.1	361	310	25		0.2	0.2	0.1	0.1	-0.1	-0.2		0.6	0.1	-0.0	-0.1	-0.1	-0.2
Alfa Aggregates	109	10.0	10.0	100	0.1	650	450	0.2	368	237	100		0.2	0.1	0.0	-0.1	-0.3	-0.5		0.2	-0.8	-0.9	-1.0	-1.1	-1.4
Township of Oro	102	30.0	15.0	450	0.1	650	450	0.0	362	233	0		0.0	0.0	-0.0	-0.0	-0.1	-0.2		0.0	-0.3	-0.3	-0.3	-0.4	-0.4
James Dick Construction	205	8.7	5.9	51	0.1	650	600	0.6	381	327	250		0.6	0.5	0.3	0.1	-0.4	-0.9		2.8	0.6	0.4	0.2	0.0	-0.5
The Sarjeant Co.	160	2.6	13.5	35	0.1	650	600	0.7	363	311	425		0.7	0.4	-0.2	-0.7	-2.1	-3.3		6.4	0.7	0.1	-0.5	-0.8	-2.3
Allan G. Cook	140	5.9	5.2	31	0.1	650	600	0.7	385	330	475		0.7	0.6	0.4	0.2	-0.4	-0.8		2.9	0.7	0.5	0.2	0.1	-0.4
MAXIMUM RECHARGE INCREASE (6.8 m3/dy/Ha)																									
Seeley & Arnill Aggregates	313	32.3	15.5	501	0.1	700	600	0.1	361	310	10		0.3	0.3	0.2	0.1	-0.1	-0.3		1.0	0.1	-0.0	-0.1	-0.1	-0.4
Alfa Aggregates	181	10.0	10.0	100	0.1	650	450	0.3	368	237	100		0.3	0.2	0.0	-0.1	-0.5	-0.9		0.3	-1.4	-1.6	-1.7	-1.8	-2.3
Township of Oro	170	30.0	15.0	450	0.1	650	450	0.1	362	233	20		0.1	0.0	-0.0	-0.1	-0.2	-0.3		0.1	-0.5	-0.5	-0.6	-0.6	-0.7
James Dick Construction	340	8.7	5.9	51	0.1	650	600	1.1	381	327	675		1.1	0.9	0.5	0.1	-0.7	-1.5		4.6	1.1	0.6	0.3	0.1	-0.9
The Sarjeant Co.	265	2.6	13.5	35	0.1	650	600	1.2	363	311	575		1.2	0.7	-0.3	-1.2	-3.4	-5.5		10.5	1.2	0.1	-0.9	-1.4	-3.8
Allan G. Cook	232	5.9	5.2	31	0.1	650	600	1.2	385	330	650		1.2	1.0	0.6	0.3	-0.6	-1.4		4.8	1.2	0.8	0.4	0.2	-0.7

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-7
POTENTIAL WELL INTERFERENCE

DHL TBLC7

Q m3/day	Pumping rate	328 and 657 m3/dy assumed pumping rates based on testing at Sarjeant	1964 m3/dy tested rate at Seeley & Arnill
T m2/day	Aquifer transmissivity	Range of 50 to 100 m2/dy from testing at Sarjeant Co.	500 m2/dy from testing at Seeley & Arnill
S	Aquifer storativity	6E-05 from testing at Sarjeant Co.	4E-04 from testing at Seeley & Arnill
s m	Drawdown at distance r	Range of 1 to 6 days for storage refilling	Range of 0.1 to 0.5 days for make up water
t days	Time since pumping started		
r m	Distance from well		

THEIS

s = (Q/(4PIT) LN ((2.25Tt)/(r2S))

