

APPENDIX

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LONG-TERM TREND
ECOLOGICAL MONITORING
PROGRAM (LTTEM) REPORT



**Walker Aggregates Duntroon
Quarry Expansion, Wetland
Vegetation Monitoring:
2022 Annual Monitoring Report**

FINAL REPORT

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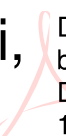
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1 Introduction

The Duntroon Quarry has been in operation on County Road 91 in Clearview Township, County of Simcoe, Ontario since the early 1960s. Since 1995 the quarry has been operated by Walker Aggregates Inc., a wholly owned subsidiary of Walker Industries Holdings Ltd. (Walker Aggregates).

The high quality dolostone produced from this quarry is in demand as building material and for use in agricultural, recreational and environmental projects. As a result, Walker Aggregates has obtained a licence under the *Aggregate Resources Act* (ARA) through the Ministry of Natural Resources and Forestry (MNR), following approval from the Joint Board on June 18, 2012, to expand the Duntroon Quarry operation across the road to a new parcel of property (Expansion Quarry).

Walker Aggregates' environmental commitment is to manage its lands for the provision of long-term ecological benefit. To this end, environmental initiatives detailed on the registered Duntroon Quarry ARA Site Plans and *Duntroon Expansion Quarry Adaptive Management Plan* (Walker Aggregates Inc., 2018) (AMP) are provided to facilitate the protection, mitigation and enhancement of natural environmental features and functions for future generations.

Ecological monitoring, including wetland monitoring, is a component of the AMP. The Long Term Trend Ecological Monitoring (LTTEM) program was developed to supplement the information from the Long Term Trend Water Monitoring (LTTWM) program with information about the health and functioning of the natural heritage features in the vicinity of the Expansion Quarry. The LTTEM program:

- provides regular updates on the current conditions and longer-term trends of the Expansion Quarry environment
- is used to determine if the key features and functions in the Expansion Quarry environment are experiencing unexpected changes and/or degradation as a result of the quarry operations by making reference to similar features in the regional environment
- is designed to ensure that changes to the Expansion Quarry environment are identified and properly investigated for any possible cause-and-effect relationship with quarry operations

If negative changes in environmental conditions are detected, the cause of the changes will be investigated and if the quarry is the cause of the change, quarry operations will be adapted and/or contingency mitigation measures will be implemented in accordance with the AMP.

The focus of the wetland component of the LTTEM program is on amphibian vernal breeding pools and ensuring hydroperiods are suitable for continued hydrophytic plant growth in the surrounding wetland zones. Wetland water level monitoring is conducted as part of the LTTWM program. Long term trends in these wetland features and their functions are considered and interpreted with reference to long term climatic trends.



Walker Aggregates Duntroon Quarry Expansion, Wetland Vegetation Monitoring: 2022 Annual Monitoring Report

1 Introduction

March 27, 2023

Ecological monitoring to complement the water level monitoring includes two components: vegetation monitoring and wildlife monitoring. Vegetation monitoring was initiated in 2019 at wetlands within the Rob Roy Swamp PSW Complex (RR2 and RR6) and ANSI wetlands A & B. This summary report describes the methods and results from the fourth year (2022) of wetland vegetation surveys and provides comparisons to previous survey years.

As documented in the Site Plan and AMP, wetland monitoring (vegetation and wildlife) is to be conducted annually for three years in Phase I to establish an ecological baseline, with subsequent monitoring every five years until rehabilitation is complete, and prior to the start of Phase 2B. The 2022 survey was conducted in anticipation of operations in Phase 2B beginning in 2023.



2 Methodology

A general methodology for wetland vegetation monitoring was presented in the 2018 AMP. More detailed monitoring and data analysis methods are presented below.

2.1 Vegetation Monitoring

Transects were established in 2019 to monitor wetland vegetation in six (6) wetland areas from the perimeter of the feature to the selected drive point monitor where surface water monitoring is undertaken. In accordance with Section 5.5.2 of the AMP, vegetation monitoring on the established transects is to be conducted in August or September of each monitoring year.

In total, six (6) vegetation monitoring transects (Transects 1 to 6) were established in the Expansion Quarry as shown on figures H.1 to H.3 of the AMP (Appendix A). The transects correspond with existing wetland features and amphibian monitoring stations as shown in Table 1.

Table 1: Wetland Vegetation Transects in Relation to Wetland Features and Amphibian Monitoring Stations

| Transect | Wetland Feature | Nearest Amphibian Monitoring Station |
|----------|---------------------------------|--------------------------------------|
| T-1 | Rob Roy Swamp PSW Complex (RR2) | Station 2 |
| T-2 | Rob Roy Swamp PSW Complex (RR2) | Station 3 |
| T-3 | ANSI wetland A | Station 4 |
| T-4 | ANSI wetland B | Station 5 |
| T-5 | Rob Roy Swamp PSW Complex (RR6) | Station 6 |
| T-6 | Rob Roy Swamp PSW Complex (RR6) | Station 6 |

Two permanent 2 m x 2 m plots were established at the beginning and end of each transect: one near the wetland edge, and one centrally located near the designated drivepoint. The corners of each plot were marked with metal pin flags and a wooden stake was placed in the centre of the plot. Coordinates of the plots were recorded using a sub-metre GPS unit.

In each monitoring plot, several observations were made in order to accurately characterize the current conditions. A description of each of the ground-layer, shrub-layer, and canopy was recorded, including a species list and percent cover of each species. The general health of mature trees (greater than 10 cm diameter at breast height) was recorded within 5m of each plot. Signs of trunk decay, crown dieback and vigour were the main criteria used to determine tree health. Standing water depth within the plot, were also recorded. In the absence of standing water, a tactile assessment of surface soil moisture was conducted.



Completed field sheets for each plot are provided in Appendix C. Two or more species may overlap in the same space at varying heights due to the stratified nature of ground-layer species, and therefore the sum of percent cover by species in any one plot may exceed 100%. An estimate of total percent cover (all species) in each plot was recorded in order to characterize the amount of vegetated cover versus open soil.

2.2 Photographic Monitoring

Photographic monitoring provides a visual representation of the current conditions in the Expansion Quarry, allowing for annual comparisons. The photographic monitoring component of this program is intended to provide a qualitative description of each transect to supplement the quantitative vegetation data. The number, location and direction of each photograph at each plot and along each transect were recorded for continuity over the duration of the monitoring program. A photolog displaying photos from 2022 and previous years is provided in Appendix B.

2.3 Data Analysis

A floristic quality assessment was completed for each plot based on the plant list collected, following methods described in Oldham, Bakowsky & Sutherland (1995). The floristic quality assessment for wetland communities includes identification of sensitive native plant species, “natural” quality and wetland tolerance of plant species within a plot.

Identification of potentially sensitive native plant species was based on their assigned Coefficient of Conservatism (C) value, as determined by criteria described in Oldham, Bakowsky & Sutherland (1995). This C value, ranging from 0 (low) to 10 (high), is based on a species’ tolerance to disturbance and fidelity to a specific natural habitat. Species with a C value of 8, 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters and are considered habitat sensitive species and are usually typical of high-quality plant communities. The mean C was calculated for each plot.

The Floristic Quality Index (FQI) is a numerical value used to evaluate the natural quality of a site based on the C values. The greater the richness of sensitive species at a site the higher the FQI will be and the more “natural” and high quality the site (Taft, Wilhelm, Ladd, & Masters, 1997). These indices are useful to track changes in floristic quality of a site over time. The FQI value was calculated for each plot by multiplying the mean C by the square root of the total number of native species present in each plot.

Co-efficient of Wetness (CW) is another part of the floristic quality assessment. Identification and ranking of wetland plants (CW value) were determined by criteria described in Oldham, Bakowsky & Sutherland (1995). Several updates to the wetland rankings are provided in recent plant lists by the Natural Heritage Information Centre (Ontario Ministry of Natural Resources and Forestry, 2022). CW ranges on an integer scale from –5 (strongest affinity to wetland conditions) to +5 (least affinity to wetland conditions). Plants within the CW range -2 and -3 are considered facultative and CW of -4 or -5 are obligate in their preference to wetland conditions. The mean CW (average CW) was calculated for each plot.



3 Results

Below is a summary of data collected during the first (2019), second (2020), third (2021) and fourth (2022) years of terrestrial vegetation monitoring. A photographic record is provided in Appendix B. Raw field data sheets are provided in Appendix C (field forms). Vegetation monitoring results are summarized throughout Section 3.1 and are provided in Appendix D (data analysis), including a species list (Latin names provided) and floristic quality assessment for each plot. Field surveys dates for the first four years of monitoring are as follows:

- First year (September 12 and 13, 2019)
- Second year (September 29, 2020)
- Third year (September 20, 2021)
- Fourth year (October 5, 2022)

Results are presented below for paired plots along each transect. An overview of the floristic assessment data for 2019 to 2022 is presented in Table 2 below.

Table 2: Floristic Quality Assessment

| | Total Native Species | Total Exotic Species | Mean C | FQI | No. of Conservative Species (C of 8, 9 or 10) | Mean CW |
|-------------|----------------------|----------------------|--------|------|--|---------|
| T1-1 (2019) | 12 | 0 | 5.0 | 17.3 | 1 | -3.6 |
| T1-1 (2020) | 9 | 0 | 4.6 | 13.7 | 0 | -3.3 |
| T1-1 (2021) | 13 | 0 | 4.7 | 16.9 | 0 | -3.3 |
| T1-1 (2022) | 15 | 0 | 4.9 | 18.8 | 0 | -3.0 |
| T1-2 (2019) | 8 | 0 | 4.0 | 11.3 | 0 | -3.0 |
| T1-2 (2020) | 9 | 0 | 3.9 | 11.7 | 0 | -3.0 |
| T1-2 (2021) | 7 | 0 | 3.4 | 9.0 | 0 | -2.4 |
| T1-2 (2022) | 9 | 0 | 3.8 | 11.3 | 0 | -3.1 |
| T2-1 (2019) | 11 | 0 | 4.6 | 15.4 | 0 | -1.9 |
| T2-1 (2020) | 14 | 0 | 4.4 | 16.5 | 0 | -2.0 |
| T2-1 (2021) | 12 | 1 | 4.9 | 17.0 | 0 | -2.2 |
| T2-1 (2022) | 14 | 0 | 5.0 | 18.7 | 0 | -1.9 |
| T2-2 (2019) | 5 | 0 | 5.8 | 13.0 | 0 | -4.2 |
| T2-2 (2020) | 7 | 0 | 5.3 | 14.1 | 1 | -2.2 |
| T2-2 (2021) | 7 | 0 | 5.4 | 14.4 | 1 | -3.4 |
| T2-2 (2022) | 7 | 0 | 5.2 | 13.7 | 1 | -3.5 |



