# MEMORANDUM

**To:** JART Review Team

**From:** Earthfx Incorporated

**Date:** April 19, 2022

**Subject:** Response to JART comments and follow up to Feb. 16, 2022 meeting.

# Introduction

This technical memorandum is intended to address remaining concerns expressed in the February 16, 2022 meeting with the JART hydrogeology technical team. The meeting was convened to address the following outstanding items related to the infiltration feature that will be constructed prior to Phase 3 excavation in the proposed West Quarry extension.

1. Clarification of purpose(s) for the infiltration pond.
    1. What is the mitigation purpose?
    2. Are they required or are they proposed for aesthetic purposes?
    3. Have there been any changes/updates?
    4. Should the modelling be updated to exclude the infiltration pond?
2. It would be good to understand how the infiltration from the new ponds will benefit the receiving waters (Willoughby Tributary, Willoughby Creek, and reaches along the Medad Valley) from a habitat perspective.
3. What are the anticipated changes to streamflow in receiving waters with and without the infiltration pond?
4. Lack of field data to support or confirm the feasibility /effectiveness of the proposed infiltration (refer to comments 6, 18, 94, 110, 116, 207, 230, 231, 237, and 247).
5. Water Quality discussion

The February 16 meeting slides have been previously provided to the JART team.

# 1 Infiltration Pond Purpose

## 1.1 What is the mitigation purpose

A short presentation was provided at the outset of the meeting in an attempt to address the list of questions. The slides have been provided to the JART team. The first slides reviewed the site history and purpose of the infiltration feature and noted that the primary intent was to replace infiltration that currently occurs due to losses from the golf course irrigation ponds. These ponds are fed by quarry discharge from the Northwest sump.

As per the slides, the purpose is as follows:

- Purpose is to replicate the function of the existing golf course irrigation ponds
- Would be fed by same diversion of quarry discharge.
- Not required, but purpose is to maintain heads and flow divide between quarry and Cedar Springs Road

## 1.2 Pond Requirement

The infiltration ponds will be excavated down to the bedrock surface and will also be fed by quarry discharge. Infiltration of water from the feature will raise heads in the immediate surrounding area and re-establish a groundwater mound between the West Quarry extension and Cedar Springs Road. The intent is to minimize the likely drawdowns (change in groundwater levels) due to the quarry but is not a required mitigation feature. The golf course ponds and irrigation system may provide some limited aesthetic benefit to the surrounding private ponds and properties.

## 1.3 Changes/Updates

There have been no changes to the original design and no changes are foreseen. The modelling results provided in the report represented the infiltration feature as it was designed.

## 1.4 Model Analysis without infiltration ponds

Additional simulations have been conducted (as discussed in the presentation and below) with and without the feature strictly for the purpose of quantifying the incremental effect of the feature on groundwater levels and surface water flows. The results of the simulations are discussed below.

# 2 Benefits to Receiving Waters

In the slide show, Earthfx presented results of two simulations conducted to isolate and quantify the effects of the golf course irrigation ponds and the infiltration feature. First, a model run was set up in which the golf course ponds were eliminated. Comparison of these results with the baseline conditions showed that infiltration from the golf course ponds accounted for about a 1.5

to 2.5 m increase in the water levels (Figure 1). Net seepage from the ponds was estimated at 130 m3/d (about 20 igpm).

A similar analysis was conducted with the infiltration ponds removed from the P3456 conditions simulation. Drawdowns show that the feature contributes to an increase of 4.5 to 5.5 m beneath the ponds and about 1.5 to 4.5 m along Cedar Springs Road. Net seepage from the feature was estimated at 780 m3/d (about 120 igpm). It should be noted that the infiltration ponds were simulated in a very conservative manner, assuming that the feature could clog over time due to runoff from the surrounding area and accumulation of organic material. The total suspended solids in the quarry discharge are low and would not contribute to clogging. Clogging would be prevented by periodic maintenance of the feature.

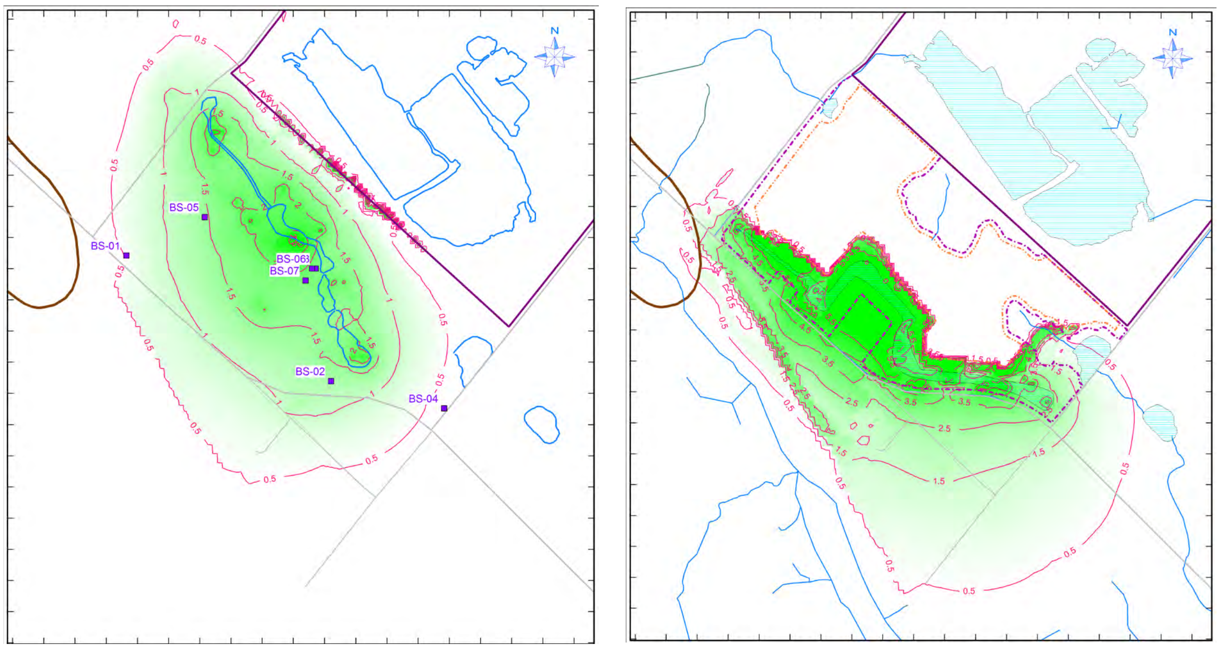


Figure 1: Simulated drawdowns in model Layer 6 due to (a) removal of the golf course irrigation ponds from the baseline conditions simulation and (b) removal of the infiltration feature from the P3456 conditions simulation.

## 3 Changes to Streamflow with and without infiltration pond

Earthfx presented a hydrograph of simulated streamflow in Willoughby Creek with and without the infiltration feature to address concerns related to impacts on groundwater-dependent habitat in the Medad Valley. The hydrograph shows that the decrease in baseflow in Willoughby Creek without the feature is very small (a decrease of about 0.002 L/s) and thus the feature has little influence on groundwater discharge. With regards to change in peak flows, the simulations indicated that there is some reduction in peak flows, but generally less than 0.01 L/s. Reductions in peak flows are generally considered beneficial as they tend to reduce potential for channel erosion. The changes here are insignificant.

In the meeting, Norbert Woerns acknowledged that the modelling was done with great effort and a high level of detail. Chris Neville indicated that that he was also willing to "sign-off" on the model. Both indicated that there are limitations in the ability of the model to predict exact response of the groundwater at specific locations. These arise from data limitations and the variable properties of fractured rock. However, Earthfx maintains that through model calibration, we are able to represent current groundwater levels and streamflow response very well and, therefore, the prediction of future response under quarry expansion is expected to have relatively low uncertainty.

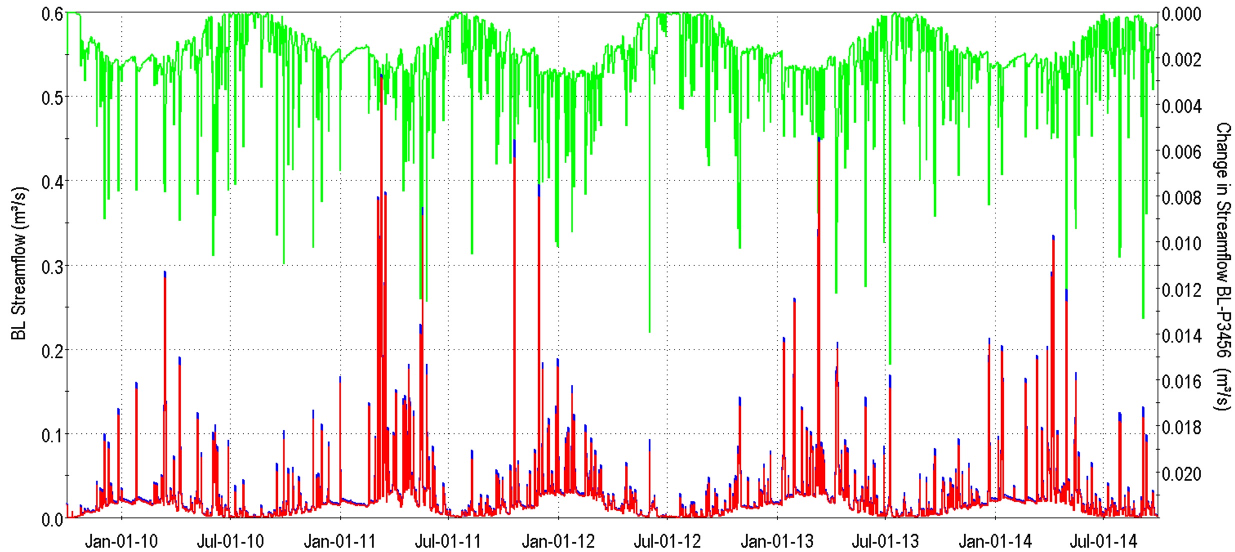


Figure 2: Simulated streamflow in Willoughby Creek upstream of SW7 with(blue) and without (red) the infiltration feature.

### *3.1 Additional details on Groundwater discharge to the Medad Valley*

Earthfx, 2020, includes Dr. Worthington's map of groundwater seeps into the Medad Valley. It is important to note that no seeps are mapped immediately adjacent to the proposed infiltration system. Recently collected LIDAR data provides useful insight, particularly when combined with the numerical model results, to illustrate how and where groundwater discharge currently occurs in the Medad Valley. The LIDAR data is able to see through the tree canopy and better illustrate the Medad valley wetland conditions.

The LIDAR DSM (digital uppermost surface model, including treetops, Figure 3) shows that the tree canopy masks the wetland and stream channels configuration. The LIDAR DTM (digital *terrain* model, Figure 4), however, can see through the canopy to show the bare ground topography as extracted from the LIDAR point cloud data. This data clearly shows the steep walls of the valley and the exceptionally flat topography of the valley fill wetlands. No discernable channel features are visible in the flat wetland even in this high-resolution imagery (enlargement shown in Figure 5). The MNDMNRF "mapped" stream (blue line) is a series of straight-line segments, also reflecting the lack of a visible stream channel. This suggests that, in the absence of a defined stream channel, flow in Willoughby Creek may behave more like sheet flow than channel flow, due to the lack of an incised channel. Without an incised channel, most of the groundwater discharge will enter the wetland as surface leakage along the valley wall.

Figure 5, in particular, confirms that there are no discernible seeps and stream channels emanating from the east valley wall and joining Willoughby Creek.