Q	T	S	t	INTERFERENCE (m)			r =									
				0.0762	100	200	300	400	500	600	700	800	900	1000	1200	1500
328	50	6E-05	0.1	9.1	1.6	0.8	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
328	50	6E-05	0.5	9.9	2.4	1.7	1.3	1.0	0.7	0.5	0.4	0.2	0.1	0.0	0.0	0.0
328	50	6E-05	1	10.3	2.8	2.0	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.0
328	50	6E-05	3	10.8	3.3	2.6	2.2	1.9	1.7	1.5	1.3	1.2	1.0	0.9	0.7	0.5
328	50	6E-05	6	11.2	3.7	3.0	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.9
657	50	6E-05	0.1	18.2	3.1	1.7	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
657	50	6E-05	0.5	19.8	4.8	3.4	2.5	1.9	1.5	1.1	0.8	0.5	0.2	0.0	0.0	0.0
657	50	6E-05	1	20.6	5.5	4.1	3.2	2.6	2.2	1.8	1.5	1.2	0.9	0.7	0.3	0.0
657	50	6E-05	3	21.7	6.7	5.2	4.4	3.8	3.3	2.9	2.6	2.3	2.1	1.9	1.5	1.0
328	100	6E-05	0.1	4.7	1.0	0.6	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
328	100	6E-05	0.5	5.1	1.4	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.0
328	100	6E-05	1	5.3	1.6	1.2	1.0	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.2
328	100	6E-05	3	5.6	1.9	1.5	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.4
328	100	6E-05	6	5.8	2.0	1.7	1.5	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6
657	100	6E-05	0.1	9.4	1.9	1.2	0.8	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
657	100	6E-05	0.5	10.3	2.8	2.0	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.0
657	100	6E-05	1	10.6	3.1	2.4	2.0	1.7	1.5	1.3	1.1	1.0	0.8	0.7	0.5	0.3
657	100	6E-05	3	11.2	3.7	3.0	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.9
1313	200	6E-05	0.1	9.8	2.3	1.6	1.1	0.8	0.6	0.4	0.3	0.1	0.0	0.0	0.0	0.0
1313	200	6E-05	0.5	10.6	3.1	2.4	2.0	1.7	1.5	1.3	1.1	1.0	0.8	0.7	0.5	0.3
1313	200	6E-05	1	11.0	3.5	2.8	2.3	2.0	1.8	1.6	1.5	1.3	1.2	1.1	0.9	0.7
1313	200	6E-05	1.5	11.2	3.7	3.0	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.9
1964	500	4E-04	0.1	5.5	1.0	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	500	4E-04	0.5	6.0	1.5	1.1	0.8	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.0
1964	500	4E-04	1	6.2	1.7	1.3	1.0	0.9	0.7	0.6	0.5	0.4	0.4	0.3	0.2	0.0
1964	500	4E-04	1.5	6.3	1.9	1.4	1.2	1.0	0.9	0.7	0.6	0.6	0.5	0.4	0.3	0.2

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-8
POTENTIAL CUMULATIVE IMPACT OF WASHING OPERATION WELLS ON PRIVATE WELLS

r (m) Distance from private well to existing/assumed washing well
s (m) Potential water level drawdown

PROPERTY	Assumed Well Location	Assumed Rate (m3/dy)	Assumed Transmissivity (m2/dy)	Pumping Period (days)	WELL	20959	7681	Murray	7010
						(m)			
Storage filling at start of season									
					r=	1500	>1500	>1500	1050
Seeley & Arnill Aggregate	1/89	1964	500	1	s=	0	0	0	0.3
					r=	400	1500	>1500	600
Alfa Aggregates Limited	11628	657	100	3	s=	2.3	0.9	0.9	1.8
					r=	400	700	1050	1150
James Dick Construction	11519	657	100	3	s=	2.3	1.7	1.4	1.1
					r=	700	1200	1500	700
The Sarjeant Co.	TW8	328	100	6	s=	1.0	0.7	0.6	1
					r=	1200	500	600	>1500
Allan G. Cook	OW1/91	657	100	3	s=	1.1	2.0	1.8	0.9
				Total	s=	**6.7**	**5.3**	**4.7**	**5.1**
Makeup water requirements									
					r=	1500	>1500	>1500	1050
Seeley & Arnill Aggregate	1/89	1964	500	0.1	s=	0	0	0	0
					r=	400	1500	>1500	600
Alfa Aggregates Limited	11628	657	100	0.1	s=	0.5	0	0	0.1
					r=	400	700	1050	1150
James Dick Construction	11519	657	100	0.1	s=	0.5	0	0	0
					r=	700	1200	1500	700
The Sarjeant Co.	TW8	328	100	0.5	s=	0.4	0.1	0	0.1
					r=	1200	500	600	>1500
Allan G. Cook	OW1/91	657	100	0.1	s=	0	0.2	0.1	0
				Total	s=	**1.4**	**0.3**	**0.1**	**0.2**

Calculations are in Table C-7.