Table 2: Floristic Quality Assessment

| | Total Native Species | Total Exotic Species | Mean C | FQI | No. of Conservative Species (C of 8, 9 or 10) | Mean CW |
|-------------|----------------------|----------------------|--------|------|--|---------|
| T3-1 (2019) | 4 | 0 | 3.3 | 6.5 | 0 | -2.8 |
| T3-1 (2020) | 4 | 0 | 3.3 | 6.5 | 0 | -2.8 |
| T3-1 (2021) | 4 | 0 | 3.3 | 6.5 | 0 | -2.8 |
| T3-1 (2022) | 4 | 0 | 3.3 | 6.5 | 0 | -2.8 |
| T3-2 (2019) | 11 | 1 | 3.4 | 11.3 | 0 | -2.6 |
| T3-2 (2020) | 8 | 1 | 3.7 | 10.5 | 0 | -3.4 |
| T3-2 (2021) | 10 | 1 | 3.4 | 10.9 | 0 | -2.9 |
| T3-2 (2022) | 8 | 1 | 3.7 | 10.5 | 0 | -3.4 |
| T4-1 (2019) | 12 | 0 | 3.3 | 11.3 | 0 | -3.3 |
| T4-1 (2020) | 13 | 0 | 2.8 | 9.9 | 0 | -2.8 |
| T4-1 (2021) | 16 | 0 | 2.7 | 10.9 | 0 | -1.9 |
| T4-1 (2022) | 14 | 0 | 3.1 | 11.5 | 0 | -1.8 |
| T4-2 (2019) | 9 | 1 | 3.3 | 9.8 | 0 | -2.7 |
| T4-2 (2020) | 7 | 1 | 3.8 | 10.1 | 0 | -2.3 |
| T4-2 (2021) | 7 | 1 | 3.2 | 8.4 | 0 | -2.7 |
| T4-2 (2022) | 6 | 1 | 3.0 | 7.3 | 0 | -1.3 |
| T5-1 (2019) | 7 | 1 | 2.7 | 7.1 | 0 | -3.7 |
| T5-1 (2020) | 1 | 0 | 0.0 | 0.0 | 0 | -3.0 |
| T5-1 (2021) | 3 | 0 | 2.3 | 4.0 | 0 | -3.7 |
| T5-1 (2022) | 4 | 0 | 2.3 | 4.7 | 0 | -4.5 |
| T5-2 (2019) | 13 | 1 | 3.3 | 11.7 | 0 | -3.5 |
| T5-2 (2020) | 10 | 1 | 3.8 | 11.9 | 0 | -3.6 |
| T5-2 (2021) | 12 | 1 | 3.8 | 13.2 | 0 | -3.6 |
| T5-2 (2022) | 8 | 1 | 3.4 | 9.7 | 0 | -3.9 |
| T6-1 (2019) | 1 | 0 | 0.0 | 0.0 | 0 | -3.0 |
| T6-1 (2020) | 3 | 0 | 2.5 | 4.3 | 0 | -4.3 |
| T6-1 (2021) | 4 | 0 | 3.0 | 6.0 | 0 | -4.5 |
| T6-1 (2022) | 5 | 0 | 3.0 | 6.7 | 0 | -4.6 |
| T6-2 (2019) | 3 | 0 | 4.7 | 8.1 | 0 | -4.3 |
| T6-2 (2020) | 5 | 0 | 4.5 | 10.1 | 0 | -4.3 |
| T6-2 (2021) | 10 | 0 | 4.5 | 14.2 | 0 | -4.3 |
| T6-2 (2022) | 10 | 0 | 3.8 | 11.9 | 0 | -4.2 |



3.1 Transect 1 – Rob Roy Swamp PSW Complex (RR2)

Transect 1 is oriented north to south and is located within a mature deciduous swamp dominated by Freeman's (swamp) maple next to an agricultural field (hay) to the north (Appendix A; Figure H.1). Transect 1 crosses the west edge of a previously mapped deep vernal pooling area within the swamp. No standing water was present along Transect 1 during vegetation monitoring from 2019 to 2022, but evidence that standing water was present earlier in the season was observed (e.g. hummocks, unvegetated low areas of swamp floor). Surface soil at both plots in Transect 1 was dry to moist.

Two vegetation monitoring plots (T1-1 and T1-2) were established along this transect in 2019 and were monitored for a fourth year in 2022.

Plot T1-1: Canopy cover in this plot remained the same as 2020 and 2021 with black ash growing inside the plot (**70%**) and Freeman's maple (**40%**) hanging over the plot. Trees within and adjacent to the plot were mostly in good condition. One Freeman's maple southwest of the plot is declining in health. The ground-layer was moderately dominated by sensitive fern (**50% cover**) with overall cover at approximately 80%. The percent overall cover was slightly lower in 2022 (80%) than previous years (90%), however this is likely due to later seasonal survey timing. No exotic or rare native species were observed in Plot T1-1.

The mean *C* of Plot T1-1 has remained in the 4.5 to 5.0 range since 2019. The 2022 FQI value (**18.8**) is the highest value to date. This increased FQI is a result of more species being identified in 2022 than in previous years (**Table 2**).

Bristle-stalked sedge, a conservative species with a high *C* value of 8 was recorded in the plot in 2019, but not in 2020, 2021 or 2022. The species could have been present and more detectable earlier in the season. It also was not abundant within the plot in 2019 (5%), which makes detection difficult later in the season.

The average (mean) CW of Plot T1-1 has been in the -3.0 to -3.6 range since 2019. These low values support field observations of wetland conditions along transect 1 and at the plot.

Plot T1-2: No trees originated inside the plot. Freeman's (swamp) maple (75% cover) and green ash (30%) canopies overhung the plot. Trees adjacent to the plot were in good condition. Similar to previous years, the ground-layer was low to moderately covered (**30%**) by herbaceous species. The most abundant species was sensitive fern, which covered approximately 30% of the plot. No exotic or rare native species were observed in Plot T1-1.

The mean *C* of Plot T1-2 changed very little from 2019 (**4.0**) to 2022 (**3.8**). The FQI fluctuated slightly in 2020 (**11.7**) and 2021 (**9.0**), but the value returned to the same as the 2019 value in 2022 (**11.3**). No conservative species with a *C* value of 8, 9 or 10 were observed in the plot in any year.

The average (mean) CW of Plot T1-2 has remained around -3.0 for three out of the four years of monitoring. These low values are supported by field observations of wetland conditions along transect 1 and at the plot.



3.2 Transect 2 – Rob Roy Swamp PSW Complex (RR2)

Transect 2 is oriented west to east and is located within a mature deciduous swamp dominated by Freeman's (swamp) maple (Appendix A; Figure H.1), and is located on the opposite side of the maple swamp from Transect 1. No standing water was present along Transect 2 during vegetation monitoring from 2019 to 2022, but evidence that standing water was present earlier in the season was observed (e.g. hummocks, unvegetated low areas of swamp floor). Surface soil at both plots in Transect 2 was dry to moist.

Two vegetation monitoring plots (T2-1 and T2-2) were established along this transect in 2019 and were monitored for a fourth year in 2022.

Plot T2-1: No trees originated inside the plot, but large Freeman's (swamp) maple hung over the plot (**80% cover**) from the outside and, to a lesser degree white elm (**30% cover**). Trees adjacent the plot were in good condition. The ground-layer was moderately covered (**50%**) by herbaceous species, which represents no change from 2020 or 2021. The most abundant species was wild sarsaparilla, which covered approximately 30% of the plot growing on and around a rotting log. No exotic or rare native species were observed in Plot T2-1.

The mean C of Plot T2-1 was the highest in 2022 (**5.0**) and lowest in 2020 (**4.4**). The FQI has steadily increased from 2019 (**15.4**) to 2020 (**16.5**) to 2021 (**17.1**) and to 2022 (**18.7**). No conservative species with a C value of 8, 9 or 10 were observed in the plot in any year.

The average (mean) CW of Plot T2-1 has remained steady at and around the -2.0 from 2019 to 2022. These moderately low values are supported by field observations of wetland conditions along transect 2 and at the plot.

Plot T2-2: No mature trees originated inside the plot, but mature Freeman's (swamp) maple hung over the plot (**70% cover**). Trees adjacent the plot were in good condition with the exception of two Freeman's maple which appear to be in a natural state of decline from shading out by larger trees. The ground-layer was moderately covered (**70%**) mainly by low shrubs and small tree seedlings or saplings, a small (10%) increase from 2020. Only a few herbaceous species were observed in the plot, which occupy a small amount of the total ground cover (15%). No exotic or rare native species were observed in Plot T2-2.

The mean C of Plot T2-2 has undergone minor fluctuations from 2019 (**5.8**) to 2021 (**5.4**) and to 2022 (**5.2**). The FQI was also similar from 2019 (**13.0**), 2020 (**14.1**), 2021 (**14.4**) and 2022 (**13.7**). One conservative species (bristle-stalked sedge) with a C value of 8 was observed in the plot in 2022 for the first time. This species was not detected in earlier years of monitoring.

The average (mean) CW of Plot T2-2 fluctuated slightly from 2019 (**-4.2**), 2020 (**-2.2**), 2021 (**-3.4**) and 2022 (**-3.5**). Despite the fluctuations, these low values remain in the negative, which supports field observations of wetland conditions along transect 2 and at the plot.



3.3 Transect 3 – ANSI Wetland A

Transect 3 is oriented west to east and is located within a pocket of dense thicket swamp (Appendix A; Figure H.2). No standing water was present along Transect 3 during vegetation monitoring in 2019 to 2022, but evidence that standing water was present earlier in the season was observed. Surface soil at both plots in Transect 3 was dry to moist.

Two vegetation monitoring plots (T3-1 and T3-2) were established along this transect in 2019 and were monitored for a fourth year in 2022.

Plot T3-1: No trees originated inside the plot, but balsam poplar hung over the plot (**80% cover**). Trees adjacent the plot were in good condition. The ground-layer was densely covered (**95%**) by red-osier dogwood shrubs and to a lesser extent riverbank grape vine (**20%**). Since the beginning of monitoring in 2019, there have only been two herbaceous species observed in the plot (sensitive fern and Tuckerman's sedge). In 2022, each species covered approximately 10% of the plot. No exotic or rare native species were observed in Plot T3-1.

The floristic quality values remained unchanged from 2019 to 2022. The mean C of Plot T3-1 was **3.3** and the FQI was **6.5** from 2019 to 2022. No conservative species with a C value of 8, 9 or 10 were observed in the plot in any year.

The average (mean) CW of Plot T3-1 also remained the same from 2019 to 2022 at **-2.8**. This low value is supported by field observations of wetland conditions along Transect 3 and at the plot.

Plot T3-2: No trees originated inside the plot, but green ash hung over the plot (**60% cover**). Green ash and other trees adjacent the plot were in good condition with the exception of one black ash that was in moderate decline. The overall ground-layer cover was **75%** in 2022, which is similar to the 2020 and 2021 values and less than the 2021 value (90%). The most abundant species were Tuckerman's sedge (**30%** cover), reed canary grass (**30%**) and red-osier dogwood (**60%**). The amount of red-osier dogwood cover has been increasing from 2020 (**25%**) to 2021 (**40%**) to 2022 (**60%**). One exotic species (bittersweet nightshade) was observed in the plot and increased slightly in cover (**10%**) compared to **5%** cover in previous years. No rare native species were observed in Plot T3-2.

The mean C of Plot T3-2 has remained steady with only minor fluctuations between 3.4 and 3.7 since the beginning of monitoring. The FQI has also changed little, fluctuating between a low of 10.5 (2020 and 2022) and a high of 11.3 (2019). No conservative species with a C value of 8, 9 or 10 were observed in the plot in any year.

The average (mean) CW of Plot T3-2 has fluctuated between -2.6 and -3.4 since 2019. These low values are supported by field observations of wetland conditions along Transect 3 and at plot T3-2.



3.4 Transect 4 – ANSI Wetland B

Transect 4 is oriented southwest to northeast and is located within a mature eastern white cedar mixed swamp community (Appendix A; Figure H.2). No standing water was present along Transect 4 during vegetation monitoring from 2019 to 2022. Surface soil at both plots in Transect 4 was dry to moist.