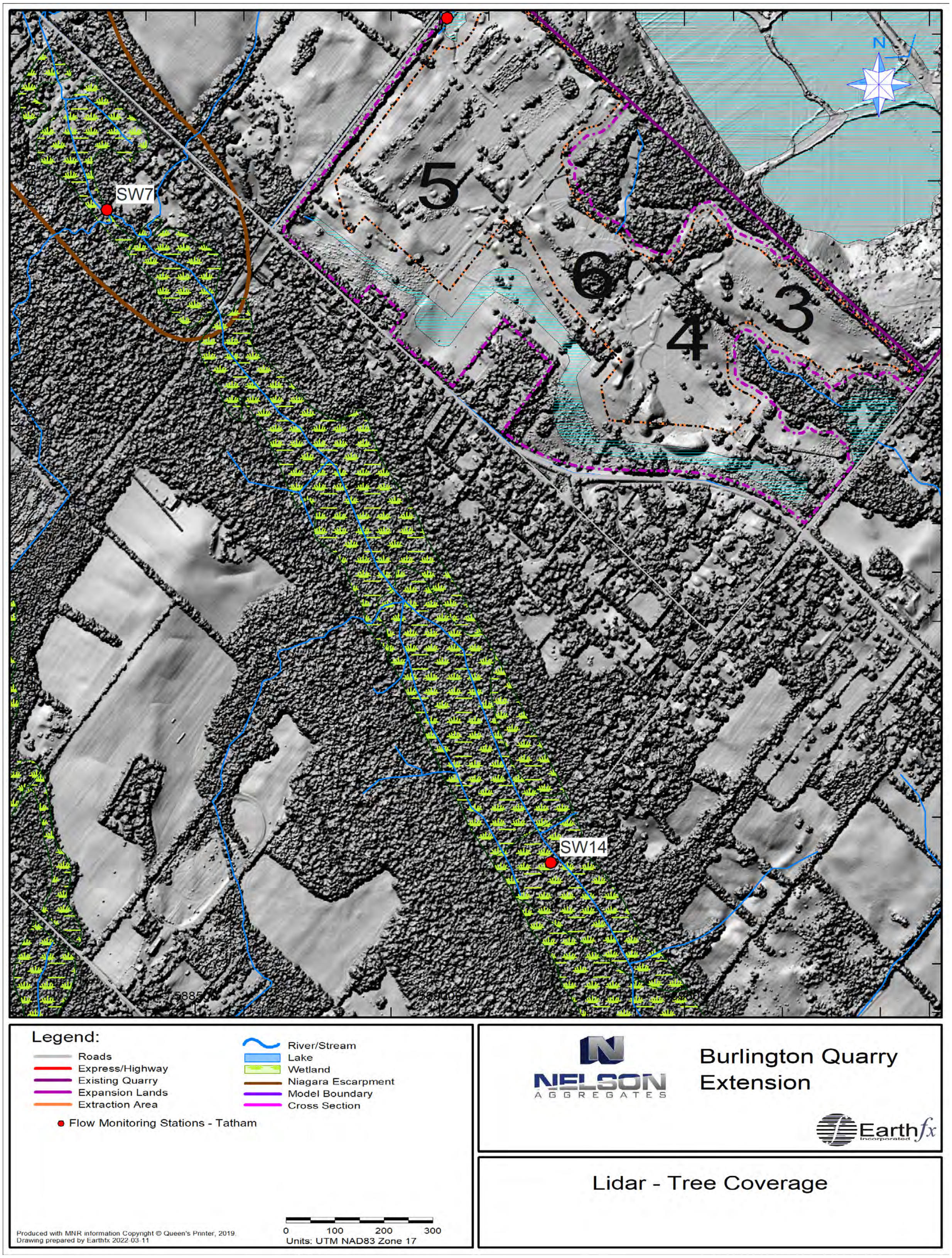


Figure 3: Land surface elevation based on LIDAR data (no correction for tree cover).

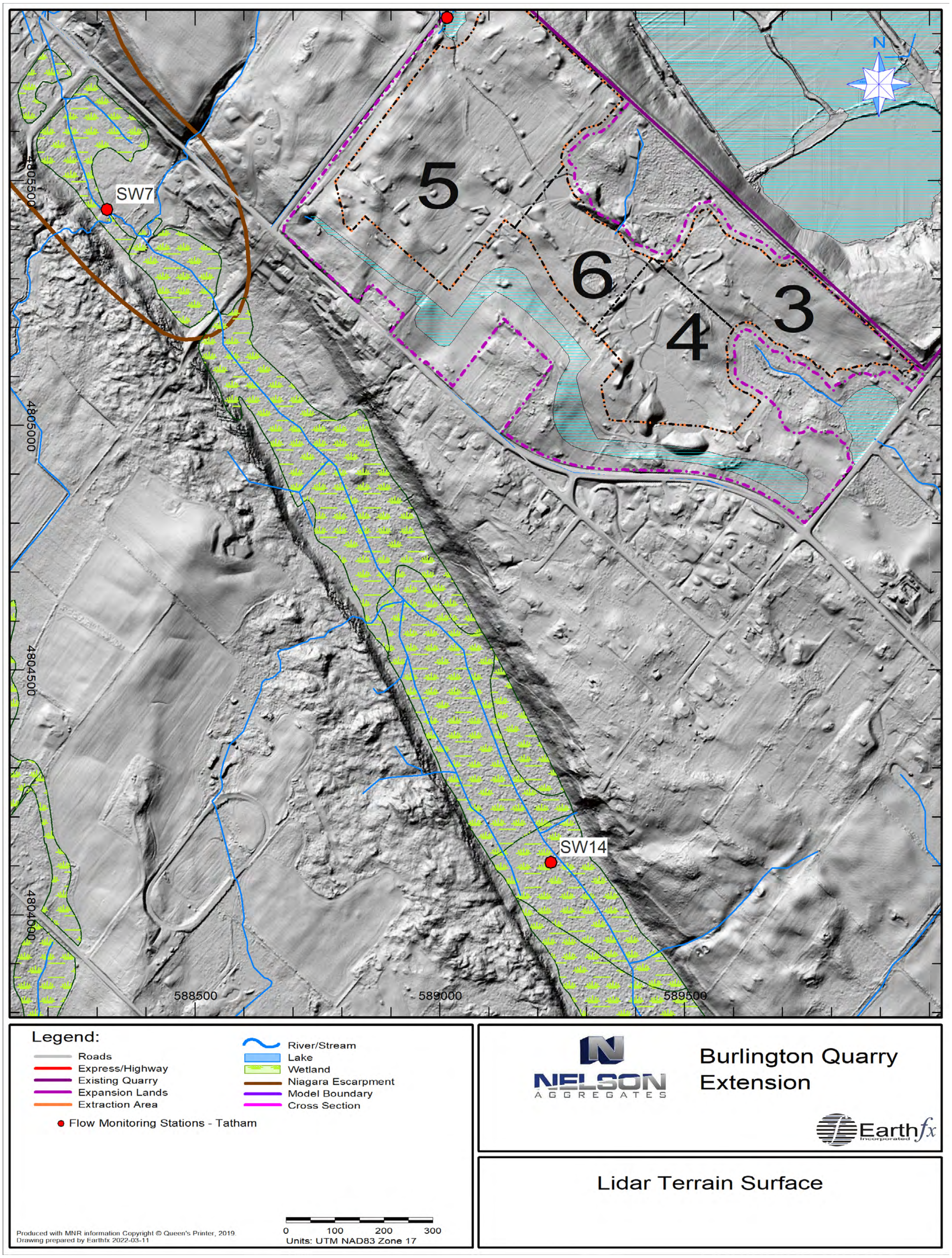


Figure 4: Land surface elevation based on bare-earth LIDAR data

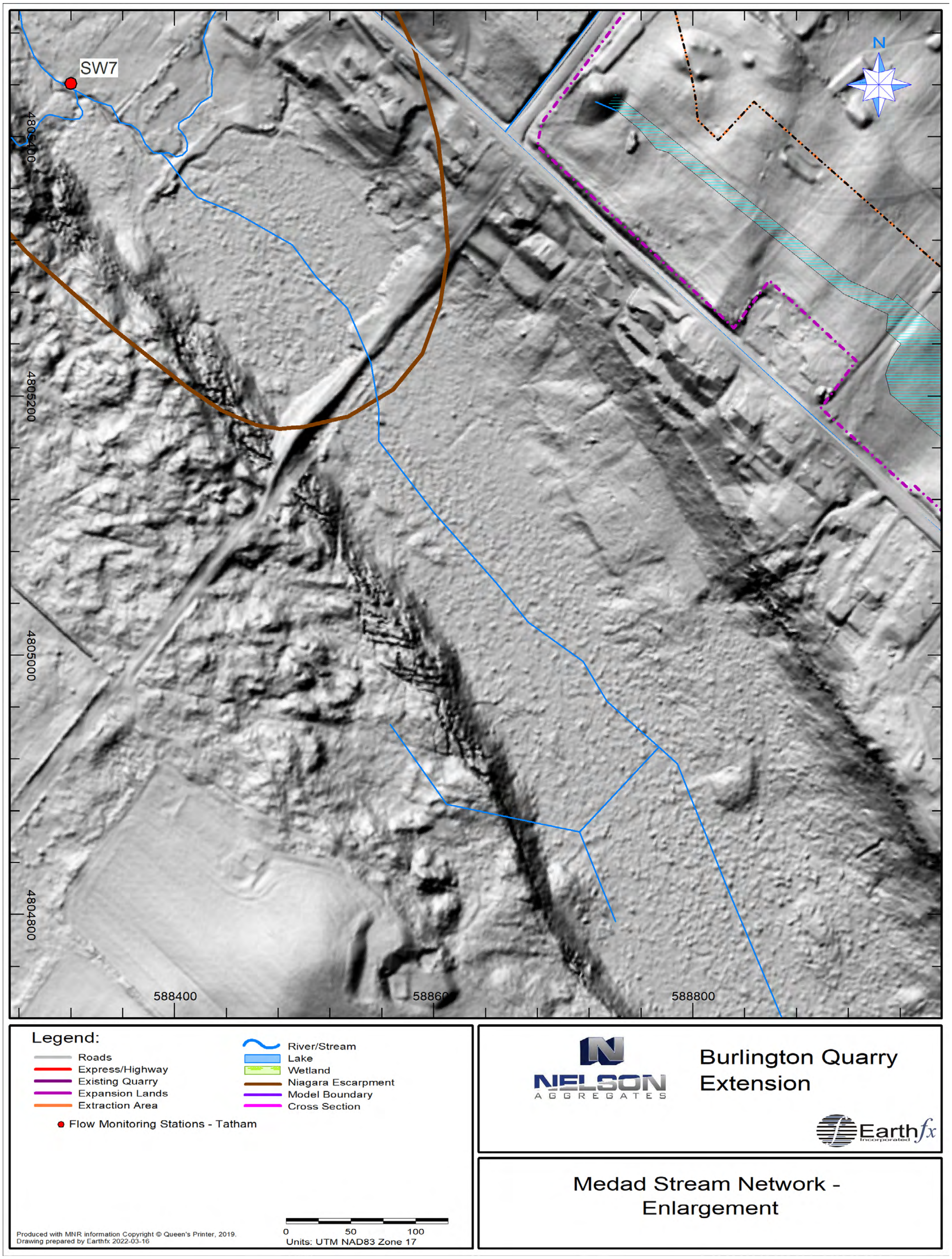


Figure 5: Medad Stream Network Mapping – Enlargement showing lack of defined stream channel

Earthfx, 2020, Figure 8.70 presented and discussed change in distributed groundwater discharge to the Medad Valley. The report compared current baseline and P3456 conditions with the infiltration ponds. The following discussion presents those simulation results in conjunction with the new LIDAR data to illustrate the limited and distributed nature of the effects of the quarry development.