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-9
ESTIMATE OF MAXIMUM ANNUAL CALCIUM CHLORIDE APPLICATION

DHL TBLC9

Groundwater recharge	Qgw	= (Ap*Ip*365)
Reasonable Use concentration	CRU	= Cgw+(0.5*(CDW-Cgw))
		mg/l m³ l/m³ mg/kg kg
Permitted CaCl2 application equivalent to Cin	CaCl2A	= (Cin*1.56*Qgw*1000)/1000,000

Ap (ha)	= Property recharge area
Ip (m3/day/Ha)	= Annual precipitation infiltration
Qgw (m3)	= Annual groundwater recharge
Cgw (mg/L)	= Background chloride in groundwater
CDW (mg/L)	= Maximum desireable chloride concentration in drinking water
CRU (mg/L)	= Reasonable Use Policy allowable concentration
Cin (mg/L)	= Permitted chloride increase from Cgw to CRU
CaCl2 (kg)	= Permitted annual calcium chloride application equivalent to Cin

Ap	Ip	Qgw	Cgw	CDW	CRU	Cin	CaCl2
1	11.4	4161	1.0	250	126	125	808

Note:

1 Groundwater recharge is calculated for an infiltration rate equivalent to the water budget surplus of 417 mm/yr (Table C-1)

2 Background Cl concentration from Table B-4

Ca 40

Cl 35.5

$$\frac{2 \times Cl + Ca}{2 \times Cl} = \frac{2 \times 35.5 + 40}{2 \times 35.5}$$

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-2
WATER BUDGET VALUES HARGREAVES MODEL
POTENTIAL EVAPOTRANSPIRATION

PE=kd(.38-.0038h)(t-32)

PE Potential Evapotranspiration (in)
k vegetation coefficient
d monthly daytime coefficient
h mean monthly relative humidity (Muskoka Climate Station)
t mean monthly temperature (F)

DHL TBLC2

Deciduous Orchard / Pasture

15099 MIDHURST ONT.

MONTH	k	d	h	t	PE	MONTH	k	d	h	t	PE
1						1					
2						2					
3	0.14	0.99	65	25		3	0.11	0.99	65	25	
4	0.45	1.09	55	40	0.65	4	0.25	1.09	55	40	0.36
5	0.49	1.24	52	52	2.22	5	0.29	1.24	52	52	1.31
6	0.74	1.26	58	61	4.34	6	0.33	1.26	58	61	1.93
7	0.71	1.27	58	67	5.06	7	0.31	1.27	58	67	2.21
8	0.55	1.17	60	66	3.35	8	0.32	1.17	60	66	1.95
9	0.43	1.01	63	59	1.65	9	0.32	1.01	63	59	1.23
10	0.36	0.91	64	48	0.71	10	0.22	0.91	64	48	0.43
11						11	0.14	0.77	74	38	0.06
12						12					
					17.96 inches						9.48 inches
					456 mm						241 mm

15810 and 15820 ORILLIA ONT.

MONTH	k	d	h	t	PE	MONTH	k	d	h	t	PE
1						1					
2						2					
3	0.14	0.99	65	26		3	0.11	0.99	65	26	
4	0.45	1.09	55	41	0.72	4	0.25	1.09	55	41	0.40
5	0.49	1.24	52	52	2.22	5	0.29	1.24	52	52	1.31
6	0.74	1.26	58	61	4.39	6	0.33	1.26	58	61	1.96
7	0.71	1.27	58	68	5.13	7	0.31	1.27	58	68	2.24
8	0.55	1.17	60	67	3.41	8	0.32	1.17	60	67	1.98
9	0.43	1.01	63	61	1.77	9	0.32	1.01	63	61	1.32
10	0.36	0.91	64	49	0.77	10	0.22	0.91	64	49	0.47
11						11	0.14	0.77	74	37	0.06
12						12					
					18.41 inches						9.74 inches
					468 mm						247 mm

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-3
SUMMARY OF CHANGES TO THE LOCAL WATER BUDGET

DHL TBLC3

Dust Sup

Increased Recharge Clearing the Excavation m3/dy/Ha (mm/annum)			Maximum Extraction Area (Table B-1) Ha	Water Budget Gains equivalent avg. m3/dy			Evaporation Wash Pond m3/dy	Evaporation Stockpiles m3/dy	Exported Water (Table C-4) m3/dy			Water Budget Losses m3/dy		Net Change m3/dy		
Low	Avg.	High		Low	Avg.	High				Low	High	Low	High	Low	Avg.	High
1.4 (50)	4.1 (150)	6.8 (250)	220	308	902	1496	64	32	Max. Avg. Extraction	140	234	236	330	+72	+572	+1166
							12.8	6.4	Max. Licenced Extraction	280	467	376	563	-68	+339	+933

−100

Note: Evaporation loss from wash pond is equivalent to 12.8 m3/dy/Ha for June through Aug. assuming a 1 Ha pond per operation.