Two vegetation monitoring plots (T4-1 and T4-2) were established along this transect in 2019 and were monitored for a fourth year in 2022.

Plot T4-1: No trees originated inside the plot, but green ash hung over the plot (**70% cover**). The green ash and other trees adjacent the plot were in good condition. The ground-layer was densely covered (**80%**) by herbaceous species. The most abundant species were fowl manna grass (**60% cover**) and panicled aster (**40% cover**). No exotic or rare native species were observed in Plot T4-1.

The mean C of Plot T4-1 has fluctuated slightly from a high of 3.3 in 2019 to a low of 2.7 in 2021. The mean C of 2022 was 3.1. The FQI has remained steady with a value in the 10 to 11.5 range since the beginning of monitoring. No conservative species with a C value of 8, 9 or 10 were observed in the plot.

The average (mean) CW of Plot T4-1 has increased gradually from **-3.3** (2019), **-2.8** (2020), **-1.9** (2021), and **-1.8** (2022). The increase in CW in 2021 and 2022 is a result of new upland or hydrologically neutral species being recorded (e.g. sugar maple seedlings, common milkweed, wild red raspberry and Virginia waterleaf). These new additions cover very little of the plot (<10%) and the plot is still dominated by wetland species.

Plot T4-2: No trees originated inside the plot, but eastern white cedar and yellow birch hung over the plot (**70% cover**). Trees adjacent to the plot were in good condition. The ground-layer was moderately covered (**50%**) by herbaceous species. The most abundant species was sensitive fern (**50% cover**). One exotic species (bittersweet nightshade) was observed in the plot at **10%** cover in 2019 and **5%** cover in both 2020 and 2021. In 2022, bittersweet nightshade covered approximately **15%** of the plot. No rare native species were observed in Plot T4-2.

The mean C of Plot T4-2 has changed little from 2019 (**3.3**) to 2022 (**3.0**). The FQI has been decreasing slightly since 2020 from **10.1** (2020) to **8.4** (2021) to **7.3** (2022). No conservative species with a C value of 8, 9 or 10 were observed in the plot.

The average (mean) CW of Plot T4-2 was **-2.7** in 2019 and 2021, **-2.3** in 2020 and **-1.3** in 2022. These low values are supported by field observations of wetland conditions along Transect 4 and at the plot.

3.5 Transect 5 – Rob Roy Swamp PSW complex (RR6)

Transect 5 is oriented north to south and is located within an inundated eastern white cedar swamp and hardwood mixed swamp (Appendix A; Figure H.3). The wetland along Transect 5 was heavily inundated with water during September 2019 surveys. The wetland was inundated again in 2020 with slightly deeper water compared to 2019. The water level in 2021 and 2022 was approximately the same as in 2020. It is difficult to discern water depth change throughout the majority of the transect due to the soft mucky



Walker Aggregates Duntroon Quarry Expansion, Wetland Vegetation Monitoring: 2022 Annual Monitoring Report

3 Results

March 27, 2023

bottom, but the water depth increases moving south along the transect and further into the wetland. The water depth was most noticeably deeper in plot T5-1 compared to water depth in 2019. Water depth fluctuation is more noticeable at this location because it is close to the wetland edge and adjacent upland forest, which provides a useful point of reference for year to year observations.

Two vegetation monitoring plots (T5-1 and T5-2) were established along this transect in 2019 and were monitored for a fourth year in 2022.

Plot T5-1: No trees originated inside the plot, and black ash crowns marginally over hung its boundaries. In 2020, a few of the black ash trees adjacent the plot appeared to be in decline. In 2021 and 2022, all adjacent black ash trees appeared to be in decline. Adjacent eastern white cedar trees were healthy at the edge of the wetland.

The ground-layer was inundated with water and lightly covered by reed canary grass (**25%**) and a burreed species (**20%**).

The mean C of Plot T5-1 has remained steady between values of 2.7 and 2.3 during the monitoring program. The FQI has fluctuated from 2019 (**7.1**), 2020 (**0.0**), 2021 (**4.0**), and 2022 (**4.7**). No value was registered in 2020 because the C value of reed canary grass, the only species present in that monitoring year, is 0. This may have been a result of noticeably deeper water levels in 2020 to 2022 compared to water levels in 2019.

The average (mean) CW of Plot T5-1 changed little in the first three years of monitoring with a value of -**3.7** in 2019, -**3.0** in 2020 and -**3.7** in 2021. The mean CW decreased in 2022 to -4.5 with the addition of new wetland plant species in the plot. These low values are supported by field observations of wetland conditions along Transect 5 and at the plot.

Plot T5-2: No trees originated inside the plot, but red maple crowns hung over the plot (**40% cover**). The red maple trees and adjacent black ash were healthy, while other trees adjacent to the plot such as eastern white cedar and yellow birch were dead or dying. Some Balsam fir adjacent the plot were dead while others were healthy. The ground-layer was primarily inundated with water and low to moderately covered (**40%**) by herbaceous species. The most abundant species growing out of the standing water was broad-leaved cattail (**30%**). Other species such as fowl manna grass (**15%**), bittersweet nightshade (**15%**) and porcupine sedge (**15%**) were growing on a hummock. One exotic species (bittersweet nightshade) was observed in the plot. No rare native species were observed in Plot T5-2.

The mean C of Plot T5-2 has remained steady with values of 3.4 or 3.8 for all years of monitoring. The FQI has fluctuated from a high of 13.2 in 2021 to a low of 9.7 in 2022. The number of species recorded in the plot have influenced the FQI values. While some changes in species presence/absence have occurred, the overall composition of vegetation at this plot has remained similar since the beginning of monitoring. No conservative species with a C value of 8, 9 or 10 were observed in the plot.

The average (mean) CW of Plot T5-2 has remained steady from 2019 (-**3.5**), 2020 (-**3.6**), 2021 (-**3.6**), and 2022 (-**3.9**). These low values are supported by field observations of wetland conditions along Transect 5 and at the plot.



3.6 Transect 6 – Rob Roy Swamp PSW complex (RR6)

Transect 6 is oriented northeast to southwest and is located within an open eastern white cedar swamp. Many or most of the cedar trees in the swamp appear to have died in recent years. It was not possible to establish a full length transect in 2019 due to pockets of standing water and the soft mucky swamp bottom. Evidence of heavy inundation throughout the transect and larger swamp area from earlier in the season and/or in previous years was evident during September 2019 monitoring surveys. The swamp was heavily inundated during surveys in 2020-2022, with standing water 40 to 50cm+ deep covering the length of the transect and both plots in water.

Two vegetation monitoring plots (T6-1 and T6-2) were established along this partial transect in 2019 and were monitored for a fourth year in 2022.

Plot T6-1: No living trees originated inside or adjacent the plot. Several eastern white cedar and white elm adjacent to the plot and along the transect were dead. The emergent ground-layer vegetation (reed canary grass) lightly covered the plot (**30%**). The tiny free-floating watermeal covered approximately **80%** of the plot in 2021, but only about **10%** in 2022. Aquatic submergents covered approximately **75%** of the plot. No exotic or rare native species were observed in Plot T6-1.

The mean C of Plot T6-1 has increased from 2019 (**0.0**), to 2020 (**2.5**) to 2021 and 2022 (**3.0**). The FQI has similarly increased from 2019 (**0.0**) to 2020 (**4.3**) to 2021 (**6.0**) to 2022 (**6.7**). These values increased because additional species were noted from 2020 to 2022 that were not noted in 2019. No conservative species with a C value of 8, 9 or 10 were observed in the plot.

The average (mean) CW of Plot T6-1 has decreased from **-3.0** in 2019 to a low of **-4.6** in 2022. Standing water was present in the plot and along the transect in 2020, 2021 and 2022, but not 2019.

Plot T6-2: No living trees originated inside or adjacent the plot. Several eastern white cedar and one white elm adjacent to the plot were dead. One red maple, one black ash and one small eastern white cedar next to the plot on a hummock were healthy, while a balsam fir and a spruce were in severe decline. No standing water was present in September 2019, but the plot was inundated in September 2020, 2021 and 2022 by approximately 40 cm deep water. The ground-layer was moderately covered by aquatic floating and submergent plants (**40%**) and willow shrubs (**25%**). No exotic or rare native species were observed in Plot T6-2.

The mean C of Plot T6-2 remained nearly the same from 2019 (**4.7**), 2020 (**4.5**), 2021 (**4.5**), but dropped in 2022 (**3.8**). The FQI has fluctuated from 2019 (**8.1**), 2020 (**10.1**), 2021 (**14.2**), 2022 (**11.9**). Species diversity increased in 2021 and 2022, which accounts for the increase in FQI values. No conservative species with a C value of 8, 9 or 10 were observed in the plot.

The average (mean) CW of Plot T6-2 was nearly the same in 2019 to 2022 (**-4.3 or -4.2**). These low values are supported by field observations of wetland conditions (e.g., standing water and wetland species) along Transect 6 and at the plot.



4 Discussion

All 6 monitoring transects were established in natural wetland habitats. In 2019, 2020, 2021 and 2022, all 12 plots were dominated by wetland plants and all calculated CW values were in the negative indicating wetland conditions. Wetland conditions appeared visually similar from 2019 to 2022 in all transects except for Transect 6 and a portion of Transect 5 (wetland RR6), which were inundated with water in 2020, 2021 and 2022 (Appendix B). The greatest difference from 2019 to 2022 was observed at Transect 6, where the substrate was moist and mucky and slightly wet in 2019, but completely inundated with 30 to 50cm+ deep water in 2020, 2021 and 2022. The north end of Transect 5 (plot T5-1) was also noticeably more inundated in 2020, 2021 and 2022 compared to 2019, resulting in fewer species recorded within this plot in 2020, 2021 and 2022 compared to 2019.

A more subtle change may be occurring in Plot T4-1 where the mean CW has increased gradually from **-3.3** in 2019 to **-2.8** in 2020 to **-1.9** in 2021 and to **-1.8** in 2022. A few upland species (sugar maple seedlings, common milkweed, wild red raspberry and Virginia waterleaf) that were recorded in 2021 and 2022 account for these increased wetland values. These upland species represent a small amount of cover in the plot (5% or less). Future monitoring activities can track the potential expansion of these species and potential addition of other upland species in this plot.

Minor fluctuations in species presence / absence were documented in some of the plots, which is reflected in some C and FQI values. This is potentially due to year-to-year natural variations and possibly a difference in survey timing rather than an indication of wetland change. Yearly monitoring dates have occurred between September 12th and October 5th since the beginning of monitoring. This timing difference can be significant in the late summer / early fall as herbaceous vegetation can die off rapidly due to frosts and other factors, making it difficult to identify certain types of vegetation and affecting the plot inventories and floristic quality calculations.

Surveys in future years of monitoring should be conducted mid-August at the earliest and no later than mid-September. This will ensure that more species are visible and better comparisons to the baseline year of monitoring can be achieved. It is recommended that Section 5.5.2. of the AMP be updated with these revisions to the monitoring period.

Vegetation Health

With respect to overall health of the natural features in the Expansion Quarry, woody vegetation, particularly trees, are better long-term indicators of change in a vegetation community. Tree health can be influenced by several factors such as flooding, insect pests, fungal pathogens, windfall, ice storms, natural decline, competition with other trees, and direct impacts to stem or roots.