Figure 6 shows the average surface leakage in the Medad Valley vicinity under baseline (current) conditions. As can be seen, the highest rates occur in model cells adjacent to the valley walls on both sides of the valley. Pickup in streamflow (shown as blue shading along the stream lines) is relatively small and losses through the streambed occur in areas with larger influx of runoff related to surface leakage.

An overlay of the simulated *change in groundwater discharge* to the Medad valley (Figure 7) shows that the change in discharge between baseline and P3456 conditions occurs primarily along the eastern valley wall at the edge of the wetland (Note that the model results shown in Figure 7 were previously presented the Earthfx 2020 Level 1 / 2 Hydrogeologic Report, Figure 8.70).

In summary, the LIDAR data shows that there is no incised stream channel within the broad, flat wetland that fills the valley. This is consistent with the water budget that shows that the majority of the groundwater discharge to the Medad Valley enters along the edge of the wetlands as distributed surface leakage. The model results are consistent with the new LIDAR data, and shows that the modest change in groundwater discharge will occur in a distributed manner along the eastern edge of the valley.

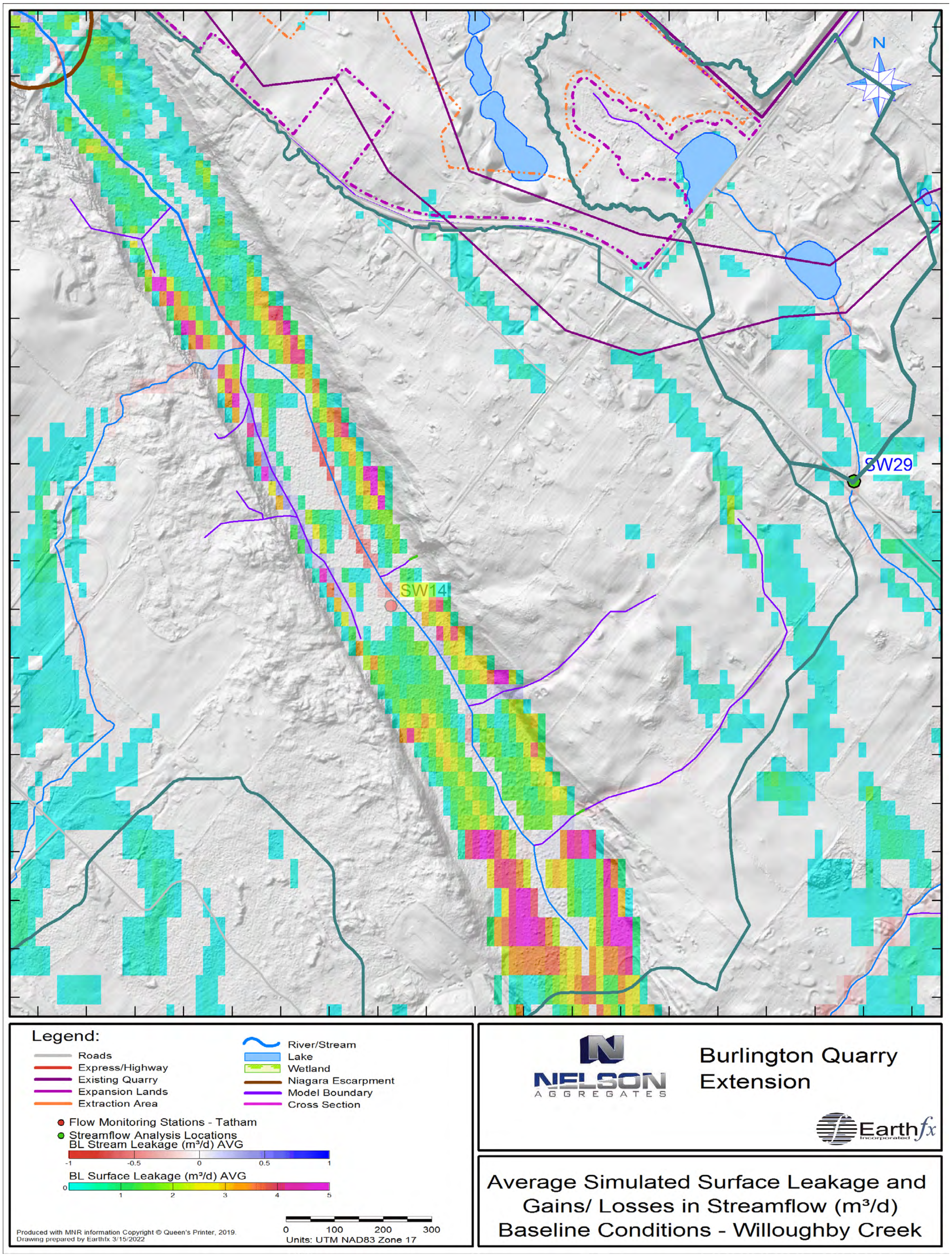


Figure 6: Simulated average stream leakage and surface leakage in the Medad Valley under baseline conditions.

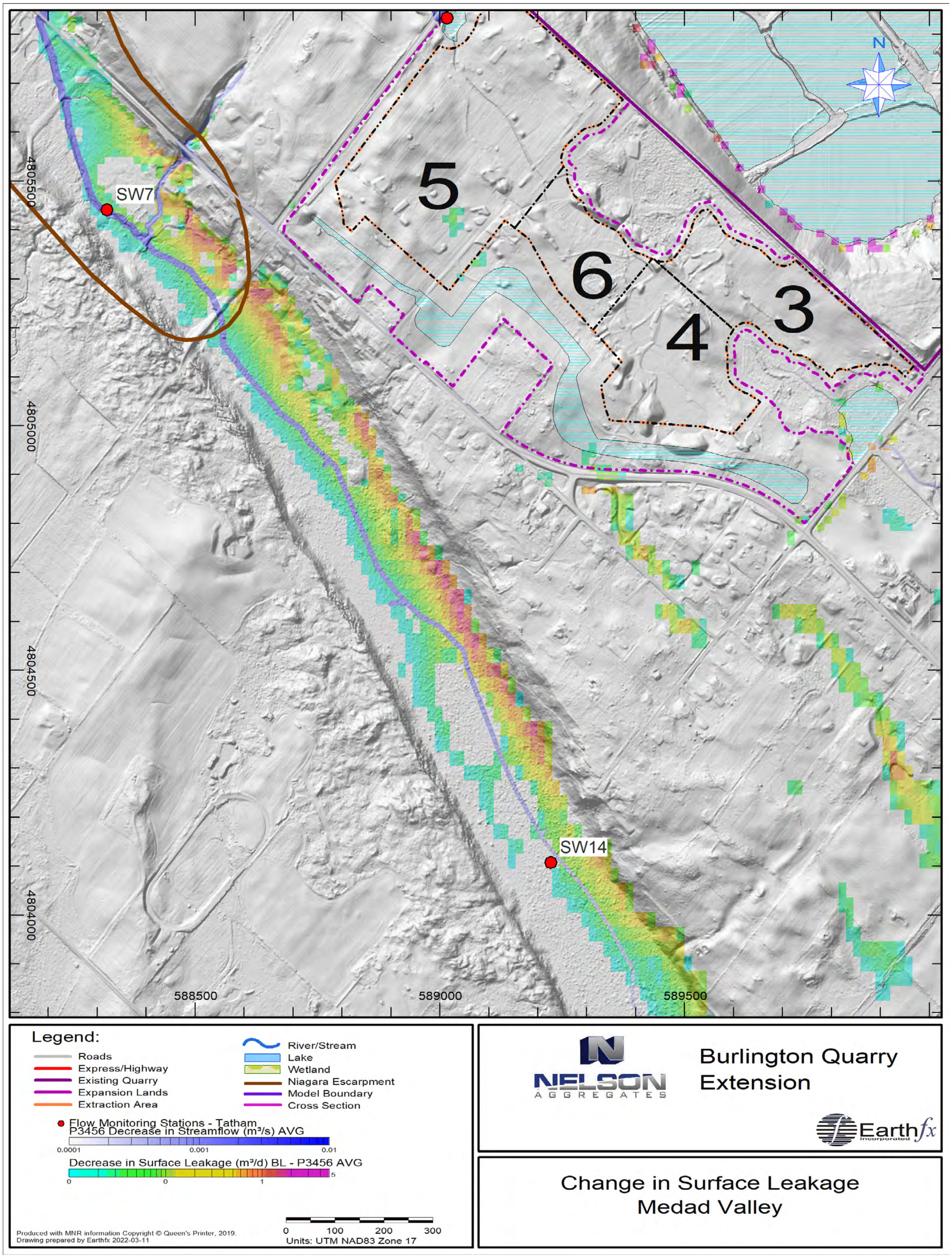


Figure 7: Change in groundwater discharge to the soil zone and predicted decrease in streamflow (Model results taken from Earthfx, 2020, Figure 8.70)

# 4 Field Data and Infiltration Pond Feasibility and Effectiveness

Most of the outstanding comments referred to in Item 4 (excluding Comment 6 and 231) questioned the assumption that the golf-course irrigation ponds are infiltrating water and that the infiltration feature will recharge the aquifer as designed. The lack of field data was cited in several of the comments.

Earthfx noted the leaky response observed during the BS-06 pump test as evidence of leakage from the nearby irrigation ponds. Further, we noted the temperature increase in the profile recorded in BS-07 before, during and after the pump test as strong evidence that surface water can leak downward and recharge into the aquifer system (Figure 8).

Earthfx relied on results of model simulations, including those presented, to quantify the likely volumes of water discharged from the ponds. The volumes lost from the ponds are small and it would be difficult to design a field program, other than the temperature test (as completed and noted above) or tracer test, to detect these volumes. In theory, the ponds might be disconnected and drained for a period of time to determine if there was a groundwater level decrease but it would be (1) impractical and inconvenient to the golf course and (2) it would still be difficult to separate the response out from other natural variation.

Similarly, Earthfx relied on field tests results and model simulations to aid in designing the infiltration feature and to quantify the likely volumes of water discharged. As noted earlier, very conservative assumptions were made so as to not overestimate the effectiveness. This was done even though the feature will be excavated to the top of or into the weathered bedrock and clogging with low TSS water should not occur.

Field testing the infiltration feature would require the actual construction of a part of the feature and installing monitoring wells. Construction would not be permitted without a prior site approval. Brian Zeman of MHBC Planning indicated that a site condition could be added to the approval requiring testing of the infiltration feature prior to start of Phase 3 extraction. This would provide a ten-year period in which to demonstrate its effectiveness.

## *4.1 Response to Water Supply Problems at Domestic Wells*

The review team indicated that the concern was not so much related to the ability to “get water into the ground” but rather if the increased heads due to the recharged water would benefit all well owners in the area. Norbert Woerns expressed concerns that, due to the fractured nature of the formation, there could be individual well owners that would still be impacted by quarry development.

While there is natural variation in the rock properties in the area, there are no documented cases where there is insufficient available drawdown in the Amabel Aquifer (a widely recognized bedrock aquifer resource) for a private well supply. As discussed, natural variability is observed when comparing the higher response observed in BS-06 versus BS-07, however BS-07 would still be a suitable well for private water supply, even if it was not selected for the much higher capacity pumping test.