Evaporation loss from stockpiles is equivalent to a surface area of 1 Ha per operation and an evaporation rate of 12.8 m3/dy/Ha for half of the time during the period of June through Aug.

ORO 7th LINE AGGREGATE PITS
TABLE C-4
ESTIMATED EXPORTED WATER

DHL TBLC4

OPERATOR	PROPOSED LICENCE TONNAGE tonnes/yr	ESTIMATED TONNAGE OF WASHED PRODUCT	tonnes/yr	RETAINED WATER m3/yr 3 %	m3/yr 5 %	EXPORTED WATER (OPERATING 190 DAYS) m3/day 3 %	m3/day 5 %	
SEELEY & ARNILL AGGREGATES LTD.	1750000	25 %	437500	13125	21875	69	115	
ALFA AGGREGATES LIMITED	750000	25 %	187500	5625	9375	30	49	230
JAMES DICK CONSTRUCTION LIMITED	1000000	25 %	250000	7500	12500	39	66	
THE SARJEANT CO. LTD.	750000	90 %	675000	20250	33750	107	178	303
ALLAN G. COOK LIMITED	900000	25 %	225000	6750	11250	36	59	237
TOTAL			1775000	53250	88750	280	467	
	PROPOSED AVERAGE TONNAGE (50 % OF LICENCE)							
SEELEY & ARNILL AGGREGATES LTD.	875000	25 %	218750	6563	10938	35	58	
ALFA AGGREGATES LIMITED	375000	25 %	93750	2812.5	4687.5	15	25	116
JAMES DICK CONSTRUCTION LIMITED	500000	25 %	125000	3750	6250	20	33	
THE SARJEANT CO. LTD.	375000	90 %	337500	10125	16875	53	89	152
ALLAN G. COOK LIMITED	450000	25 %	112500	3375	5625	18	30	119
TOTAL			887500	26625	44375	140	234	

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-5a
GROUNDWATER MOUNDING THEIS EQUATION
MINIMUM RECHARGE INCREASE (1.4 M3/DY/HA)

DHL TBLC5A

Q m3/day	Increased recharge
k m/day	Aquifer hydraulic conductivity
T m2/day	Aquifer transmissivity
S	Aquifer storativity
s m	Mounding at distance r
t days	Time since mounding started
r m	Distance from centre of property

THEIS

s = (Q/(4PIT) LN ((2.25Tt)/(r2S))

Q	T	S	t	MOUNDING (m)				
				r =	200	300	400	500
SEELEY & ARNILL AGGREGATES LTD. 46 Ha								
64	100	0.1	365		0.2	0.1	0.1	0.1
64	200	0.1	365		0.1	0.1	0.1	0.0
64	500	0.1	365		0.0	0.0	0.0	0.0
TOWNSHIP OF ORO 25 Ha								
35	100	0.1	365		0.1	0.1	0.0	0.0
35	200	0.1	365		0.1	0.0	0.0	0.0
37	400	0.1	365		0.0	0.0	0.0	0.0
ALFA AGGREGATES LIMITED 26.65 Ha								
37	50	0.1	365		0.1	0.1	0.1	0.0
37	100	0.1	365		0.1	0.1	0.0	0.0
37	200	0.1	365		0.1	0.0	0.0	0.0
JAMES DICK CONSTRUCTION LIMITED 50 Ha								
70	30	0.1	365		0.3	0.2	0.1	0.0
70	50	0.1	365		0.3	0.2	0.1	0.1
70	100	0.1	365		0.2	0.1	0.1	0.1
THE SARJEANT CO. LTD. 39 Ha								
55	30	0.1	365		0.3	0.1	0.1	0.0
55	50	0.1	365		0.2	0.1	0.1	0.0
55	100	0.1	365		0.1	0.1	0.1	0.1
ALLAN G. COOK LIMITED 34.16 Ha								
48	30	0.1	365		0.2	0.1	0.1	0.0
48	50	0.1	365		0.2	0.1	0.1	0.0
48	100	0.1	365		0.1	0.1	0.1	0.0

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-5b
GROUNDWATER MOUNDING THEIS EQUATION
AVERAGE RECHARGE INCREASE (4.1 M3/DY/HA)