The trees in the study area were generally healthy with a few exceptions. Of the black ash trees adjacent Plot T5-1, some were noted to be healthy and others in decline in 2020. In 2021, all black ash trees adjacent Plot T5-1 were in decline. This could potentially be due to the higher water levels in this swamp compared to 2019.

Many of the trees found along Transect 6 and throughout the surrounding wetland (RR6) were dead, as noted in 2019. RR6 is known to be wet throughout the year as drivepoint monitoring stations DP1 (corresponding with Transect 6) and DP2 (corresponding with Transect 5) have never been dry and surface water levels can reach over 1m in depth. Discharge from the existing quarry runs along the hydro corridor between Transects 5 and 6 and is released close to Grey Rd. 31. The amount of water discharged in 2019 was similar to that of previous years. Future monitoring years may provide more insight into the change experienced by this wetland feature.

In 2020, it was observed that some of the black ash trees around the north end of Transect 5 (Plot T5-1) were in decline, while others were healthy. In 2021 and 2022, all of the black ash trees in this area were in decline. This could potentially be the result of water levels or widespread emerald ash borer beetle that is affecting ash trees throughout southern Ontario.

No other notable changes were observed in the general health of trees from 2019 to 2022 within and adjacent the other transects and plots.

4.1 Conclusions

This report represents the fourth year of terrestrial monitoring in the Expansion Quarry. Future years of monitoring will provide greater opportunities to observe any changes in vegetation composition and wetland conditions along the transects.

For the most part the wetlands remain consistent in their floristic character and remain as healthy wetland communities. RR6 appears to be experiencing inundation over a long period which is changing the character of the wetland floristic diversity from treed swamp to a more open canopy wetland environment.



5 References

Oldham, M. J., Bakowsky, W. D., & Sutherland, D. A. (1995). *Floristic quality assessment for Southern Ontario*. Natural Heritage Information Centre.

Ontario Ministry of Natural Resources and Forestry. (2022, 09 20). Ontario Species List.

Taft, J. B., Wilhelm, G. S., Ladd, D. M., & Masters, L. A. (1997). *Floristic Quality Assessment for Vegetation in Illinois: A Method for Assessing Vegetation Integrity*.

Walker Aggregates. (2018). *Duntroon Expansion Quarry Adaptive Management Plan 2018*.



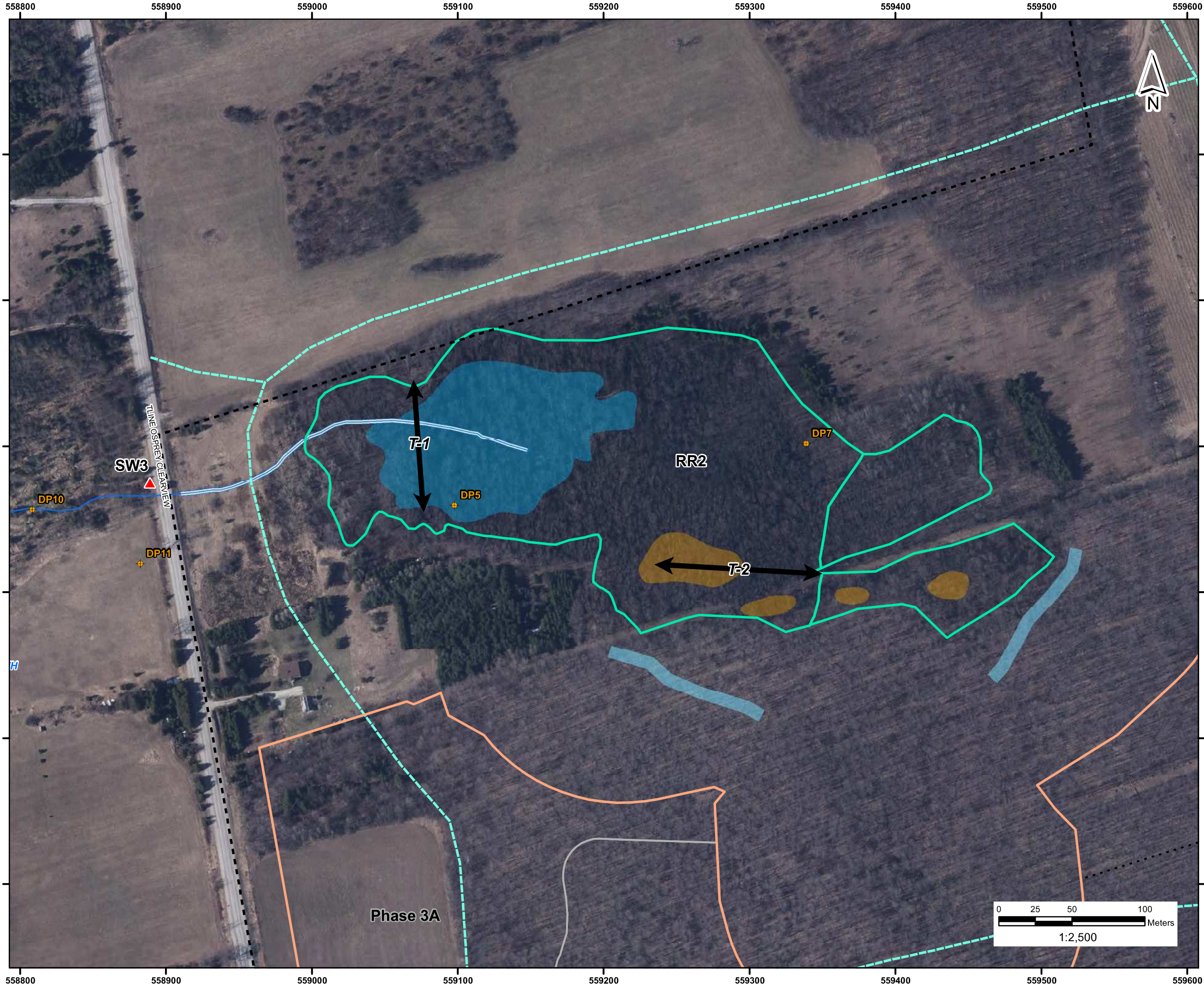
Appendices




Appendix A Figures



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Revised: 2018-12-21 By: dharvey




walker
industries

Walker
Aggregates Inc.

Legend

- Walker Owned Lands
- Limit of Extraction - Walker
- Phase Boundary
- Phase 4 - Lower Bench
- Surface Water Monitoring Station and Designation (Jagger Hims, 2005)
- Surface Water Monitoring Station with Observed Seepage (within 120m of the proposed licensed area)
- Surface Water Monitoring Station - Karst 2007
- Drive Point Monitoring Location
- Transect
- Karst Infiltration Area
- Surface Trench Discharge
- Dual purpose Monitoring/Recharge Wells
- Wetland ⁴
- Interpreted Wetland Catchment Areas
- Approximate location of diffuse overflow channel between ANSI A and ANSI B
- Intermittent Surface Water Features and Fisheries Habitat
- Undefined Braided Channel
- Dug Agricultural Ponds
- Vernal Pools
- Approximate Location of Deeper Vernal Pools
- Approximate Location of Shallower Vernal Pools

Notes

1. Coordinate System: UTM NAD 83 - Zone 17(N)
2. Data Sources: Ontario Ministry of Natural Resources, © Queens Printer Ontario, 2009.
3. Image Source: First Base Solutions WMS, 2008
4. Wetland boundaries approximated using handheld GPS and air photo except where adjacent to proposed license boundary, surveyed in consultation with MNR.

December 2018
62602732

Client / Project

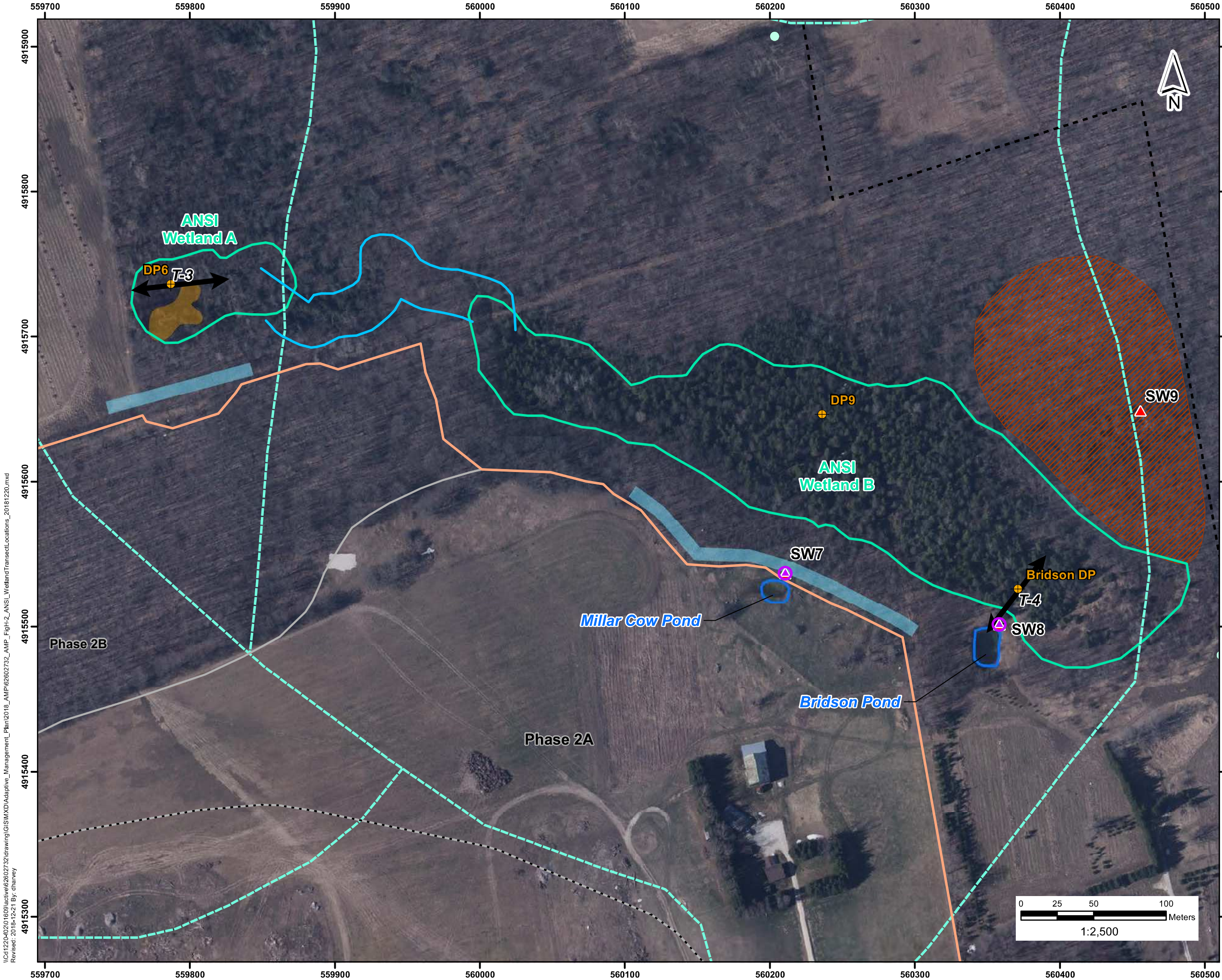
WALKER AGGREGATES INC.
DUNTROON QUARRY EXPANSION
ADAPTIVE MANAGEMENT PLAN

Figure No.