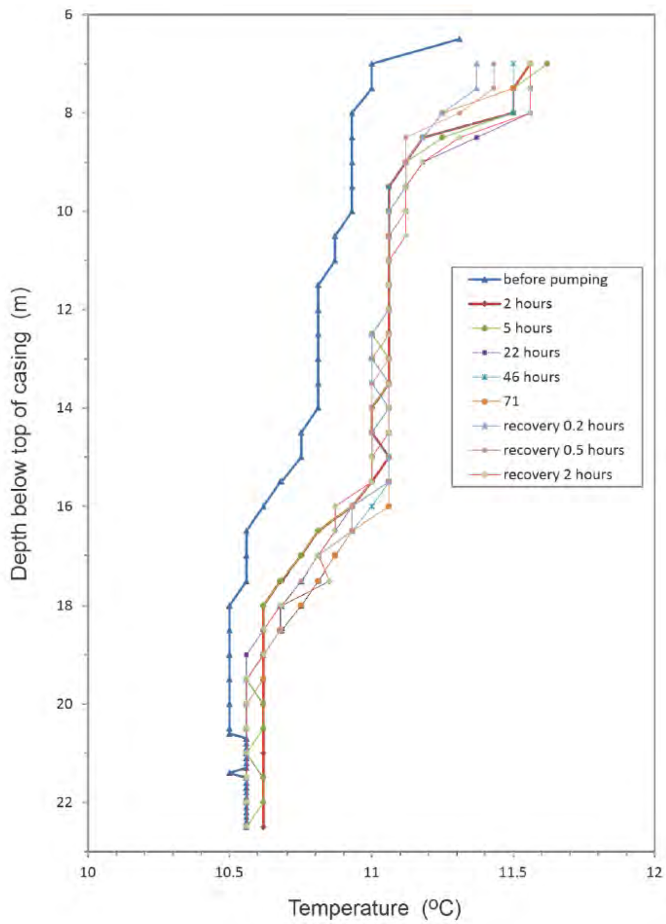


Figure 8: Temperature profile at well BS07 before, during and after the pumping test at BS-06 (From Earthfx, 2020, Page 439)

#### 4.1.1 Available Drawdown

The report discussed possible effects of decreased heads due to quarry expansion on private wells. The report noted that "The private wells in the vicinity of the West Extension will see a decline of approximately 2 m in available drawdown [during the Phase 3, 4, 5, and 6 operations], however the majority of the wells have between 10 and 16 m of Amabel Aquifer drawdown after excavation, so deepening a well is a viable mitigation measure. Near the intersection of Colling Road and Cedar Springs Road there are a few wells that will have between 5 and 10 m of available drawdown, however these are in a significant discharge area so it is likely that there will be sufficient flow to meet their private supply needs." Furthermore, "If the ARA licence is issued, Nelson will complete a follow-up door-to-door water well survey to inform residents that they are still able to participate in the [monitoring] program if interested. Particular focus will be on wells located within 500 m of the proposed extraction area and wells that have an available drawdown of less than 10 m. Based on the information obtained from the MECP database, there are 36 water wells that meet this requirement..." As well, "Under worst case drought conditions, such during the Level 2 Provincial Low Water Advisory that was issued in 2016, water levels in the vicinity of P3456 will be an additional 1 m lower than average extraction conditions. There will, however, continue to be between 5 and 20 m of available drawdown in the Amabel Aquifer".

The JART team then expressed concerns that having sufficient available drawdown may not be enough to prevent well problems for low yielding wells. There are no records of significant existing issues in private wells, and the proposed AMP includes a detailed approach to mitigate any potential issues.

# 5 Water Quality

Questions related to water quality were mainly focussed on the lack of water quality information with respect to Ontario drinking water objectives (ODWO). Our opinion is that sufficient data is available to clearly show that the local water quality is generally excellent, and that the long-term discharge to the golf course ponds and south quarry discharge stream show no ill effects.

Our response centers on three areas: (1) Historic monitoring of quarry discharge to meet ECA requirements; (2) historic information related to groundwater quality in the South expansion area; (3) and water quality sampling from 2019 and 2021, covering both the south and west expansion areas.

## 5.1 Environmental Compliance Approval (ECA) Data

Environment, Conservation and Parks (MECP) issued Nelson Aggregate Company an Ontario Water Resources Act Section 53 Environmental Compliance Approval for Industrial Sewage Works (ECA No.: 5203-AN6NGV). The ECA allows the site to discharge incidental water that enters the quarry footprint. As a condition of the ECA, Nelson is required to complete an annual compliance report that contains, among other information, data on water quality of the effluent. The sampling details are provided in Table 1.

Quarry discharge is monitored completed at two sampling locations: the North Discharge pipe located along Collins Road which conveys water from the northwest sump; and the South Discharge pipe, located along 2nd line.

Table 1: List of Parameters and Sampling Frequency for Quarry Discharge Sampling.

| Monthly | Quarterly |
|---|---|
| pH (field), temperature (field), conductivity (field), dissolved oxygen (field),<br>total suspended solids (TSS), total dissolved solids (TDS), Alkalinity, Hardness<br>Total Ammonia, unionized Ammonia (calculated), Oil, and Grease | Chloride, Sulphate, Total Kjeldahl Nitrogen (TKN), Dissolved Organic Carbon, Total Phosphorus, Nitrate, Nitrite, Phenols, PAHs,<br>Metals (Total Aluminum, Antimony, Arsenic, Barium, Boron, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Selenium, Silver, and Zinc)<br>temperature (field) |

The ECA reports confirm that the Burlington Quarry discharge complied with the requirements stipulated in ECA No.: 5203-AN6NGV. The quarry discharge water is safe and in compliance.

Additional discharge water sampling was conducted in 2021, and is discussed in more detail below.

## 5.2 Groundwater Quality Data

Golder collected groundwater quality data from numerous wells starting in 2003 in the South expansion area. A summary table, compiled by Golder, is presented Table 2. As can be seen, water quality is generally good with exceedances of some Aesthetic Objectives including iron, manganese, and total dissolved solids. The high alkalinity and hardness values are typical of groundwater in carbonate aquifers. The elevated arsenic, just above the ODWO limit, is a common, naturally-occurring problem in this area. High turbidity and TSS results are not representative of groundwater quality because sediments in the well were likely disturbed during sampling.

Additional sampling was conducted by Azimuth in 2019 for well clusters in both the west extension area and in the south extension area (Table 3). In a similar manner to the Golder results, exceedances are seen in the samples for hardness, TDS, iron, and manganese. The water chemistry at location MW03-01A (Figure 9, Table 3), immediately beneath the stream containing the south quarry discharge, is very similar to the chemistry at background location MW03-04A (Figure 9), which is located distant from the quarry and south quarry discharge. This data indicates that the south quarry discharge is not impacting the water quality relative to the background levels at the site. Complete results are shown in Table 4 and Table 5.

A similar comparison can be made between the water quality at the BS-01 and the background water quality at MW03-04A. The sodium and chloride levels at BS-01 are slightly elevated, but this is not unexpected give that the well is less than 30 m from the road salt applied to Cedar Spring Road. A stronger road salt impact is noted at BS-02A and BS-02B, located west of the quarry.

Background water quality in the west extension (without road salt impact) is better illustrated by the sampling at well DW1 (Figure 9). A number of domestic wells, the northwest quarry sump, and the golf course ponds were sampled in March and May of 2021 and analyzed for compliance with ODWO (Table 4). The samples for the sump and pond provide the most direct evidence that the quarry discharge is compliant with OWDO and should not be a concern for future infiltration. The Aesthetic Objectives for hardness and TDS are exceeded by all samples, with the sump and pond having the lowest values (The lower values are reflective of the mixing of groundwater inflows with direct precipitation into the quarry). DW1, located west of the golf course ponds, shows no effect of the ponds and good water quality. (DW3, located east of the quarry, appears to have been impacted by road salt.)

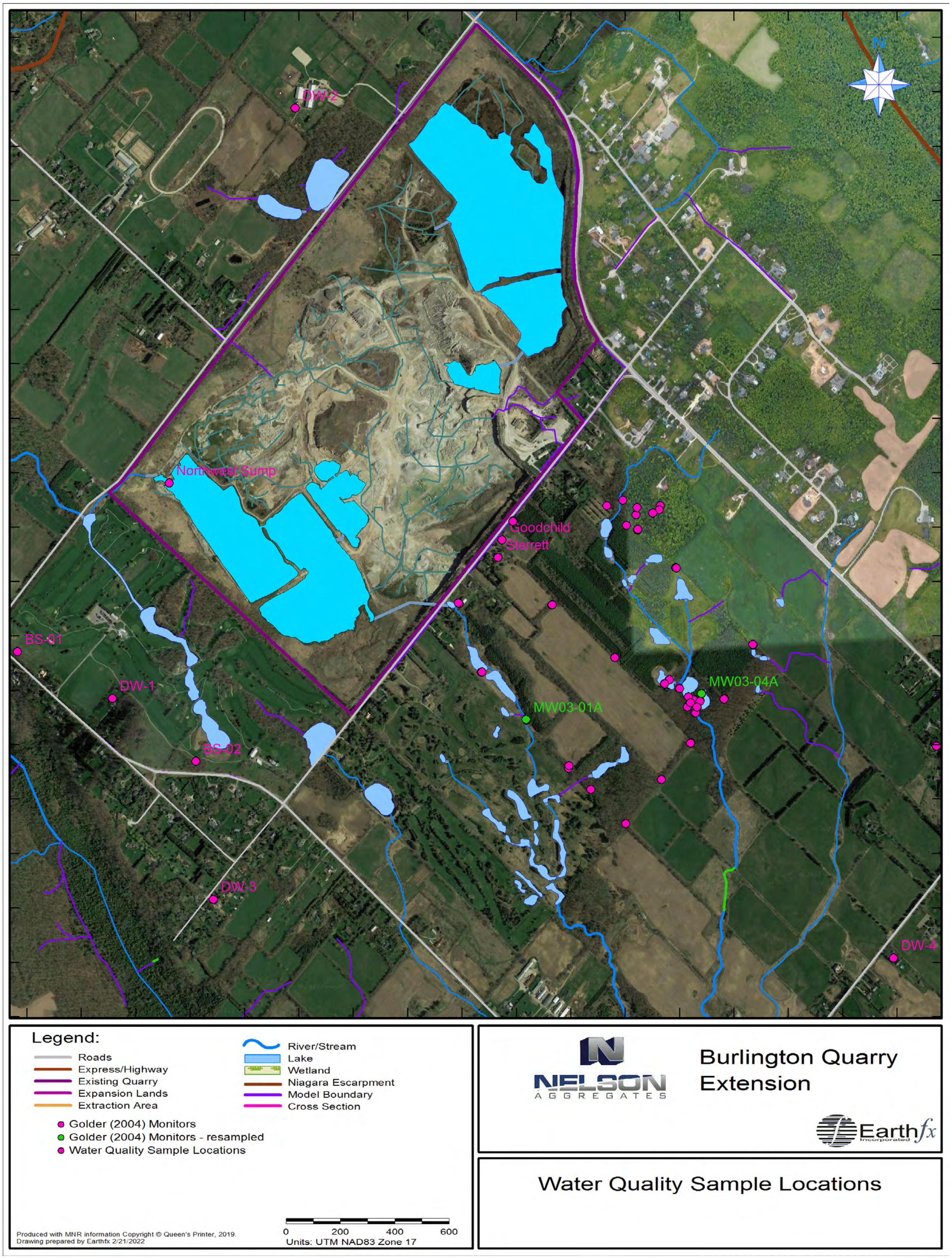


Figure 9: Location of water quality sampling points.