DHL TBLC5B

Q m3/day	Increased recharge
k m/day	Aquifer hydraulic conductivity
T m2/day	Aquifer transmissivity
S	Aquifer storativity
s m	Mounding at distance r
t days	Time since mounding started
r m	Distance from centre of property
THEIS	
s = (Q/(4PIT) LN ((2.25Tt)/(r2S))	

Q	T	S	t	MOUNDING (m)			
				r = 200	300	400	500
SEELEY & ARNILL AGGREGATES LTD. 46 Ha							
189	100	0.1	365	0.5	0.3	0.2	0.2
189	200	0.1	365	0.3	0.2	0.2	0.1
189	500	0.1	365	0.1	0.1	0.1	0.1
TOWNSHIP OF ORO 25 Ha							
102	100	0.1	365	0.2	0.2	0.1	0.1
102	200	0.1	365	0.2	0.1	0.1	0.1
102	400	0.1	365	0.1	0.1	0.1	0.1
ALFA AGGREGATES LIMITED 26.65 Ha							
109	50	0.1	365	0.4	0.3	0.2	0.1
109	100	0.1	365	0.3	0.2	0.1	0.1
109	200	0.1	365	0.2	0.1	0.1	0.1
JAMES DICK CONSTRUCTION LIMITED 50 Ha							
205	30	0.1	365	1.0	0.5	0.2	-0.0
205	50	0.1	365	0.8	0.5	0.3	0.2
205	100	0.1	365	0.5	0.4	0.3	0.2
THE SARJEANT CO. LTD. 39 Ha							
160	30	0.1	365	0.8	0.4	0.2	-0.0
160	50	0.1	365	0.6	0.4	0.2	0.1
160	100	0.1	365	0.4	0.3	0.2	0.2
ALLAN G. COOK LIMITED 34.16 Ha							
140	30	0.1	365	0.7	0.4	0.2	-0.0
140	50	0.1	365	0.5	0.3	0.2	0.1
140	100	0.1	365	0.3	0.2	0.2	0.1

DIXON HYDROGEOLOGY LIMITED
TABLE C-5c
GROUNDWATER MOUNDING THEIS EQUATION
MAXIMUM RECHARGE INCREASE (6.8 M3/DY/HA)

DHL TBLC5C

Q m3/day	Increased recharge
k m/day	Aquifer hydraulic conductivity
T m2/day	Aquifer transmissivity
S	Aquifer storativity
s m	Mounding at distance r
t days	Time since mounding started
r m	Distance from centre of property
THEIS	
s = (Q/(4PIT) LN ((2.25Tt)/(r2S))	

Q	T	S	t	MOUNDING (m)			
			r =	200	300	400	500
SEELEY & ARNILL AGGREGATES LTD. 46 Ha							
313	100	0.1	365	0.8	0.6	0.4	0.3
313	200	0.1	365	0.5	0.4	0.3	0.2
313	500	0.1	365	0.2	0.2	0.2	0.1
TOWNSHIP OF ORO 25 Ha							
170	100	0.1	365	0.4	0.3	0.2	0.2
170	200	0.1	365	0.3	0.2	0.2	0.1
170	400	0.1	365	0.1	0.1	0.1	0.1
ALFA AGGREGATES LIMITED 26.65 Ha							
181	50	0.1	365	0.7	0.4	0.3	0.1
181	100	0.1	365	0.4	0.3	0.2	0.2
181	200	0.1	365	0.3	0.2	0.2	0.1
JAMES DICK CONSTRUCTION LIMITED 50 Ha							
340	30	0.1	365	1.6	0.9	0.4	-0.0
340	50	0.1	365	1.3	0.8	0.5	0.3
340	100	0.1	365	0.8	0.6	0.4	0.3
THE SARJEANT CO. LTD. 39 Ha							
265	30	0.1	365	1.3	0.7	0.3	-0.0
265	50	0.1	365	1.0	0.6	0.4	0.2
265	100	0.1	365	0.6	0.5	0.3	0.3
ALLAN G. COOK LIMITED 34.16 Ha							
232	30	0.1	365	1.1	0.6	0.3	-0.0
232	50	0.1	365	0.9	0.6	0.3	0.2
232	100	0.1	365	0.6	0.4	0.3	0.2

ORO SEVENTH LINE AGGREGATE PITS

TABLE C-6

GROUNDWATER MOUNDING DARCY FORMULA

Hydrogeological Variables

Q (m3/day)	Rate of increased recharge
k (m/day)	Hydraulic Conductivity
b (m)	Aquifer Thickness
T (m2/day)	Aquifer Transmissivity
S	Storativity (Specific Yield)