H.1

Title

RR2 TRANSECT LOCATIONS



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Revised: 2018-12-21 By: dharvey



Legend

- Walker Owned Lands
- Limit of Extraction - Walker
- Phase Boundary
- Phase 4 - Lower Bench
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Notes

1. Coordinate System: UTM NAD 83 - Zone 17(N)
2. Data Sources: Ontario Ministry of Natural Resources, © Queens Printer Ontario, 2009.
3. Image Source: First Base Solutions WMS, 2008.
4. Wetland boundaries approximated using handheld GPS and air photo except where adjacent to proposed license boundary, surveyed in consultation with MNR.

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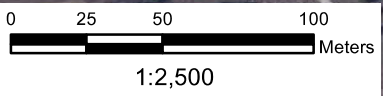
WALKER AGGREGATES INC.
DUNTROON QUARRY EXPANSION
ADAPTIVE MANAGEMENT PLAN

Figure No.

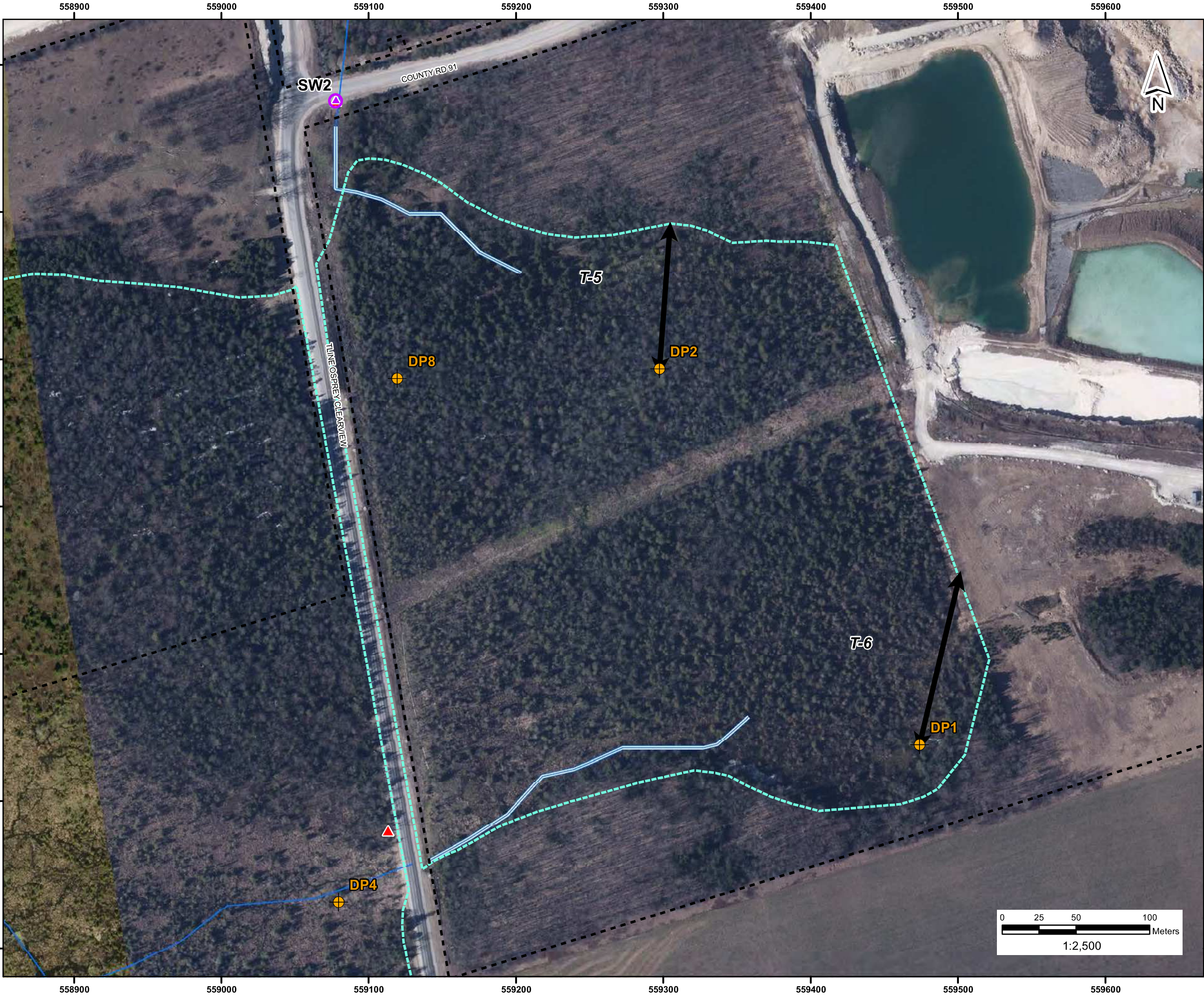
H.2

Title

ANSI WETLAND TRANSECT
LOCATIONS



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Revised: 2018-12-21 By: dharvey



Legend

- Walker Owned Lands
- Limit of Extraction - Walker
- Phase Boundary
- Phase 4 - Lower Bench
- Surface Water Monitoring Station and Designation (Jagger Hims, 2005)
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December 2018
62602732

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DUNTROON QUARRY EXPANSION
ADAPTIVE MANAGEMENT PLAN

Figure No.

H.3

Title

RR6 WETLAND TRANSECT
LOCATIONS

Appendix B Photographic Record (2022)





Photo 1: Transect 1, Plot 1 – September 29, 2020



Photo 2: Transect 1, Plot 1 – September 20, 2021



Photo 3: Transect 1, Plot 1 – October 5, 2022



Photo 4: Transect 1, Plot 2 – September 29, 2020



Photo 5: Transect 1, Plot 2 – September 20, 2021



Photo 6: Transect 1, Plot 2 – October 5, 2022



Photo 7: Transect 2, Plot 1 – September 29, 2020



Photo 8: Transect 2, Plot 1 – September 20, 2021



Photo 9: Transect 2, Plot 1 – October 5, 2022



Photo 10: Transect 2, Plot 2 – September 29, 2020



Photo 11: Transect 2, Plot 2 – September 20, 2021



Photo 12: Transect 2, Plot 2 – October 5, 2022



Photo13: Transect 3, Plot 1 – September 29, 2020



Photo 14: Transect 3, Plot 1 – September 20, 2021



Photo 15: Transect 3, Plot 1 – October 5, 2022



Photo 16: Transect 3, Plot 2 – September 29, 2020



Photo 17: Transect 3, Plot 2 – September 20, 2021



Photo 18: Transect 3, Plot 2 – October 5, 2022

Filepath: \\cd1004-f01101609active\\160901062.05_report_deliv\\2022_monitoring_memos\\wetland vegetation report 2022.appt_2022_veg-monitor-photolog.docx



Photo 19: Transect 4, Plot 1 – September 29, 2020



Photo 20: Transect 4, Plot 1 – September 20, 2021



Photo 21: Transect 4, Plot 1 – October 5, 2022



Photo 22: Transect 4, Plot 2 – September 29, 2020



Photo 23: Transect 4, Plot 2 – September 20, 2021



Photo 24: Transect 4, Plot 2 – October 5, 2022



Photo 25: Transect 5, Plot 1 – September 29, 2020



Photo 26: Transect 5, Plot 1 – September 20, 2021



Photo 27: Transect 5, Plot 1 – October 5, 2022



Photo 28: Transect 5, Plot 2 – September 29, 2020



Photo 29: Transect 5, Plot 2 – September 20, 2021



Photo 30: Transect 5, Plot 2 – October 5, 2022



Photo 31: Transect 6, Plot 1 – September 29, 2020



Photo 32: Transect 6, Plot 1 – September 20, 2021



Photo 33: Transect 6, Plot 1 – October 5, 2022



Photo 34: Transect 6, Plot 2 – September 29, 2020



Photo 35: Transect 6, Plot 2 – September 20, 2021



Photo 36: Transect 6, Plot 2 – October 5, 2022



Photo 37: Transect 1 habitat photo – October 5, 2022



Photo 38: Transect 2 habitat photo – October 5, 2022



Photo 39: Transect 4 habitat photo – October 5, 2022



Photo 40: Transect 5 habitat photo – October 5, 2022



Photo 41: Transect 6 habitat photo – October 5, 2022

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Appendix C Field Data Sheets (2022)

#62602732

~~XXXXXXXXXXXXXXXXXXXX~~ Duntroon Veg. Monitoring

Transect #: 1 Plot: 1

Date: Sept. 29, 2020

Sept. 20, 2021

Oct. 5, 2022

Personnel:

B. Miller

B. Miller

UTM:

Community:

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | Black Ash in plot Freeman's Maple hanging in | 70% 40% Same ✓ |
| Shrub | * See below | |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: <u>90</u>) 90 | | | | |
|---|-----|-----|-----|---------------------|
| Onoclea sens. | 70% | 70% | 50% | Scot. LATE. → 1% 2% |
| Carex brunn. | 5% | 10% | 5% | Rob. PUB. → 1% 2% |
| Eutrochium macu. | 5% | 10% | 5% | Acer x free 10% |
| * Rhamnus alni. | 10% | 10% | 10% | ↳ seedlings |
| Equisetum arve. | 10% | 5% | 5% | TIAR. CO. RD. 1% |
| Carex intumescens | 10% | 5% | 10% | |
| Glyceria striata | 5% | ✓ | 2% | |
| Carex projecta | 5% | 5% | 5% | |
| Lycopus unifl. | | 5% | 2% | |
| Hydro. virg. | | 1% | 2% | |

Water Depth: No Standing water

Photos Taken:

" " "

" " "

General Health of Trees within 5m of Plot: Good

Freeman's maple. Black Ash

One declining Freeman's maple to S.W. ✓

Additional Notes (habitat, disturbance, incidental wildlife):

#62602732

Duntroon Veg. Monitoring

Transect #: 1 Plot: 2

Date: Sept. 29, 2020 B. Miller

Personnel:

UTM: Oct. 5, 2022

Community: B. Miller

Sept. 20, 2020

B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | Green Ash + Freeman's maple Hanging in. | 10 + 50% 30✓ + 60% 75% |
| Shrub | Prunus virg. Hanging in. * See below | 45% 5% 10% |

Ground-layer species in Plot and % cover by species

(Overall % Cover of Ground-layer: 30) 40% 30%.

| | | | |
|---------------------------|-----|------------------------|-------------------|
| Onoclea sens. | 20% | 40% 30% | Dryopt. inter. 5% |
| Carex tuck. | 5% | ✓ / | |
| Equisetum arve. | 2% | 1% 2% | |
| Symphro. later. | 2% | 5% / | |
| * Acer x free (seedlings) | 2% | ✓ 20% | |
| * Ulmus amer. (seedling) | 5% | 10% 10% 10% | |
| Lycopus unifl. | 2% | 5% 2% | |
| * Rubus pube. | 2% | 5% 5% | |
| Epilobium cf. ciliatum | 1% | ✓ 1% | |
| ARIS. TRIPH. | | 5% 5% | |

Water Depth:

Photos Taken:

No standing water. Much of plot was recently inundated. in spring.

General Health of Trees within 5m of Plot:

Good.

Freeman's maple. Green Ash.

Same Same

Additional Notes (habitat, disturbance, incidental wildlife):

#62602732

~~Chapman Creek Forest Management~~ Duntroon Veg. Monitoring.