Table 2: Summary of water quality samples from Golder wells.

| Parameter | MDL | ODWO | Units | Overburden/Upper Bedrock | | | Upper Amabel | | | Lower Amabel | | | Amabel/Lower Units | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | Avg | Min | Max | Avg | Min | Max | Avg | Min | Max | Avg |
| Alkalinity ($CaCO_3$) | 1.0 | 30-500[2] | mg/L | 300 | 730 | 432 | 220 | 1200 | 411 | 170 | 310 | 260 | 230 | 310 | 263 |
| Conductivity | 4.2 | | µS/cm | 640 | 1100 | 788 | 460 | 790 | 630 | 490 | 820 | 690 | 680 | 1200 | 893 |
| DOC | 0.20 | 5.0[1] | mg/L | 1.1 | 6.5 | 3.1 | 0.4 | 1.3 | 0.8 | < | 4.0 | 1.8 | 0.4 | 1.6 | 0.8 |
| Hardness ($CaCO_3$) | 1.0 | 80-100[2] | mg/L | 280 | 550 | 378 | 260 | 450 | 331 | 230 | 370 | 314 | 260 | 500 | 393 |
| pH (20 °C) | | | | 7.69 | 8.39 | 8.11 | 8.01 | 8.21 | 8.14 | 7.54 | 8.22 | 7.94 | 7.62 | 8.24 | 7.99 |
| TDS (180 °C) | 11 | 500[1] | mg/L | 420 | 800 | 540 | 240 | 560 | 400 | 260 | 580 | 446 | 460 | 870 | 618 |
| TKN (as N) | 0.16 | | mg/L | < | 0.62 | 0.47 | < | 0.58 | 0.43 | 0.16 | 0.91 | 0.38 | < | 1.20 | 0.57 |
| TSS[3] | 2.0 | | mg/L | 1500 | 8000 | 3850 | < | 18000 | 11750 | < | 4200 | 1615 | 800 | 800 | 800 |
| Turbidity[3] | 0.10 | 5.0[1] | ntu | 1100 | 3800 | 2100 | 0.27 | 9800 | 3701 | 1 | 3200 | 922 | 7 | 390 | 104 |
| | | | | | | | | | | | | | | | |
| Aluminum | 0.010 | 0.10[2] | mg/L | 0.03 | 0.32 | 0.09 | 0.02 | 0.21 | 0.06 | 0.02 | 0.11 | 0.04 | 0.02 | 0.19 | 0.11 |
| Ammonia (N) | 0.02 | | mg/L | < | 0.12 | 0.09 | < | 0.15 | 0.07 | < | 0.18 | 0.09 | 0.04 | 0.66 | 0.22 |
| Antimony | 0.002 | 0.006 | mg/L | < | < | < | < | 0.004 | 0.003 | < | 0.002 | 0.002 | < | < | < |
| Arsenic | 0.002 | 0.01 | mg/L | 0.002 | 0.007 | 0.005 | < | 0.005 | 0.003 | 0.003 | 0.023 | 0.014 | 0.002 | 0.011 | 0.005 |
| Barium | 0.005 | 1.0 | mg/L | 0.02 | 0.07 | 0.05 | 0.05 | 0.13 | 0.08 | 0.03 | 0.18 | 0.07 | 0.01 | 0.08 | 0.04 |
| Beryllium | 0.001 | | mg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Bismuth | 0.002 | | mg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Boron | 0.005 | 5.0 | mg/L | 0.016 | 0.061 | 0.033 | 0.014 | 0.120 | 0.033 | 0.026 | 0.060 | 0.036 | 0.041 | 1.200 | 0.365 |
| Bromide | 0.10 | | mg/L | < | < | < | < | < | < | < | < | < | < | 0.41 | 0.41 |
| Cadmium | 0.00007 | 0.005 | mg/L | < | 0.00007 | 0.00007 | < | 0.00008 | 0.00008 | < | < | < | < | < | < |
| Calcium | 0.20 | | mg/L | 73 | 110 | 91 | 71 | 120 | 86 | 61 | 110 | 85 | 68 | 150 | 116 |
| Chloride | 0.05 | 250[1] | mg/L | 3 | 27 | 9 | 3 | 32 | 11 | 4 | 19 | 10 | 5 | 38 | 15 |
| Chromium | 0.002 | 0.05 | mg/L | < | < | < | < | 0.008 | 0.008 | < | < | < | < | < | < |
| Cobalt | 0.0005 | | mg/L | < | 0.001 | 0.0009 | 0.0005 | 0.002 | 0.001 | < | 0.0006 | 0.0006 | < | 0.0007 | 0.0006 |
| Copper | 0.002 | 1.0[1] | mg/L | < | 0.010 | 0.006 | 0.002 | 0.008 | 0.004 | < | 0.008 | 0.005 | < | 0.004 | 0.003 |
| Cyanide free | 0.002 | 0.02 | mg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Fluoride (probe) | 0.030 | 1.5 | mg/L | 0.15 | 0.22 | 0.18 | 0.13 | 0.28 | 0.18 | 0.18 | 0.24 | 0.22 | 0.20 | 0.69 | 0.35 |

| Parameter | MDL | ODWO | Units | Overburden/Upper Bedrock | | | Upper Amabel | | | Lower Amabel | | | Amabel/Lower Units | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | Avg | Min | Max | Avg | Min | Max | Avg | Min | Max | Avg |
| Iron (Total) | 0.010 | 0.3[1] | mg/L | 0.03 | 6.70 | 1.54 | < | 0.36 | 0.12 | 0.08 | 0.51 | 0.23 | < | 0.35 | 0.23 |
| Iron (Dissolved) | 0.020 | 0.3[1] | mg/L | < | < | < | < | 0.07 | 0.05 | 0.40 | 0.40 | 0.40 | < | 0.23 | 0.20 |
| Lead | 0.0005 | 0.010 | mg/L | < | 0.012 | 0.012 | 0.0008 | 0.0034 | 0.0018 | < | 0.0005 | 0.0005 | < | 0.0061 | 0.0027 |
| Magnesium | 0.40 | | mg/L | 23 | 67 | 37 | 19 | 40 | 28 | 19 | 33 | 25 | 23 | 30 | 26 |
| Manganese | 0.002 | 0.05[1] | mg/L | 0.047 | 0.620 | 0.258 | 0.007 | 0.038 | 0.022 | 0.014 | 0.043 | 0.025 | 0.026 | 0.044 | 0.035 |
| Mercury | 0.05 | 0.001 | µg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Molybdenum | 0.002 | | mg/L | 0.002 | 0.026 | 0.011 | < | 0.023 | 0.009 | 0.003 | 0.023 | 0.009 | 0.002 | 0.010 | 0.006 |
| Nickel | 0.002 | | mg/L | < | 0.002 | 0.002 | < | 0.009 | 0.004 | < | 0.002 | 0.002 | < | 0.002 | 0.002 |
| Nitrate (N) | 0.050 | 10.0 | mg/L | < | 0.93 | 0.61 | < | 2.2 | 1.29 | < | < | < | < | 0.74 | 0.74 |
| Nitrite (N) | 0.010 | 1.0 | mg/L | 0.013 | 0.018 | 0.016 | < | 0.150 | 0.048 | < | 0.015 | 0.015 | < | 0.018 | 0.018 |
| Orthophosphate | 0.50 | | mg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Phenolic compounds | 0.0010 | | mg/L | < | 0.001 | 0.001 | < | < | < | < | < | < | < | < | < |
| Phosphorus | 0.06 | | mg/L | < | < | < | < | < | < | < | < | < | < | 0.06 | 0.06 |
| Total Phosphorus | 0.010 | | mg/L | 0.73 | 2.10 | 1.26 | < | 1.40 | 0.57 | 0.01 | 2.10 | 0.68 | 0.01 | 0.60 | 0.16 |
| Potassium | 1.0 | | mg/L | 1.7 | 5.8 | 3 | < | 1.7 | 1.5 | < | 2.2 | 1.825 | 1.2 | 14 | 4.7 |
| Selenium | 0.002 | 0.01 | mg/L | < | < | < | < | < | < | < | < | < | < | 0.002 | 0.002 |
| Silver | 0.0001 | | mg/L | < | 0.0001 | 0.0001 | < | < | < | < | < | < | < | < | < |
| Sodium | 0.10 | 200 | mg/L | 4.9 | 73 | 25 | 3 | 18 | 7.88 | 4.7 | 20 | 10.66 | 11 | 98 | 45 |
| Strontium | 0.002 | | mg/L | 0.18 | 0.86 | 0.39 | 0.11 | 3.30 | 0.85 | 0.23 | 11.00 | 4.81 | 2.30 | 10.00 | 6.53 |
| Sulphate ($SO_4$) | 0.10 | 500 | mg/L | 41 | 230 | 99 | 23 | 150 | 66 | 33 | 150 | 81 | 66 | 460 | 242 |
| Sulphide | 0.020 | | mg/L | 0.02 | 0.03 | 0.025 | < | 0.48 | 0.128 | < | 0.02 | 0.02 | < | 0.02 | 0.02 |
| Sulphur | 0.060 | | mg/L | 14 | 94 | 40 | 8 | 51 | 23 | 12 | 51 | 29 | 24 | 150 | 78 |
| Thallium | 0.0002 | | mg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Tin | 0.002 | | mg/L | < | < | < | < | < | < | < | < | < | < | < | < |
| Titanium | 0.001 | | mg/L | 0.001 | 0.017 | 0.004 | 0.001 | 0.010 | 0.003 | < | 0.002 | 0.001 | 0.001 | 0.010 | 0.005 |
| Uranium | 0.0002 | 0.02 | mg/L | 0.0012 | 0.012 | 0.0048 | 0.0002 | 0.0020 | 0.0013 | 0.0003 | 0.0056 | 0.0017 | 0.0003 | 0.0018 | 0.0012 |
| Vanadium | 0.002 | | mg/L | < | 0.003 | 0.003 | < | < | < | < | < | < | < | 0.002 | 0.002 |
| Zinc | 0.003 | 5[1] | mg/L | 0.008 | 0.026 | 0.018 | 0.012 | 0.110 | 0.051 | 0.004 | 0.022 | 0.015 | 0.017 | 0.042 | 0.027 |

Notes: [1] Ontario Drinking Water Aesthetic Objective, [2] Ontario Drinking Water Operational Guideline, [3] High values likely due to disturbance of well sediments

Table 3: 2019 Water quality data from BS-01, BS-02, and two Golder well clusters.