Excavation Variables

L (m)	Length of Excavation
W (m)	Width of Excavation

Mounding Variables

Hm (m)	Maximum water table rise at equilibrium
Xm (m)	Maximum mound radius on X axis
Ym (m)	Maximum mound radius on Y axis
Tm (days)	Time to reach equilibrium
rx (m)	Distance From Center of Pit in X Direction
ry (m)	Distance From Center of Pit in Y Direction
hm (m)	Height of Mound (Water Table Rise)

Mounding Calculations

Maximum Mound	1. Hm =	Q/(2*PI*k*b)
Mound at Distance	2. hm =	Hm - Q/(PI*k) * ln(rx/(L/2))
Mounding at Time	3. hm =	Q/(2*PI*k*b) * (1 - exp((-2*PI*k*b*t)/(Lb*Wb*S)))

	Q	k	b	T	S	L	W	Hm	Xm	Ym	Tm	rx=	Mounding hm 325	330	340	350	375	400	ry=	Mounding hm 225	300	310	320	325	350
MINIMUM RECHARGE INCREASE (1.4 m3/dy/Ha)																									
Seeley & Arnill Aggregates	64	32.3	15.5	501	0.1	700	600	0.0	361	310	0		0.1	0.1	0.0	0.0	-0.0	-0.1		0.2	0.0	-0.0	-0.0	-0.0	-0.1
Alfa Aggregates	37	10.0	10.0	100	0.1	650	450	0.1	368	237	100		0.1	0.0	0.0	-0.0	-0.1	-0.2		0.1	-0.3	-0.3	-0.4	-0.4	-0.5
Township of Oro	35	30.0	15.0	450	0.1	650	450	0.0	362	233	0		0.0	0.0	-0.0	-0.0	-0.0	-0.1		0.0	-0.1	-0.1	-0.1	-0.1	-0.2
James Dick Construction	70	8.7	5.9	51	0.1	650	600	0.2	381	327	150		0.2	0.2	0.1	0.0	-0.1	-0.3		1.0	0.2	0.1	0.1	0.0	-0.2
The Sarjeant Co.	55	2.6	13.5	35	0.1	650	600	0.2	363	311	175		0.2	0.1	-0.1	-0.2	-0.7	-1.1		2.2	0.2	0.0	-0.2	-0.3	-0.8
Allan G. Cook	48	5.9	5.2	31	0.1	650	600	0.2	385	330	200		0.2	0.2	0.1	0.1	-0.1	-0.3		1.0	0.2	0.2	0.1	0.0	-0.2
AVERAGE RECHARGE INCREASE (4.1 m3/dy/Ha)																									
Seeley & Arnill Aggregates	189	32.3	15.5	501	0.1	700	600	0.1	361	310	25		0.2	0.2	0.1	0.1	-0.1	-0.2		0.6	0.1	-0.0	-0.1	-0.1	-0.2
Alfa Aggregates	109	10.0	10.0	100	0.1	650	450	0.2	368	237	100		0.2	0.1	0.0	-0.1	-0.3	-0.5		0.2	-0.8	-0.9	-1.0	-1.1	-1.4
Township of Oro	102	30.0	15.0	450	0.1	650	450	0.0	362	233	0		0.0	0.0	-0.0	-0.0	-0.1	-0.2		0.0	-0.3	-0.3	-0.3	-0.4	-0.4
James Dick Construction	205	8.7	5.9	51	0.1	650	600	0.6	381	327	250		0.6	0.5	0.3	0.1	-0.4	-0.9		2.8	0.6	0.4	0.2	0.0	-0.5
The Sarjeant Co.	160	2.6	13.5	35	0.1	650	600	0.7	363	311	425		0.7	0.4	-0.2	-0.7	-2.1	-3.3		6.4	0.7	0.1	-0.5	-0.8	-2.3
Allan G. Cook	140	5.9	5.2	31	0.1	650	600	0.7	385	330	475		0.7	0.6	0.4	0.2	-0.4	-0.8		2.9	0.7	0.5	0.2	0.1	-0.4
MAXIMUM RECHARGE INCREASE (6.8 m3/dy/Ha)																									
Seeley & Arnill Aggregates	313	32.3	15.5	501	0.1	700	600	0.1	361	310	10		0.3	0.3	0.2	0.1	-0.1	-0.3		1.0	0.1	-0.0	-0.1	-0.1	-0.4
Alfa Aggregates	181	10.0	10.0	100	0.1	650	450	0.3	368	237	100		0.3	0.2	0.0	-0.1	-0.5	-0.9		0.3	-1.4	-1.6	-1.7	-1.8	-2.3
Township of Oro	170	30.0	15.0	450	0.1	650	450	0.1	362	233	20		0.1	0.0	-0.0	-0.1	-0.2	-0.3		0.1	-0.5	-0.5	-0.6	-0.6	-0.7
James Dick Construction	340	8.7	5.9	51	0.1	650	600	1.1	381	327	675		1.1	0.9	0.5	0.1	-0.7	-1.5		4.6	1.1	0.6	0.3	0.1	-0.9
The Sarjeant Co.	265	2.6	13.5	35	0.1	650	600	1.2	363	311	575		1.2	0.7	-0.3	-1.2	-3.4	-5.5		10.5	1.2	0.1	-0.9	-1.4	-3.8
Allan G. Cook	232	5.9	5.2	31	0.1	650	600	1.2	385	330	650		1.2	1.0	0.6	0.3	-0.6	-1.4		4.8	1.2	0.8	0.4	0.2	-0.7