Transect #: 2 Plot: 1
 Date: Sept. 29, 2020 B. Miller
 Personnel:
 UTM:
 Community: Oct. 5, 2022
 B. Miller

Sept. 20, 2021
 B. Miller

Both hanging in

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--|
| Canopy | Ulmus amer. + Acer x free Betula sp. (yellow) | 30% + 70% 30% 80% 10% 10% |
| Shrub | * See below below | |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: $\frac{50}{50\%}$) | | | |
|--|----------|------------------|-------------|
| Species growing on rotting log: | | | |
| 10% Carex projecta | 20% 20% | Aralia nudic. | 15% 20% 30% |
| 2% Bidens frond. | 5% 2% | Oxalis mont. | 15% 20% 20% |
| 10% Lycopodium unifl. | 10% 10%* | Rubus pub. | 10% 10% 5% |
| 25% Acer x free. (seedling) | 5% 5% | Dryopteris cart. | 15% 15% 20% |
| 2% 4% Viola sp. | 5% 5% | | |
| 10% Glycyrrhiza striata | 5% 5% | Poly. pube. | 2% |
| 10% Cinn. latifolia | 2% 5% | Carex intum. | 5% |
| Solidago cana. | 2% / | | |
| SOLA. DULC. | 2% | | |
| 2% SCUT. LATR. | | | |

Water Depth: No standing water. Recently inundated

Photos Taken: " " " " "

General Health of Trees within 5m of Plot: Good. Same ✓

Acer x free. (D) White elm. Betula sp.

Additional Notes (habitat, disturbance, incidental wildlife):

#62602732

~~Site Name~~ Duntroon Veg. Monitoring

Transect #: 2 Plot: 2

Date: Sept. 29, 2020 B. Miller

Sept. 20, 2021

Personnel:

UTM:

Community:

Oct. 5, 2022

B. Miller

B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|---|--------------------------------|
| Canopy | Acer x free. - Hanging in. Black Ash sapling. → 10% same ✓ | 70% 70% ✓ |
| Shrub | * See below | |

Ground-layer species in Plot and % cover by species

(Overall % Cover of Ground-layer: 60) 70% 70%

| | | |
|----------------------------------|-----|--------------------|
| * Rhamnus alai. | 40% | 50% 60% |
| Carex disperua | 10% | 15% / |
| Carex sp. | 2% | 2% 2% |
| Equisetum arve | 2% | 2% 5% |
| Cinna sp. latifolia | 2% | 1% / |
| Ulmus amer. sapling | 10% | 15% 20% |
| Black Ash saplings/ Seedlings | 10% | 20% 10% |
| Carex leptalea | | 5% |
| Acer x free. (seedlings) | | 5% |

Water Depth: No standing water

Photos Taken:

" " "

General Health of Trees within 5m of Plot: Same as 2019

Acer x free.

Two Acer x free in decline/dead. Appears to be natural decline.
e.g. Shaded out.

Additional Notes (habitat, disturbance, incidental wildlife):

#62602732

~~CONFIDENTIAL~~ Duntroon Veg. Monitoring

Transect #: 3 Plot: 1

Date: Sept. 29, 2020 B. Miller
Personnel:

Personnel:

UTM: Oct. 5, 2022
Community:

Community: B. Miller

Sept. 20, 2021

B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | Populus bals. Hanging Ia. | 80% 80% |
| Shrub | * See below | |

| Ground-layer species in Plot and % cover by species | | |
|---|-----|---------|
| (Overall % Cover of Ground-layer: <u>90%</u>) | | |
| Cornus stolon. | 90% | 95% 95% |
| Oxoclea sens. | 10% | 15% 10% |
| Carex tuck. | 5% | 5% 10% |
| Vitis riparia | 20% | 30% 20% |
| → growing up adjacent trees. | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Water Depth: No Standing water

Photos Taken:

u u y
le ll ll

General Health of Trees within 5m of Plot: Good

Populus bals. Ulmus amer.

Same ✓

Additional Notes (habitat, disturbance, incidental wildlife):

#62602732

~~STANDARD FORM 100-100~~

Duntroon Veg. Monitoring

Transect #: 3 Plot: 2

Date: Sept. 29, 2020 B. Miller

Personnel:

UTM: Oct. 5, 2022

Community: B. Miller

Sept. 20, 2021

B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | Green Ash - Hanging In. | 60% Same ✓ |
| Shrub | * Salix discolor Hanging in - * See below | → 30% ✓ |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: 70) 90% 75% | | |
|---|-----|------------------------|
| Onoclea sens. | 30% | 40% 20% ² |
| Phalaris arund. | 30% | 20% 30% |
| * Cornus stolon. | 25% | 40% 60% |
| XXXXXXXXXXXX LYCO. AMER. | | 2% ✓ |
| Carex tuck. | 10% | 10% 30% |
| Lycopus unifl. | 10% | 10% 15% |
| Carex sp. projecta | 20% | 10% 30% 10% |
| * Solanum dub. | 5% | 5% 10% |
| XXXXXXXXXXXX SOLI. CANA. | | 2% ✓ |
| Epilobium ciliatum or color | | → 2% ✓ 2% |

Water Depth: No standing water

Photos Taken:

" " "

General Health of Trees within 5m of Plot: Good

Green Ash. Black Ash. Salix discolor.

Freeman's Maple. One Black ash → slight decline. ✓

Additional Notes (habitat, disturbance, incidental wildlife):

Moderate decline.

#62602732

~~Simpson Land~~
100909

Duntroon Veg. Monitoring

Transect #: 4 Plot: 1

Date: Sept. 29, 2020 B. Miller

Personnel:

UTM: Oct. 5, 2022

Community: B. Miller

Sept. 20, 2021

B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|---|--------------------------------|
| Canopy | No woody veg. growing in plot. Green Ash Hanging in. | 70% 50% Same |
| Shrub | None Cornus stolon. | 2% ✓ |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: 95) 95 80 | | | |
|---|-------------|---------------------|---------|
| Eutroch. macv. | 25% 30% | Carex vulp. | 2% ✓ |
| Symphyo. lauc. | 5% 40% 40% | Phalaris arund. | 2% ✓ 2% |
| Glyceria stria. | 40% 70% 60% | ASCL. SYRI. | 5% 5% |
| Equisetum arve. | 5% 10% 5% | Acer-sugar seedling | 1% 1% |
| Impatiens cape. | 10% 30% 10% | RUB. PUBE. | 2% 2% |
| Symphyo. puni. | 10% 15% 10% | RUB. STRIG. | 1% ✓ |
| Solidago rugo. | 5% 2% 10% | Hydro. virg. | 2% |
| Geum sp. | 2% 2% 2% | | |
| Scirpus cf. atrovirens | 2% 2% 10% | | |
| Circaea cana. | ✓ 1% ✓ | | |

Water Depth: No standing water

Photos Taken: " " "

General Health of Trees within 5m of Plot: Good.

Abies bals. Frax. Thuja occi.

Same ✓

Additional Notes (habitat, disturbance, incidental wildlife):

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~~Shrubland Vegetation Monitoring~~

Duntroon Veg. Monitoring

Transect #: 4 Plot: 2

Date: Sept. 29, 2020 B. Miller

Sept. 20, 2021

Personnel:

UTM: Oct. 5, 2022

B. Miller

Community: B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | THU. OCCI. } Both Hanging BET. ALLE. } in. | 60% 70% |
| Shrub | * See below | |

Ground-layer species in Plot and % cover by species

(Overall % Cover of Ground-layer: 60%) 75% 50%

| | | | | |
|---|-------------------|-----|-----|-----|
| | Onoclea sens. | 50% | 60% | 50% |
| | Glyceria stria. | 10% | 5% | 5% |
| * | Robus pube. | 10% | 15% | 10% |
| | Lycopus unifl. | 5% | 5% | / |
| * | Solanum dule. | 5% | 5% | 15% |
| | Galium trif. | 2% | / | 2% |
| * | Fraxinus seedling | 5% | 2% | / |
| | EQUI. ARVE. | | 2% | 5% |
| | | | | |
| | | | | |

Water Depth: - No standing water

Photos Taken: 1 " 1 " 1 "

General Health of Trees within 5m of Plot: Good.

THU. OCCI. BETALLE. ABIES BALS. Fraxinus

POP TREM. Same ✓

Additional Notes (habitat, disturbance, incidental wildlife):

Duntroon Expansion Quarry – Wetland Vegetation Monitoring
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Oct. 5, 2021
B. Miller

Transect #: 5 Plot: 1
Date: Sept. 29, 2020
Personnel: B. Miller
UTM:
Community:

Sept. 20, 2021
B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | Black ash hanging in | 5% 0% 0% |
| Shrub | None ✓✓ | |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: 50% 60%) | | |
|---|-----|---------|
| Phalaris arund. | 50% | 50% 25% |
| Bidens cern. | | 30% 5% |
| Bidens conn. | | 10% ✓ |
| Lemna cf. minor | | 1% |
| Sparganium sp. - no fruit | | 20% |
| | | |
| | | |
| | | |
| | | |
| | | |

Water Depth: Plot inundated. Water approx 30cm deep.

Photos Taken: " " " " 30-40cm deep.
" " " " 30cm deep

General Health of Trees within 5m of Plot:

A few black ash in decline. Others are healthy.
White cedar healthy. All black ash appear in decline.

Additional Notes (habitat, disturbance, incidental wildlife):

→ Abundant Tussilago farfara at edge of wetland
5m away from plot. ✓

62602732

~~Swamp Land Forest Monitoring~~ Duntroon Veg. Monitoring

Transect #: 5 Plot: 2

Date: Sept. 29, 2020 B. Miller

Personnel:

UTM:

Community: Oct. 5, 2022

Sept. 20, 2021

B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | Hanging into plot | 50% 50% 40% |
| Shrub | | |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: 40% 40% 30%) | | | |
|---|-----|---------|-----------------------|
| Typha latifolia | 15% | 15% | Carex sp. 5% 5% |
| Solanum dulc. | 25% | 10% 15% | Phalaris arun. 5% 10% |
| Bidens connata | 10% | 10% 2% | Carex hystrix. 15% |
| Solidago rigida | 5% | 5% | ✓ |
| Glyceria striata | 20% | 20% 15% | |
| Lycopus unifl. | 15% | 5% 10% | |
| Scutellaria later. | 5% | 5% | ✓ |
| Impatiens cape. | 2% | 2% | ✓ |
| Caltha palu. | 2% | 5% 1% | |
| Bidens cernua | 2% | 2% | ✓ |

Water Depth: Plot inundated except for a hummock.