| Parameter | ODWO | Units | BS-01A 5/15/19 | BS-01B 5/15/19 | BS-01C 5/15/19 | BS-02A 5/15/19 | BS-02B 5/15/19 | BS-02C 5/15/19 | MW03-01A 5/15/19 | MW03-04A 5/15/19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity ($CaCO_3$) | 30-500[2] | mg/L | 260 | 264 | 264 | 309 | 312 | 264 | 167 | 245 |
| Conductivity | | µS/cm | 865 | 811 | 538 | 2280 | 1780 | 1110 | 626 | 595 |
| DOC | 5.0[1] | mg/L | 2.8 | 2.4 | 2.4 | 1.6 | 1.3 | 2.1 | 3.2 | 4.4 |
| Hardness ($CaCO_3$) | 80-100[2] | mg/L | 344 | 325 | 261 | 447 | 427 | 396 | 320 | 247 |
| pH | | | 7.89 | 7.93 | 8.03 | 7.8 | 7.84 | 7.85 | 8.0 | 8.0 |
| TDS (180 °C) | 500[1] | mg/L | 476 | 430 | 257 | 1184 | 938 | 584 | 376 | 306 |
| Turbidity[3] | 5.0[1] | ntu | 5540 | 18300 | 596 | 6840 | 8150 | 342 | 533 | 6520 |
| Aluminum | 0.10[2] | mg/L | 0.07 | 0.05 | 0.05 | 0.08 | 0.07 | 0.06 | 0.050 | 0.050 |
| Ammonia (N) | | mg/L | 0.21 | 0.2 | 0.13 | 0.3 | 0.24 | 0.09 | 0.24 | 0.26 |
| Arsenic | 0.01 | mg/L | 0.0006 | 0.0002 | <0.0001 | 0.0088 | 0.007 | 0.0103 | 0.0015 | 0.0096 |
| Barium | 1.0 | mg/L | 0.049 | 0.045 | 0.012 | 0.256 | 0.206 | 0.177 | 0.01 | 0.08 |
| Boron | 5.0 | mg/L | 0.02 | 0.019 | < 0.005 | 0.027 | 0.026 | 0.034 | 0.062 | 0.071 |
| Bromide | | mg/L | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 |
| Cadmium | 0.005 | mg/L | 0.000173 | 0.000039 | 0.00002 | < 0.000015 | < 0.000015 | 0.000047 | <0.000015 | 0.0000 |
| Calcium | | mg/L | 94.1 | 87.1 | 67.8 | 117 | 109 | 97.1 | 90 | 64 |
| Chloride | 250[1] | mg/L | 39.3 | 44.9 | 2.8 | 459 | 321 | 137 | 7 | 6 |
| Chromium | 0.05 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | < 0.001 | 0.0010 | 0.0010 |
| Copper | 1.0[1] | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Fluoride | 1.5 | mg/L | <0.1 | <0.1 | <0.1 | <0.1 | 0.3 | <0.1 | <0.1 | 0.40 |
| Iron (Dissolved) | 0.3[1] | mg/L | 0.047 | < 0.005 | 0.011 | 1.37 | 1.16 | 1.12 | 0.84 | 0.63 |
| Lead | 0.010 | mg/L | 0.00044 | 0.00009 | 0.00008 | 0.00113 | 0.00079 | 0.00048 | 0.0001 | 0.0003 |
| Magnesium | | mg/L | 26.5 | 26.2 | 22.3 | 37.6 | 37.7 | 37.4 | 23 | 21 |
| Manganese | 0.05[1] | mg/L | 0.038 | 0.002 | 0.001 | 0.083 | 0.103 | 0.105 | 0.054 | 0.014 |
| Molybdenum | | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nickel | | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nitrate (N) | 10.0 | mg/L | 1.9 | 3.1 | 0.3 | 0.2 | < 0.1 | 0.2 | 0.2 | 0.3 |
| Nitrite (N) | 1.0 | mg/L | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Orthophosphate | | mg/L | 2.26 | 0.063 | 0.152 | 1.41 | 0.01 | 0.087 | 0.15 | 6.71 |
| Total Phosphorus | | mg/L | 4.88 | 4.42 | 0.2 | 2.68 | 1.9 | 0.25 | 0.27 | 7.85 |
| Potassium | | mg/L | 2.3 | 2 | 0.1 | 1.8 | 1.7 | 1.9 | 2.4 | 2.4 |
| Selenium | 0.01 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Silver | | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |

| Parameter | ODWO | Units | BS-01A 5/15/19 | BS-01B 5/15/19 | BS-01C 5/15/19 | BS-02A 5/15/19 | BS-02B 5/15/19 | BS-02C 5/15/19 | MW03-01A 5/15/19 | MW03-04A 5/15/19 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sodium | 200 | mg/L | 31.3 | 33 | 2.1 | 277 | 183 | 60.5 | 11 | 16 |
| Strontium | | mg/L | 0.389 | 0.185 | 0.08 | 0.666 | 0.602 | 0.545 | 1.3 | 13.5 |
| Sulphate ($SO_4$) | 500 | mg/L | 118 | 65 | 3 | 104 | 97 | 90 | 140 | 47 |
| Thallium | | mg/L | 0.00007 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Tin | | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Titanium | | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Uranium | 0.02 | mg/L | 0.00093 | 0.0005 | 0.00019 | 0.0004 | 0.00034 | 0.00044 | <0.00005 | 0.0006 |
| Vanadium | | mg/L | 0.0002 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | 5[1] | mg/L | 0.03 | 0.023 | 0.033 | 0.047 | 0.096 | 0.219 | 0.073 | 0.383 |

# Table 4: Water chemistry results 2003-2019 - Part 1

| | PARAMETER | | | Alkalinity | Conductivity @25°C | Dissolved Organic Carbon | Hardness | pH | Total Dissolved Solids | Total Kjeldahl Nitrogen | Total Suspended Solids | Turbidity | Aluminum | Ammonia, total | Antimony | Arsenic | Barium | Beryllium | Bismuth | Boron | Bromide | Cadmium | Calcium | Chloride | Chromium | Cobalt | Copper | Ctanide free |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | UNITS | | mg/L | µS/cm | mg/L | mg/L | pH Units | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ODWQS | | 500 | - | 5 | 100 | 6.5-8.5 | 500 | - | - | 1 | 0.100 | - | 0.006 | 0.0250 | 1.00 | - | | 5.000 | - | 0.0050 | - | 250 | 0.0500 | - | 1.0000 | 0.2000 |
| | | | | OG | | | OG | OG | AO | | | | OG | | IMAC | IMAC | MAC | | | IMAC | | MAC | | AO | MAC | | AO | |
| 1 | MW03-01A | 30-May-03 | | 230 | 940 | 2 | 480 | 8 | 640 | 0 | <2 | 14 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 150 | 5 | <0.002 | 0 | 0 | <0.002 |
| 2 | MW03-01A | 15-May-19 | | 167 | 626 | 3 | 320 | 8 | 376 | | | 533 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | < 0.000015 | 90 | 7 | 0 | | < 0.002 | |
| 3 | MW03-01B | 30-May-03 | | 260 | 560 | 1 | 320 | 8 | 300 | <0.16 | <2 | 1 | 0 | <0.02 | 0 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 88 | 5 | <0.002 | 0 | 0 | <0.002 |
| 4 | MW03-01C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | MW03-02A | 30-May-03 | | 240 | 1,200 | 0 | 500 | 8 | 870 | <0.16 | <2 | 7 | 0 | 1 | <0.002 | <0.002 | 0 | <0.001 | <0.002 | 1 | 0 | <0.00007 | 150 | 38 | <0.002 | 0 | 0 | <0.002 |
| 6 | MW03-02A | 15-May-19 | | 224 | 1,830 | 3 | 619 | 8 | 1,321 | | | 14,000 | 0 | 5 | | 0 | 0 | | | 2 | 1 | < 0.000029 | 184 | 74 | < 0.001 | | < 0.002 | |
| 7 | MW03-02B | 30-May-03 | | 310 | 790 | 1 | 450 | 8 | 560 | <0.16 | <2 | 3 | 0 | <0.02 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 120 | 32 | <0.002 | 0 | 0 | <0.002 |
| 8 | MW03-02C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | MW03-03A | 30-May-03 | | 270 | 680 | 1 | 330 | 8 | 460 | <0.16 | <2 | 7 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 96 | 7 | <0.002 | 0 | 0 | <0.002 |
| 10 | MW03-03B | 30-May-03 | | 260 | 590 | 1 | 320 | 8 | 350 | 0 | <2 | 0 | 0 | <0.02 | 0 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 85 | 6 | <0.002 | 0 | 0 | <0.002 |
| 11 | MW03-03C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | MW03-04A | 30-May-03 | | 310 | 750 | 0 | 260 | 8 | 500 | 0 | 800 | 390 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 68 | 11 | <0.002 | <0.0005 | <0.002 | <0.002 |
| 13 | MW03-04A | 15-May-19 | | 245 | 595 | 4 | 247 | 8 | 306 | | | 6,520 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | 0 | 64 | 6 | 0 | | < 0.002 | |
| 14 | MW03-04B | 30-May-03 | | 1,200 | 670 | 1 | 290 | 8 | 440 | 0 | 14,000 | 8,000 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 77 | 3 | <0.002 | <0.0005 | <0.002 | <0.002 |
| 15 | MW03-04B | 15-May-19 | | 263 | 598 | 2 | 285 | 8 | 309 | | | 7,490 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | 0 | 75 | 3 | 0 | | < 0.002 | |
| 16 | MW03-04C | 30-May-03 | | 430 | 640 | 1 | 300 | 8 | 430 | 0 | 1,500 | 1,200 | 0 | <0.02 | <0.002 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | 0 | 78 | 3 | <0.002 | 0 | 0 | <0.002 |
| 17 | MW03-04C | 30-May-03 | Dup | 730 | 640 | 1 | 280 | 8 | 420 | 0 | 1,500 | 1,400 | 0 | <0.02 | <0.002 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 75 | 3 | <0.002 | 0 | 0 | <0.002 |
| 18 | MW03-05A | 30-May-03 | | 380 | 650 | 2 | 280 | 8 | 430 | <0.16 | 4,900 | 2,900 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 73 | 3 | <0.002 | <0.0005 | 0 | <0.002 |
| 19 | MW03-05B | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | MW03-06A | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | MW03-06B | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | MW03-07A | 20-Aug-03 | | 270 | 820 | <0.2 | 370 | 8 | 580 | 0 | 970 | 580 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 110 | 4 | <0.002 | <0.0005 | <0.002 | <0.002 |
| 23 | MW03-07A | 20-Aug-03 | Dup | 260 | 820 | 0 | 370 | 8 | 530 | 0 | 960 | 640 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 110 | 4 | <0.002 | <0.0005 | 0 | <0.002 |
| 24 | MW03-07B | 20-Aug-03 | | 460 | 700 | 0 | 300 | 8 | 480 | 1 | 18,000 | 9,800 | 0 | 0 | <0.002 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | 0 | 78 | 7 | <0.002 | 0 | 0 | <0.002 |
| 25 | MW03-07C | 30-May-03 | | 300 | 920 | 5 | 380 | 8 | 610 | 1 | 3,200 | 1,100 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 100 | 8 | <0.002 | <0.0005 | 0 | <0.002 |
| 26 | MW03-08A | 30-May-03 | | 310 | 600 | 1 | 320 | 8 | 380 | 0 | 4,200 | 3,200 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 74 | 8 | <0.002 | <0.0005 | <0.002 | <0.002 |
| 27 | MW03-08B | 30-May-03 | | 290 | 630 | 1 | 340 | 8 | 410 | 1 | 9,100 | 7,000 | 0 | <0.02 | <0.002 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 86 | 14 | 0 | <0.0005 | <0.002 | <0.002 |
| 28 | MW03-08C | 30-May-03 | | 330 | 780 | 3 | 480 | 8 | 550 | 0 | 4,000 | 2,200 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 110 | 27 | <0.002 | 0 | <0.002 | <0.002 |
| 29 | MW03-09A | 30-May-03 | | 170 | 490 | 4 | 230 | 8 | 260 | 0 | <2 | 1 | 0 | <0.02 | 0 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 61 | 14 | <0.002 | <0.0005 | 0 | <0.002 |
| 30 | MW03-09B | 30-May-03 | | 220 | 460 | 1 | 260 | 8 | 240 | <0.16 | <2 | 4 | 0 | <0.02 | <0.002 | <0.002 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 71 | 7 | <0.002 | <0.0005 | <0.002 | <0.002 |
| 31 | MW03-09C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | MW03-10A | 21-Aug-03 | | 290 | 720 | 2 | 280 | 8 | 480 | 1 | 330 | 190 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 70 | 19 | <0.002 | 0 | 0 | <0.002 |
| 33 | MW03-10B | 30-May-03 | | 290 | 640 | 1 | 370 | 8 | 420 | 1 | 5,900 | 4,800 | 0 | 0 | 0 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 84 | 15 | <0.002 | 0 | 0 | <0.002 |
| 34 | MW03-10C | 30-May-03 | | 420 | 1,100 | 7 | 550 | 8 | 800 | 1 | 8,000 | 3,800 | 0 | 0 | <0.002 | 0 | 0 | <0.001 | <0.002 | 0 | <0.1 | <0.00007 | 110 | 11 | <0.002 | <0.0005 | <0.002 | <0.002 |
| 35 | MW03-11A | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 | MW03-11B | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | MW03-12 | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 | BS01-A | 15-May-19 | | 260 | 865 | 3 | 344 | 8 | 476 | | | 5,540 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | 0 | 94 | 39 | < 0.001 | | < 0.002 | |
| 39 | BS01-B | 15-May-19 | | 264 | 811 | 2 | 325 | 8 | 430 | | | 18,300 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | 0 | 87 | 45 | < 0.001 | | < 0.002 | |
| 40 | BS01-C | 15-May-19 | | 264 | 538 | 2 | 261 | 8 | 257 | | | 596 | 0 | 0 | | < 0.0001 | 0 | | | < 0.005 | <0.4 | 0 | 68 | 3 | < 0.001 | | < 0.002 | |
| 41 | BS02-A | 15-May-19 | | 309 | 2,280 | 2 | 447 | 8 | 1,184 | | | 6,840 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | < 0.000015 | 117 | 459 | < 0.001 | | < 0.002 | |
| 42 | BS02-B | 15-May-19 | | 312 | 1,780 | 1 | 427 | 8 | 938 | | | 8,150 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | < 0.000015 | 109 | 321 | < 0.001 | | < 0.002 | |
| 43 | BS02-C | 15-May-19 | | 264 | 1,110 | 2 | 396 | 8 | 584 | | | 342 | 0 | 0 | | 0 | 0 | | | 0 | <0.4 | 0 | 97 | 137 | < 0.001 | | < 0.002 | |