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-7
POTENTIAL WELL INTERFERENCE

DHL TBLC7

Q m3/day	Pumping rate	328 and 657 m3/dy assumed pumping rates based on testing at Sarjeant	1964 m3/dy tested rate at Seeley & Arnill
T m2/day	Aquifer transmissivity	Range of 50 to 100 m2/dy from testing at Sarjeant Co.	500 m2/dy from testing at Seeley & Arnill
S	Aquifer storativity	6E-05 from testing at Sarjeant Co.	4E-04 from testing at Seeley & Arnill
s m	Drawdown at distance r	Range of 1 to 6 days for storage refilling	Range of 0.1 to 0.5 days for make up water
t days	Time since pumping started		
r m	Distance from well		

THEIS

s = (Q/(4PIT) LN ((2.25Tt)/(r2S))

Q	T	S	t	INTERFERENCE (m)			r =									
				0.0762	100	200	300	400	500	600	700	800	900	1000	1200	1500
328	50	6E-05	0.1	9.1	1.6	0.8	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
328	50	6E-05	0.5	9.9	2.4	1.7	1.3	1.0	0.7	0.5	0.4	0.2	0.1	0.0	0.0	0.0
328	50	6E-05	1	10.3	2.8	2.0	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.0
328	50	6E-05	3	10.8	3.3	2.6	2.2	1.9	1.7	1.5	1.3	1.2	1.0	0.9	0.7	0.5
328	50	6E-05	6	11.2	3.7	3.0	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.9
657	50	6E-05	0.1	18.2	3.1	1.7	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
657	50	6E-05	0.5	19.8	4.8	3.4	2.5	1.9	1.5	1.1	0.8	0.5	0.2	0.0	0.0	0.0
657	50	6E-05	1	20.6	5.5	4.1	3.2	2.6	2.2	1.8	1.5	1.2	0.9	0.7	0.3	0.0
657	50	6E-05	3	21.7	6.7	5.2	4.4	3.8	3.3	2.9	2.6	2.3	2.1	1.9	1.5	1.0
328	100	6E-05	0.1	4.7	1.0	0.6	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
328	100	6E-05	0.5	5.1	1.4	1.0	0.8	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.0
328	100	6E-05	1	5.3	1.6	1.2	1.0	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.2
328	100	6E-05	3	5.6	1.9	1.5	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.4
328	100	6E-05	6	5.8	2.0	1.7	1.5	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6
657	100	6E-05	0.1	9.4	1.9	1.2	0.8	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
657	100	6E-05	0.5	10.3	2.8	2.0	1.6	1.3	1.1	0.9	0.7	0.6	0.5	0.4	0.2	0.0
657	100	6E-05	1	10.6	3.1	2.4	2.0	1.7	1.5	1.3	1.1	1.0	0.8	0.7	0.5	0.3
657	100	6E-05	3	11.2	3.7	3.0	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.9
1313	200	6E-05	0.1	9.8	2.3	1.6	1.1	0.8	0.6	0.4	0.3	0.1	0.0	0.0	0.0	0.0
1313	200	6E-05	0.5	10.6	3.1	2.4	2.0	1.7	1.5	1.3	1.1	1.0	0.8	0.7	0.5	0.3
1313	200	6E-05	1	11.0	3.5	2.8	2.3	2.0	1.8	1.6	1.5	1.3	1.2	1.1	0.9	0.7
1313	200	6E-05	1.5	11.2	3.7	3.0	2.6	2.3	2.0	1.8	1.7	1.5	1.4	1.3	1.1	0.9
1964	500	4E-04	0.1	5.5	1.0	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	500	4E-04	0.5	6.0	1.5	1.1	0.8	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.0	0.0
1964	500	4E-04	1	6.2	1.7	1.3	1.0	0.9	0.7	0.6	0.5	0.4	0.4	0.3	0.2	0.0
1964	500	4E-04	1.5	6.3	1.9	1.4	1.2	1.0	0.9	0.7	0.6	0.6	0.5	0.4	0.3	0.2