Photos Taken:

" " " " a couple hummocks.
About 50 cm deep. ✓

General Health of Trees within 5m of Plot:

Black Ash, red maple → Both healthy
white cedar and yellow birch → dead or dying ✓
Balsam fir → some dead, a few alive

Additional Notes (habitat, disturbance, incidental wildlife):

Duntroon Expansion Quarry – Wetland Vegetation Monitoring
62602732

Oct. 5, 2022
B. Miller

Transect #: 6 Plot: 1
Date: September 29, 2020
Personnel: B. Miller
UTM:
Community:

~~Sept. 20, 2021~~
B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | No living trees in plot or hanging in. | ✓ ✓ |
| Shrub | None. | ✓ ✓ |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: 80% 80%) | | | |
|--|-----|-----|-----|
| Phalaris arund. | 80% | 60% | 30% |
| Lemna minor | 5% | 5% | 5% |
| Submergents | 50% | 50% | 75% |
| Wolfia sp. | | 80% | 10% |
| Potamogeton sp. | | | 2% |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Water Depth: Plot inundated. Approx. 40-50cm Deep.
Photos Taken: " " " " " "

General Health of Trees within 5m of Plot:
All dead ✓

Additional Notes (habitat, disturbance, incidental wildlife):

Duntroon Expansion Quarry – Wetland Vegetation Monitoring
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Transect #: 6 Plot: 2
Date: Sept. 29, 2020
Personnel: B. Miller
UTM:
Community:

Oct. 5 2022
B. Miller
Sept. 20, 2021
B. Miller

| Layer | Dominant species above Plot and % cover by species | Overall Percent Cover of Layer |
|--------|--|--------------------------------|
| Canopy | No living trees within or hanging into plot. | ✓ ✓ |
| Shrub | * See below. | |

| Ground-layer species in Plot and % cover by species (Overall % Cover of Ground-layer: <u>80%</u>) | | | |
|---|-----|-----|-----|
| Potamogeton | 70% | 20% | |
| * Salix discolor | 25% | 25% | 20% |
| Bidens sp. connata | <1% | 1% | 1% |
| Immature/undeveloped grass | 5% | ✓ | |
| Carex sp. | 5% | 5% | 5% |
| Submergents | 75% | 50% | 20% |
| Phalaris arun. | | 10% | 10% |
| Lyc. unifl. | | 1% | 1% |
| * Cornus stolon. | | 5% | 10% |
| Wolfie sp. | | 10% | 20% |
| Lemna cf. minor | | 5% | 5% |

Water Depth: Plot inundated. Approx 40 cm deep.
Photos Taken: " "

General Health of Trees within 5m of Plot: ~~poor~~ Poor - Dead

See 2019 notes for tree health. Mostly all dead with exception of a red maple, one black ash and

Additional Notes (habitat, disturbance, incidental wildlife):

(a balsam fir and spruce)
These two spp. are dying.
young white cedar healthy on hummock next to plot.

Appendix D Vegetation Plot Data Summary & Analysis (2022)

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 1, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|--------------------------|--------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| x | x | x | x | Equisetum arvense | Field Horsetail | S5 | | 0 | 0 |
| x | x | x | x | Onoclea sensibilis | Sensitive Fern | S5 | | 4 | -3 |
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| | | | x | Acer x freemanii | Freeman's (Swamp) Maple | | | 6 | -5 |
| x | x | x | x | Endotropis alnifolia | Alder-leaved Buckthorn | S5 | | 7 | -5 |
| x | x | x | x | Eutrochium maculatum | Spotted Joe Pye Weed | S5 | | 3 | -5 |
| x | x | x | x | Fraxinus nigra | Black Ash | S4 | | 7 | -3 |
| | x | x | x | Glyceria striata | Fowl Mannagrass | S5 | | 3 | -5 |
| | | x | x | Hydrophyllum virginianum | Virginia waterleaf | S5 | | 6 | 0 |
| x | | x | x | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | | x | x | Rubus pubescens | Dewberry | S5 | | 4 | -3 |
| x | | x | x | Scutellaria lateriflora | Mad Dog Skullcap | S5 | | 5 | -5 |
| | | | x | Tiarella cordifolia | Heart-leaved Foam-flower | S5 | | 6 | 3 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | x | x | x | Carex brunnescens | Brownish Sedge | S5 | | 6 | -3 |
| x | x | x | x | Carex intumescens | Bladder Sedge | S5 | | 6 | -3 |
| x | | | | Carex leptalea | Bristle-stalked Sedge | S5 | | 8 | -5 |
| x | x | x | x | Carex projecta | Necklace Sedge | S5 | | 5 | -3 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 1, PLOT 1 |
|------|------|------|------|---|
| 12 | 9 | 13 | 15 | Total Species |
| 12 | 9 | 13 | 15 | Native Species |
| 0 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 5.0 | 4.6 | 4.7 | 4.9 | Average Coefficient of Conservatism (mean C) |
| 17.3 | 13.7 | 16.9 | 18.8 | Floristic Quality Index (FQI) |
| 1 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -3.6 | -3.3 | -3.3 | -3.0 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 1, Plot 2

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|-------------------------------|--------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| | | | x | Dryopteris intermedia | Evergreen Wood Fern | S5 | | 5 | 0 |
| x | x | x | x | Equisetum arvense | Field Horsetail | S5 | | 0 | 0 |
| x | x | x | x | Onoclea sensibilis | Sensitive Fern | S5 | | 4 | -3 |
| | | | | ANGIOSPERMS (Dicots) | | | | | |
| x | x | | x | Acer x freemanii | Freeman (Swamp) Maple | S5 | | 6 | -5 |
| | x | | x | Epilobium cf. ciliatum | Northern Willowherb | S5 | | 3 | -3 |
| x | x | x | x | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | x | x | x | Rubus pubescens | Dewberry | S5 | | 4 | -3 |
| x | x | x | | Symphyotrichum lateriflorum | Calico Aster | S5 | | 3 | 0 |
| x | x | x | x | Ulmus americana | American Elm | S5 | | 3 | -3 |
| | | | | ANGIOSPERMS (Monocots) | | | | | |
| | | x | x | Arisaema triphyllum | Jack-in-the-pulpit | S5 | | 5 | -3 |
| x | x | | | Carex tuckermanii | Tuckerman's Sedge | S5 | | 7 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 1, PLOT 2 |
|------|------|------|------|---|
| 8 | 9 | 7 | 9 | Total Species |
| 8 | 9 | 7 | 9 | Native Species |
| 0 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 4.0 | 3.9 | 3.4 | 3.8 | Average Coefficient of Conservatism (mean C) |
| 11.3 | 11.7 | 9.0 | 11.3 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -3.0 | -3.0 | -2.4 | -3.1 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 2, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|-----------------------------|----------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| x | x | x | x | Dryopteris carthusiana | Spinulose Wood Fern | S5 | | 5 | -3 |
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | x | x | x | Acer x freemanii | Freeman (Swamp) Maple | S5 | | 6 | -5 |
| x | x | x | x | Aralia nudicaulis | Wild Sarsaparilla | S5 | | 4 | 3 |
| | x | | | Betula sp. | Birch Species seedling | | | | |
| x | | | | Bidens connata | Purple-stemmed Beggarticks | S4? | | 5 | -3 |
| | x | x | x | Bidens frondosa | Devil's Beggarticks | S5 | | 3 | -3 |
| x | x | x | x | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | x | x | x | Oxalis montana | Common Wood-sorrel | S5 | | 7 | 3 |
| | | | x | Polygonatum pubescens | Hairy Solomon's Seal | S5 | | 5 | 5 |
| x | | | | Rubus idaeus ssp. strigosus | Wild Red Raspberry | S5 | | 2 | 3 |
| x | x | x | x | Rubus pubescens | Dewberry | S5 | | 4 | -3 |
| | | | x | Scutellaria lateriflora | Mad Dog Skullcap | S5 | | 5 | -5 |
| | | x | | Solanum dulcamara | Bittersweet Nightshade | SE5 | | | 0 |
| | x | | | Solidago canadensis | Canada Goldenrod | S5 | | 1 | 3 |
| | x | | | Ulmus americana | American Elm | S5 | | 3 | -3 |
| x | x | x | x | Viola sp. | Violet Species | | | | |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | | | | Arisaema triphyllum | Jack-in-the-pulpit | S5 | | 5 | -3 |
| | | | x | Carex intumescens | Bladder Sedge | S5 | | 6 | -3 |
| x | x | x | x | Carex projecta | Necklace Sedge | S5 | | 5 | -3 |
| | x | x | x | Cinna latifolia | Drooping Woodreed | S5 | | 7 | -3 |
| x | x | x | x | Glyceria striata | Fowl Mannagrass | S5 | | 3 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 2, PLOT 1 |
|------|------|------|------|---|
| 11 | 14 | 12 | 14 | Total Species |
| 11 | 14 | 11 | 14 | Native Species |
| 0 | 0 | 1 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 2, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|------------------------|------------------------|------------------------|------------------------|---|-------------|----------------------------|-----------------------|--|------------------------|
| 4.6 | 4.4 | 4.9 | 5.0 | Average Coefficient of Conservatism (mean C) | | | | | |
| 15.4 | 16.5 | 17.0 | 18.7 | Floristic Quality Index (FQI) | | | | | |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 | | | | | |
| -1.9 | -2.0 | -2.2 | -1.9 | Mean Wetness Value | | | | | |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 2, Plot 2

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|------------------------|------------------------|------------------------|------------------------|--|------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| | | | | PTERIDOPHYTES (Ferns & Fern Allies) | | | | | |
| | x | x | x | Equisetum arvense | Field Horsetail | S5 | | 0 | 0 |
| | | | | ANGIOSPERMS (Dicots) | | | | | |
| x | | | x | Acer x freemanii | Freeman (Swamp) Maple | S5 | | 6 | -5 |
| x | x | x | x | Endotropis alnifolia | Alder-leaved Buckthorn | S5 | | 7 | -5 |
| x | x | x | x | Fraxinus nigra | Black Ash | S4 | | 7 | -3 |
| x | x | x | x | Ulmus americana | American Elm | S5 | | 3 | -3 |
| | | | | ANGIOSPERMS (Monocots) | | | | | |
| | x | x | | Carex disperma | Two-seeded Sedge | S5 | | 8 | -5 |
| x | | | | Carex cf. interior | Inland Sedge | S5 | | 6 | -5 |
| | | | x | Carex leptalea | Bristle-stalked Sedge | S5 | | 8 | -5 |
| | x | x | x | Carex sp. | Sedge Species | | | | |
| | x | x | | Cinna latifolia | Drooping Woodreed | S5 | | 7 | 3 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 2, PLOT 2 |
|------|------|------|------|---|
| 5 | 7 | 7 | 7 | Total Species |
| 5 | 7 | 7 | 7 | Native Species |
| 0 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 5.8 | 5.3 | 5.4 | 5.2 | Average Coefficient of Conservatism (mean C) |
| 13.0 | 14.1 | 14.4 | 13.7 | Floristic Quality Index (FQI) |
| 0 | 1 | 1 | 1 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -4.2 | -2.2 | -3.4 | -3.5 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 3, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|--------------------|-------------------|----------------------------|-----------------------|--|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| x | x | x | x | Onoclea sensibilis | Sensitive Fern | S5 | | 4 | -3 |
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | x | x | x | Cornus sericea | Red-osier Dogwood | S5 | | 2 | -3 |
| x | x | x | x | Vitis riparia | Riverbank Grape | S5 | | 0 | 0 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | x | x | x | Carex tuckermanii | Tuckerman's Sedge | S5 | | 7 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 3, PLOT 1 |
|------|------|------|------|---|
| 4 | 4 | 4 | 4 | Total Species |
| 4 | 4 | 4 | 4 | Native Species |
| 0 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 3.3 | 3.3 | 3.3 | 3.3 | Average Coefficient of Conservatism (mean C) |
| 6.5 | 6.5 | 6.5 | 6.5 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -2.8 | -2.8 | -2.8 | -2.8 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING
Transect 3, Plot 2