Table 5: Water chemistry results 2003-2019 - Part 2

| | PARAMETER | | | Fluoride | Iron | Iron (dissolved) | Lead | Magnesium | Manganese | Mercury | Molybdenum | Nickel | Nitrate (N) | Nitrite (N) | ortho-Phosphate (P) | Phenolics | Phosphorus | Phosphorus-Total | Potassium | Selenium | Silver | Sodium | Strontium | Sulphate | Sulphide | Sulphur | Thallium | Tin | Titanium | Uranium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | UNITS | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | ug/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | ODWQS | | | 2.40 | 0.30 | 0.30 | 0.0100 | - | 0.050 | 1.00000 | - | - | 10.0 | 1.00 | | | | - | - | 0.010 | - | 200 | - | 500 | 0.05 | | - | | | 0.1000 | - | 5.000 |
| | | | | MAC | AO | AO | MAC | | AO | MAC | | | MAC | MAC | | | | | | MAC | | AO | | AO | | | | | | | | AO |
| 1 | W03-01A | 30-May-03 | | 0 | 0 | 0 | 0 | 26 | 0 | <0.05 | 0 | 0 | <0.05 | 0 | <0.5 | <0.001 | <0.06 | 0 | 2 | <0.002 | <0.0001 | 38 | 2 | 310 | <0.02 | 100 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 2 | W03-01A | 15-May-19 | | <0.1 | | 1 | 0 | 23 | 0 | | < 0.01 | < 0.01 | 0 | <0.1 | 0 | | | 0 | 2 | < 0.001 | < 0.0001 | 11 | 1 | 140 | | | < 0.00005 | < 0.05 | < 0.005 | < 0.00005 | < 0.0001 | 0 |
| 3 | W03-01B | 30-May-03 | | 0 | 0 | <0.02 | <0.0005 | 24 | 0 | <0.05 | 0 | 0 | 1 | 0 | <0.5 | <0.001 | <0.06 | <0.01 | <1.0 | <0.002 | <0.0001 | 3 | 0 | 59 | 0 | 23 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 4 | W03-01C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | W03-02A | 30-May-03 | | 1 | 0 | <0.02 | <0.0005 | 30 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 0 | 14 | 0 | <0.0001 | 98 | 4 | 460 | <0.02 | 150 | <0.0002 | <0.002 | 0 | 0 | 0 | 0 |
| 6 | W03-02A | 15-May-19 | | 1 | | < 0.005 | 0 | 39 | 0 | | 0 | 0 | 0 | <0.1 | 2 | | | 2 | 21 | < 0.001 | < 0.0001 | 166 | 6 | 694 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0004 | 0 |
| 7 | W03-02B | 30-May-03 | | 0 | 0 | 0 | 0 | 40 | 0 | <0.05 | 0 | 0 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 0 | 2 | <0.002 | <0.0001 | 18 | 0 | 150 | <0.02 | 51 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 8 | W03-02C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | W03-03A | 30-May-03 | | 0 | <0.01 | <0.02 | 0 | 23 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | 0 | 0 | 1 | <0.002 | <0.0001 | 11 | 10 | 130 | 0 | 36 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 10 | W03-03B | 30-May-03 | | 0 | 0 | 0 | 0 | 27 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | <0.01 | <1.0 | <0.002 | <0.0001 | 7 | 3 | 76 | <0.02 | 26 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 11 | W03-03C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | W03-04A | 30-May-03 | | 0 | 0 | | 0 | 23 | 0 | <0.05 | 0 | <0.002 | 1 | <0.01 | <0.5 | <0.001 | <0.06 | 1 | 2 | <0.002 | <0.0001 | 33 | 10 | 66 | <0.02 | 24 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 13 | W03-04A | 15-May-19 | | 0 | | 1 | 0 | 21 | 0 | | < 0.01 | < 0.01 | 0 | <0.1 | 7 | | | 8 | 2 | < 0.001 | < 0.0001 | 16 | 14 | 47 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |
| 14 | W03-04B | 30-May-03 | | 0 | 0 | | 0 | 24 | 0 | <0.05 | 0 | 0 | 0 | 0 | <0.5 | <0.001 | <0.06 | 1 | 2 | <0.002 | <0.0001 | 6 | 1 | 48 | 0 | 16 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 15 | W03-04B | 15-May-19 | | <0.1 | | 0 | 0 | 24 | 0 | | < 0.01 | < 0.01 | 0 | <0.1 | 0 | | | 9 | 1 | < 0.001 | < 0.0001 | 4 | 1 | 44 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |
| 16 | W03-04C | 30-May-03 | | 0 | 0 | | <0.0005 | 24 | 0 | <0.05 | 0 | 0 | 0 | 0 | <0.5 | <0.001 | <0.06 | 1 | 2 | <0.002 | <0.0001 | 5 | 0 | 41 | 0 | 15 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 17 | W03-04C | 30-May-03 | Dup | 0 | 0 | | <0.0005 | 23 | 0 | <0.05 | 0 | 0 | 0 | 0 | <0.5 | <0.001 | <0.06 | 1 | 2 | <0.002 | <0.0001 | 5 | 0 | 41 | 0 | 14 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 18 | W03-05A | 30-May-03 | | 0 | 0 | | <0.0005 | 25 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | 0 | <0.06 | 2 | 2 | <0.002 | <0.0001 | 19 | 1 | 57 | <0.02 | 22 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 19 | W03-05B | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | W03-06A | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | W03-06B | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | W03-07A | 20-Aug-03 | | 0 | 0 | | <0.0005 | 24 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 1 | 2 | <0.002 | <0.0001 | 7 | 11 | 150 | <0.02 | 51 | <0.0002 | <0.002 | <0.001 | 0 | <0.002 | 0 |
| 23 | W03-07A | 20-Aug-03 | Dup | 0 | 0 | | <0.0005 | 24 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 1 | 2 | <0.002 | <0.0001 | 7 | 11 | 130 | <0.02 | 51 | <0.0002 | <0.002 | <0.001 | 0 | <0.002 | 0 |
| 24 | W03-07B | 20-Aug-03 | | 0 | 0 | | <0.0005 | 25 | 0 | <0.05 | 0 | 0 | 2 | 0 | <0.5 | <0.001 | <0.06 | 0 | <1.0 | <0.002 | <0.0001 | 15 | 1 | 73 | 0 | 26 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 25 | W03-07C | 30-May-03 | | 0 | 7 | | 0 | 31 | 0 | <0.05 | 0 | <0.002 | <0.05 | 0 | <0.5 | <0.001 | <0.06 | 1 | 4 | <0.002 | 0 | 29 | 0 | 150 | <0.02 | 54 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 26 | W03-08A | 30-May-03 | | 0 | 0 | | <0.0005 | 33 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 2 | 1 | <0.002 | <0.0001 | 5 | 1 | 33 | <0.02 | 12 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 27 | W03-08B | 30-May-03 | | 0 | <0.01 | | 0 | 30 | 0 | <0.05 | 0 | 0 | 1 | 0 | <0.5 | <0.001 | <0.06 | 0 | 1 | <0.002 | <0.0001 | 5 | 0 | 48 | 0 | 15 | <0.0002 | <0.002 | <0.001 | 0 | <0.002 | 0 |
| 28 | W03-08C | 30-May-03 | | 0 | 1 | | <0.0005 | 51 | 1 | <0.05 | 0 | <0.002 | 1 | <0.01 | <0.5 | <0.001 | <0.06 | 1 | 3 | <0.002 | <0.0001 | 19 | 0 | 74 | 0 | 41 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 29 | W03-09A | 30-May-03 | | 0 | 1 | 0 | 0 | 19 | 0 | <0.05 | 0 | 0 | <0.05 | 0 | <0.5 | <0.001 | <0.06 | 0 | <1.0 | <0.002 | <0.0001 | 14 | 0 | 43 | 0 | 16 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 30 | W03-09B | 30-May-03 | | 0 | 0 | <0.02 | <0.0005 | 19 | 0 | <0.05 | ,0.002 | <0.002 | 2 | <0.01 | <0.5 | <0.001 | <0.06 | 0 | <1.0 | <0.002 | <0.0001 | 3 | 0 | 23 | 0 | 8 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 31 | W03-09C | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | W03-10A | 21-Aug-03 | | 0 | 0 | | <0.0005 | 26 | 0 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 0 | 2 | <0.002 | <0.0001 | 20 | 1 | 51 | <0.02 | 15 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 33 | W03-10B | 30-May-03 | | 0 | 0 | | 0 | 38 | 0 | <0.05 | 0 | 0 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 1 | <1.0 | <0.002 | <0.0001 | 6 | 0 | 49 | <0.02 | 17 | <0.0002 | <0.002 | 0 | 0 | <0.002 | 0 |
| 34 | W03-10C | 30-May-03 | | 0 | 1 | | <0.0005 | 67 | 1 | <0.05 | 0 | <0.002 | <0.05 | <0.01 | <0.5 | <0.001 | <0.06 | 3 | 6 | <0.002 | <0.0001 | 73 | 0 | 230 | 0 | 94 | <0.0002 | <0.002 | 0 | 0 | 0 | <0.003 |
| 35 | W03-11A | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 | W03-11B | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | MW03-12 | 21-Aug-03 | Dry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 | BS01-A | 15-May-19 | | <0.1 | | 0 | 0 | 27 | 0 | | < 0.01 | < 0.01 | 2 | <0.1 | 2 | | | 5 | 2 | < 0.001 | < 0.0001 | 31 | 0 | 118 | | | 0 | < 0.05 | < 0.005 | 0 | 0 | 0 |
| 39 | BS01-B | 15-May-19 | | <0.1 | | < 0.005 | 0 | 26 | 0 | | < 0.01 | < 0.01 | 3 | <0.1 | 0 | | | 4 | 2 | < 0.001 | < 0.0001 | 33 | 0 | 65 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |
| 40 | BS01-C | 15-May-19 | | <0.1 | | 0 | 0 | 22 | 0 | | < 0.01 | < 0.01 | 0 | <0.1 | 0 | | | 0 | 0 | < 0.001 | < 0.0001 | 2 | 0 | 3 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |
| 41 | BS02-A | 15-May-19 | | <0.1 | | 1 | 0 | 38 | 0 | | < 0.01 | < 0.01 | 0 | <0.1 | 1 | | | 3 | 2 | < 0.001 | < 0.0001 | 277 | 1 | 104 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |
| 42 | BS02-B | 15-May-19 | | 0 | | 1 | 0 | 38 | 0 | | < 0.01 | < 0.01 | < 0.1 | <0.1 | 0 | | | 2 | 2 | < 0.001 | < 0.0001 | 183 | 1 | 97 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |
| 43 | BS02-C | 15-May-19 | | <0.1 | | 1 | 0 | 37 | 0 | | < 0.01 | < 0.01 | 0 | <0.1 | 0 | | | 0 | 2 | < 0.001 | < 0.0001 | 61 | 1 | 90 | | | < 0.00005 | < 0.05 | < 0.005 | 0 | < 0.0001 | 0 |