ORO SEVENTH LINE AGGREGATE PITS

TABLE C-8

POTENTIAL CUMULATIVE IMPACT OF WASHING OPERATION WELLS ON PRIVATE WELLS

r (m) Distance from private well to existing/assumed washing well

s (m) Potential water level drawdown

PROPERTY	Assumed Well Location	Assumed Rate (m3/dy)	Assumed Transmissivity (m2/dy)	Pumping Period (days)	WELL	20959	7681	Murray	7010
						(m)			
Storage filling at start of season									
					r=	1500	>1500	>1500	1050
Seeley & Arnill Aggregate	1/89	1964	500	1	s=	0	0	0	0.3
					r=	400	1500	>1500	600
Alfa Aggregates Limited	11628	657	100	3	s=	2.3	0.9	0.9	1.8
					r=	400	700	1050	1150
James Dick Construction	11519	657	100	3	s=	2.3	1.7	1.4	1.1
					r=	700	1200	1500	700
The Sarjeant Co.	TW8	328	100	6	s=	1.0	0.7	0.6	1
					r=	1200	500	600	>1500
Allan G. Cook	OW1/91	657	100	3	s=	1.1	2.0	1.8	0.9
				Total	s=	6.7	5.3	4.7	5.1
Makeup water requirements									
					r=	1500	>1500	>1500	1050
Seeley & Arnill Aggregate	1/89	1964	500	0.1	s=	0	0	0	0
					r=	400	1500	>1500	600
Alfa Aggregates Limited	11628	657	100	0.1	s=	0.5	0	0	0.1
					r=	400	700	1050	1150
James Dick Construction	11519	657	100	0.1	s=	0.5	0	0	0
					r=	700	1200	1500	700
The Sarjeant Co.	TW8	328	100	0.5	s=	0.4	0.1	0	0.1
					r=	1200	500	600	>1500
Allan G. Cook	OW1/91	657	100	0.1	s=	0	0.2	0.1	0
				Total	s=	1.4	0.3	0.1	0.2

Calculations are in Table C-7.

ORO SEVENTH LINE AGGREGATE PITS
TABLE C-9
ESTIMATE OF MAXIMUM ANNUAL CALCIUM CHLORIDE APPLICATION

DHL TBLC9

Groundwater recharge	Qgw	= (Ap*Ip*365)
Reasonable Use concentration	CRU	= Cgw+(0.5*(CDW-Cgw))
		mg/l m³ l/m³ mg/kg kg
Permitted CaCl2 application equivalent to Cin	CaCl2A	= (Cin*1.56*Qgw*1000)/1000,000

Ap (ha)	= Property recharge area
Ip (m3/day/Ha)	= Annual precipitation infiltration
Qgw (m3)	= Annual groundwater recharge
Cgw (mg/L)	= Background chloride in groundwater
CDW (mg/L)	= Maximum desireable chloride concentration in drinking water
CRU (mg/L)	= Reasonable Use Policy allowable concentration
Cin (mg/L)	= Permitted chloride increase from Cgw to CRU
CaCl2 (kg)	= Permitted annual calcium chloride application equivalent to Cin

Ap	Ip	Qgw	Cgw	CDW	CRU	Cin	CaCl2
1	11.4	4161	1.0	250	126	125	808

Note:

1 Groundwater recharge is calculated for an infiltration rate equivalent to the water budget surplus of 417 mm/yr (Table C-1)

2 Background Cl concentration from Table B-4

Ca 40

Cl 35.5

$$\frac{2 \times Cl + Ca}{2 \times Cl} = \frac{2 \times 35.5 + 40}{2 \times 35.5}$$