Table 6: 2021 Water quality data from the Northwest Sump, golf course ponds, and nearby domestic wells.

| Parameter | ODWO | Units | NW Sump 5/12/21 | Golf Pond 5/12/21 | Sterrett 5/12/21 | Goodchild 5/12/21 | Goodchild 3/16/21 | Sterrett 3/16/21 | Golf Pond 3/16/21 | NW Sump 3/16/21 | DW1 3/16/21 | DW2 3/16/21 | DW3 3/16/21 | DW4 3/16/21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkalinity ($CaCO_3$) | 30-500[2] | mg/L | 136 | 145 | 285 | 363 | 330 | 312 | 121 | 206 | 313 | 265 | 384 | 310 |
| Conductivity | | µS/cm | 974 | 839 | 817 | 983 | 904 | 885 | 711 | 1110 | 775 | 624 | 1430 | 715 |
| DOC | 5.0[1] | mg/L | 3.2 | 4.1 | 0.9 | 1 | 0.8 | 0.6 | 4.5 | 3.2 | 0.8 | 1.9 | 1.6 | 0.9 |
| Hardness ($CaCO_3$) | 80-100[2] | mg/L | 347 | 310 | 178 | 466 | 477 | 450 | 245 | 428 | 426 | 291 | 478 | 362 |
| pH | | | 8.2 | 8.1 | 7.79 | 7.73 | 7.71 | 7.82 | | | 7.85 | 7.74 | 7.77 | 7.96 |
| TDS (180 °C) | 500[1] | mg/L | 580 | 540 | 495 | 614 | 595 | 595 | 459 | 787 | 509 | 369 | 819 | 433 |
| TKN (as N) | | mg/L | | | | | 2.8 | 2.8 | 3.1 | 6 | 3.9 | 3.3 | 2.9 | 3 |
| Turbidity[3] | 5.0[1] | ntu | 0.7 | 1.5 | 0.2 | 1.1 | 0.1 | 0.9 | | | 0.8 | 5.8 | 3.1 | 0.7 |
| Colour | 5 | TCU | 3 | 6 | 2 | 2 | <1 | <1 | | | <1 | 8 | 4 | 4 |
| Aluminum | 0.10[2] | mg/L | 0.006 | 0.02 | <0.001 | <0.001 | | | | | | | | |
| Ammonia (N) | | mg/L | <0.01 | 0.02 | 0.03 | <0.01 | | | | | | | | |
| Antimony | 0.006 | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | | | | | | | | |
| Arsenic | 0.01 | mg/L | 0.002 | 0.002 | <0.001 | <0.001 | | | | | | | | |
| Barium | 1.0 | mg/L | 0.034 | 0.036 | 0.016 | 0.038 | | | | | | | | |
| Beryllium | | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | | | | | | | | |
| Bicarbonate($CaCO_3$) | | | 134 | 143 | 283 | 361 | 328 | 310 | 120 | 204 | 311 | 264 | 382 | 307 |
| Bismuth | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Boron | 5.0 | mg/L | 0.113 | 0.09 | 0.021 | 0.026 | | | | | | | | |
| Bromide | | mg/L | 0.2 | <0.1 | <0.1 | <0.1 | | | | | | | | |
| Cadmium | 0.005 | mg/L | <0.0001 | <0.0001 | <0.0001 | 0.0001 | | | | | | | | |
| Calcium | | mg/L | 75.4 | 69.7 | 46.5 | 136 | 131 | 120 | 54.4 | 106 | 115 | 80.9 | 142 | 86.3 |
| Carbonate | | mg/L | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 3 |
| Cerium | | | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Cesium | | | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Chloride | 250[1] | mg/L | 80.7 | 70 | 9.6 | 34.7 | 31.1 | 27.3 | 64.9 | 86 | 16.2 | 27.8 | 193 | 19.5 |
| Chromium | 0.05 | mg/L | 0.001 | 0.002 | 0.004 | 0.004 | | | | | | | | |
| Cobalt | | mg/L | 0.0001 | 0.0001 | <0.0001 | 0.0004 | | | | | | | | |

| Parameter | ODWO | Units | NW Sump 5/12/21 | Golf Pond 5/12/21 | Sterrett 5/12/21 | Goodchild 5/12/21 | Goodchild 3/16/21 | Sterrett 3/16/21 | Golf Pond 3/16/21 | NW Sump 3/16/21 | DW1 3/16/21 | DW2 3/16/21 | DW3 3/16/21 | DW4 3/16/21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Copper | 1.0[1] | mg/L | 0.002 | 0.002 | 0.023 | 0.012 | | | | | | | | |
| Europium | 0.02 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Fluoride | 1.5 | mg/L | 0.16 | 0.17 | 0.1 | 0.07 | 0.09 | <0.06 | | | <0.06 | 0.07 | 0.06 | 0.09 |
| Gallium | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Hydroxide (NaOH) | | mg/L | 0.0269 | 0.0214 | 0.0105 | 0.00913 | | | | | | | | |
| Iron | 0.3[1] | mg/L | 0.25 | 0.24 | 0.14 | 0.4 | | | | | | | | |
| Lanthium | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Lead | 0.010 | mg/L | <0.0001 | <0.0001 | 0.0002 | 0.001 | | | | | | | | |
| Lithium | | mg/L | 0.011 | 0.009 | 0.005 | <0.005 | | | | | | | | |
| Magnesium | | mg/L | 38.6 | 32.9 | 15.1 | 30.8 | 36.4 | 36.6 | 26.4 | 39.7 | 33.8 | 21.5 | 29.9 | 35.6 |
| Manganese | 0.05[1] | mg/L | 0.007 | 0.007 | <0.001 | 0.022 | | | | | | | | |
| Mercury | 0.001 | µg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Molybdenum | | mg/L | 0.002 | 0.002 | 0.002 | 0.005 | | | | | | | | |
| Nickel | | mg/L | 0.003 | 0.003 | 0.002 | 0.01 | | | | | | | | |
| Nobium | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Nitrate (N) | 10.0 | mg/L | <0.05 | <0.05 | 1.9 | 0.19 | 0.11 | 0.48 | <0.05 | <0.05 | 4.73 | 1.34 | 0.06 | <0.05 |
| Nitrite (N) | 1.0 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Orthophosphate | | mg/L | <0.005 | <0.005 | 0.005 | <0.005 | | | | | | | | |
| Phosphorus | | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | | | | | | | | |
| Total Phenols | | mg/L | | | | | <0.0004 | 0.0007 | 0.0018 | 0.0022 | <0.0004 | 0.001 | 0.0006 | 0.0015 |
| Total Phosphorus | | mg/L | 0.02 | 0.017 | 0.012 | 0.012 | <0.002 | 0.002 | 0.008 | 0.009 | 0.004 | 0.04 | 0.027 | 0.003 |
| Potassium | | mg/L | 4.52 | 4.62 | 17.5 | 1.23 | 1.31 | 3.21 | 4.62 | 5.08 | 1.72 | 6.48 | 1.78 | 1.88 |
| Reactive Silica | | mg/L | 0.49 | 0.11 | 7.06 | 7.82 | | | | | | | | |
| Rubidium | | mg/L | 0.002 | 0.001 | 0.008 | 0.001 | | | | | | | | |
| Scandium | | | 0.001 | <0.001 | 0.002 | 0.002 | | | | | | | | |
| Selenium | 0.01 | mg/L | 0.0009 | <0.0005 | <0.0005 | <0.0005 | | | | | | | | |
| Silicon | | mg/L | 0.629 | 0.482 | 4.11 | 4.26 | | | | | | | | |
| Silver | | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | | | | | | |
| Sodium | 200 | mg/L | 43 | 38 | 88 | 17.8 | 20.2 | 17.3 | 37 | 47 | 8.7 | 12.6 | 123 | 10.7 |
| Strontium | | mg/L | 1.09 | 0.846 | 0.136 | 0.317 | | | | | | | | |

| Parameter | ODWO | Units | NW Sump 5/12/21 | Golf Pond 5/12/21 | Sterrett 5/12/21 | Goodchild 5/12/21 | Goodchild 3/16/21 | Sterrett 3/16/21 | Golf Pond 3/16/21 | NW Sump 3/16/21 | DW1 3/16/21 | DW2 3/16/21 | DW3 3/16/21 | DW4 3/16/21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulphate ($SO_4$) | 500 | mg/L | 222 | 177 | 113 | 141 | 123 | 151 | 130 | 244 | 84.6 | 21 | 78.1 | 56.3 |
| Sulphur | | mg/L | 80.3 | 62.9 | 39.7 | 48.3 | | | | | | | | |
| Tellurium | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Thallium | | mg/L | <0.0001 | <0.0001 | 0.0002 | <0.0001 | | | | | | | | |
| Thorium | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Tin | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Titanium | | mg/L | <0.001 | <0.001 | <0.001 | 0.001 | | | | | | | | |
| Tungsten | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Uranium | 0.02 | mg/L | 0.0012 | 0.012 | 0.0048 | 0.0002 | | | | | | | | |
| Vanadium | | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |
| Yttrium | | mg/L | 0.004 | 0.002 | 0.095 | 0.2 | | | | | | | | |
| Zinc | 5[1] | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | | | | | | | | |

Notes: [1] Ontario Drinking Water Aesthetic Objective, [2] Ontario Drinking Water Operational Guideline, [3] High values likely due to disturbance of well sediments

### 5.3 Water Quality Summary

In summary, water quality data has been collected, both historically and in the past few years, to characterize the groundwater in the quarry vicinity and at nearby domestic wells. There has been continuous ECA data collection from the North quarry discharge to characterize this water for surface water criteria and a more limited set of analysis for comparative analysis against ODWO parameters. In general, the natural groundwater quality is good except for elevated levels of hardness and total dissolved solids. Some domestic wells near roads appear to have been have been impacted by road salting. The quarry water has generally better quality that the nearby domestic well DW-1, due to the mixing of groundwater and precipitation in the discharge, and therefore should not present a water quality problem is used in an infiltration system. Quarry water has been discharged to the golf course ponds for over 50 years and infiltration from the ponds does not seem to have adversely affected water quality in the downgradient domestic well.

Yours truly
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