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|-----------------------------|--------------------------|----------------------------|-----------------------|--|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| x | x | x | x | Onoclea sensibilis | Sensitive Fern | S5 | | 4 | -3 |
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | x | x | x | Cornus sericea | Red-osier Dogwood | S5 | | 2 | -3 |
| x | x | x | x | Epilobium cf. coloratum | Purple-veined Willowherb | S5 | | 3 | -5 |
| | | x | | Lycopus americanus | American Water-horehound | S5 | | 4 | -5 |
| x | x | x | x | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | x | x | x | Solanum dulcamara | Bittersweet Nightshade | SE5 | | | 0 |
| x | | x | | Solidago cf. canadensis | Canada Goldenrod | S5 | | 1 | 3 |
| x | | | | Symphyotrichum lateriflorum | Calico Aster | S5 | | 3 | 0 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | | | | Calamagrostis canadensis | Bluejoint Reedgrass | S5 | | 4 | -5 |
| x | x | x | x | Carex projecta | Necklace Sedge | S5 | | 5 | -3 |
| x | x | x | x | Carex tuckermanii | Tuckerman's Sedge | S5 | | 7 | -5 |
| x | x | x | x | Phalaris arundinacea | Reed Canary Grass | S5 | | 0 | -3 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 3, PLOT 2 |
|------|------|------|------|---|
| 11 | 8 | 10 | 8 | Total Species |
| 10 | 7 | 9 | 7 | Native Species |
| 1 | 1 | 1 | 1 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 3.4 | 3.7 | 3.4 | 3.7 | Average Coefficient of Conservatism (mean C) |
| 11.3 | 10.5 | 10.9 | 10.5 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -2.6 | -3.4 | -2.9 | -3.4 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 4, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|-----------------------------|-------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| x | x | x | x | Equisetum arvense | Field Horsetail | S5 | | 0 | 0 |
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| | | x | x | Acer saccharum | Sugar Maple | S5 | | 4 | 3 |
| | | x | x | Asclepias syriaca | Common Milkweed | S5 | | 0 | 5 |
| x | | | | Circaea sp. | Enchanter's Nightshade | S5 | | | |
| | x | | | Circaea canadensis | Enchanter's Nightshade | S5 | | 2 | 3 |
| | x | x | | Cornus sericea | Red-osier Dogwood | S5 | | 2 | -3 |
| x | | | | Euthamia graminifolia | Grass-leaved Goldenrod | S5 | | 2 | 0 |
| x | x | x | x | Eutrochium maculatum | Spotted Joe Pye Weed | S5 | | 3 | -5 |
| | x | x | x | Geum sp. | Avens Species | | | | |
| | | | x | Hydrophyllum virginianum | Virginia Waterleaf | S5 | | 6 | 0 |
| x | x | x | x | Impatiens capensis | Spotted Jewelweed | S5 | | 4 | -3 |
| | | x | | Rubus idaeus ssp. strigosus | Wild Red Raspberry | S5 | | 2 | 3 |
| | | x | x | Rubus pubescens | Dwarf Raspberry | S5 | | 4 | -3 |
| x | x | x | x | Solidago rugosa | Rough-stemmed Goldenrod | S5 | | 4 | 0 |
| x | x | x | x | Symphyotrichum lanceolatum | Panicked Aster | S5 | | 3 | -3 |
| x | x | x | x | Symphyotrichum puniceum | Swamp Aster | S5 | | 6 | -5 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | | | | Carex hystericina | Porcupine Sedge | S5 | | 5 | -5 |
| x | | | | Carex stipata | Awl-fruited Sedge | S5 | | 3 | -5 |
| x | x | x | | Carex vulpinoidea | Fox Sedge | S5 | | 3 | -5 |
| x | x | x | x | Glyceria striata | Fowl Mannagrass | S5 | | 3 | -5 |
| | x | x | x | Phalaris arundinacea | Reed Canary Grass | S5 | | 0 | -3 |
| | x | x | x | Scirpus cf. atrovirens | Dark-green Bulrush | S5 | | 3 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 4, PLOT 1 |
|------|------|------|------|---|
| 12 | 13 | 16 | 14 | Total Species |
| 12 | 13 | 16 | 14 | Native Species |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 4, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|------------------------|------------------------|------------------------|------------------------|---|-------------|----------------------------|-----------------------|--|------------------------|
| 0 | 0 | 0 | 0 | Introduced (exotic) species | | | | | |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) | | | | | |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) | | | | | |
| 3.3 | 2.8 | 2.7 | 3.1 | Average Coefficient of Conservatism (mean C) | | | | | |
| 11.3 | 9.9 | 10.9 | 11.5 | Floristic Quality Index (FQI) | | | | | |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 | | | | | |
| -3.3 | -2.8 | -1.9 | -1.8 | Mean Wetness Value | | | | | |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 4, Plot 2

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|--|------------------------|------------------------|------------------------|------------------------|--------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| PTERIDOPHYTES (Ferns & Fern Allies) | | | | | | | | | |
| x | | x | x | Equisetum arvense | Field Horsetail | S5 | | 0 | 0 |
| x | x | x | x | Onoclea sensibilis | Sensitive Fern | S5 | | 4 | -3 |
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | | | | Eutrochium maculatum | Spotted Joe Pye Weed | S5 | | 3 | -5 |
| x | x | x | | Fraxinus pennsylvanica | Green Ash | S4 | | 3 | -3 |
| | x | | x | Galium triflorum | Three-flowered Bedstraw | S5 | | 4 | 3 |
| x | x | x | | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | x | x | x | Rubus pubescens | Dewberry | S5 | | 4 | -3 |
| x | x | x | x | Solanum dulcamara | Bittersweet Nightshade | SE5 | | | 0 |
| x | | | | Solidago rugosa | Rough-stemmed Goldenrod | S5 | | 4 | 0 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | x | x | x | Glyceria striata | Fowl Mannagrass | S5 | | 3 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 4, PLOT 2 |
|------|------|------|------|---|
| 9 | 7 | 7 | 6 | Total Species |
| 8 | 6 | 6 | 5 | Native Species |
| 1 | 1 | 1 | 1 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 3.3 | 3.8 | 3.2 | 3.0 | Average Coefficient of Conservatism (mean C) |
| 9.8 | 10.1 | 8.4 | 7.3 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -2.7 | -2.3 | -2.7 | -1.3 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 5, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|-------------------------------|------------------------|------------------------|------------------------|-----------------------------|----------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | | x | x | <i>Bidens cernua</i> | Nodding Beggarticks | S5 | | 2 | -5 |
| x | | x | | <i>Bidens connata</i> | Purple-stemmed Beggarticks | S4? | | 5 | -3 |
| x | | | | <i>Caltha palustris</i> | Yellow Marsh Marigold | S5 | | 5 | -5 |
| x | | | | <i>Solanum dulcamara</i> | Bittersweet Nightshade | SE5 | | | 0 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | | | | <i>Glyceria striata</i> | Fowl Mannagrass | S5 | | 3 | -5 |
| | | | x | <i>Lemna minor</i> | Lesser Duckweed | S5? | | 5 | -5 |
| x | x | x | x | <i>Phalaris arundinacea</i> | Reed Canary Grass | S5 | | 0 | -3 |
| | | | x | <i>Sparganium</i> sp. | Burreed Species | | | | -5 |
| x | | | | <i>Typha latifolia</i> | Broad-leaved Cattail | S5 | | 1 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 5, PLOT 1 |
|------|------|------|------|---|
| 7 | 1 | 3 | 4 | Total Species |
| 6 | 1 | 3 | 4 | Native Species |
| 1 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 2.7 | 0.0 | 2.3 | 2.3 | Average Coefficient of Conservatism (mean C) |
| 7.1 | 0.0 | 4.0 | 4.7 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -3.7 | -3.0 | -3.7 | -4.5 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING
Transect 5, Plot 2

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|-------------------------------|------------------------|------------------------|------------------------|----------------------------|----------------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | | | | Betula sp. | Birch Seedling | | | | |
| x | x | x | | Bidens cernua | Nodding Beggarticks | S5 | | 2 | -5 |
| x | x | x | x | Bidens connata | Purple-stemmed Beggarticks | S4? | | 5 | -3 |
| | x | x | x | Caltha palustris | Yellow Marsh Marigold | S5 | | 5 | -5 |
| x | | | | Galium sp. | Bedstraw Species | | | | |
| x | x | x | | Impatiens capensis | Spotted Jewelweed | S5 | | 4 | -3 |
| x | x | x | x | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | | | | Rubus pubescens | Dewberry | S5 | | 4 | -3 |
| x | x | x | | Scutellaria lateriflora | Mad Dog Skullcap | S5 | | 5 | -5 |
| x | x | x | x | Solanum dulcamara | Bittersweet Nightshade | SE5 | | | 0 |
| x | x | x | | Solidago rugosa | Rough-stemmed Goldenrod | S5 | | 4 | 0 |
| x | | | | Symphyotrichum lanceolatum | Panicked Aster | S5 | | 3 | -3 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| | | | x | Carex hystericina | Porcupine Sedge | S5 | | 5 | -5 |
| x | | | | Carex stipata | Awl-fruited Sedge | S5 | | 3 | -5 |
| | x | x | x | Carex sp. | Sedge Species | | | | |
| x | x | x | x | Glyceria striata | Fowl Mannagrass | S5 | | 3 | -5 |
| x | | x | x | Phalaris arundinacea | Reed Canary Grass | S5 | | 0 | -3 |
| x | x | x | x | Typha latifolia | Broad-leaved Cattail | S5 | | 1 | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 5, PLOT 2 |
|------|------|------|------|---|
| 13 | 10 | 12 | 8 | Total Species |
| 12 | 9 | 11 | 7 | Native Species |
| 1 | 1 | 1 | 1 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 3.3 | 3.8 | 3.8 | 3.4 | Average Coefficient of Conservatism (mean C) |
| 11.7 | 11.9 | 13.2 | 9.7 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -3.5 | -3.6 | -3.6 | -3.9 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING

Transect 6, Plot 1

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|------------------------|------------------------|------------------------|------------------------|----------------------|-------------------|----------------------------|-----------------------|---------------------------------------|------------------------|
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | x | x | x | Phalaris arundinacea | Reed Canary Grass | S5 | | 0 | -3 |
| | x | x | x | Lemna minor | Lesser Duckweed | S5? | | 5 | -5 |
| | | | x | Potamogeton sp. | Pondweed Species | | | | -5 |
| | | x | x | Wolffia sp. | Watermeal | | | 4 | -5 |
| | x | x | x | Unknown | Submergent | | | | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 6, PLOT 1 |
|------|------|------|------|---|
| 1 | 3 | 4 | 5 | Total Species |
| 1 | 3 | 4 | 5 | Native Species |
| 0 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 0.0 | 2.5 | 3.0 | 3.0 | Average Coefficient of Conservatism (mean C) |
| 0.0 | 4.3 | 6.0 | 6.7 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -3.0 | -4.3 | -4.5 | -4.6 | Mean Wetness Value |

DUNTROON EXPANSION QUARRY - WETLAND VEGETATION MONITORING
Transect 6, Plot 2

| MONITORING YEAR - 2019 | MONITORING YEAR - 2020 | MONITORING YEAR - 2021 | MONITORING YEAR - 2022 | SCIENTIFIC NAME | COMMON NAME | PROVINCIAL STATUS (S-RANK) | COSEWIC / SARO STATUS | COEFFICIENT OF CONSERVATISM (C VALUE) | COEFFICIENT OF WETNESS |
|-------------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------|----------------------------|-----------------------|--|------------------------|
| ANGIOSPERMS (Dicots) | | | | | | | | | |
| x | x | x | | Bidens sp. | Beggarticks Species | | | | |
| | | | x | Bidens connata | Purple-stemmed Beggarticks | S4? | | 5 | -3 |
| | | x | x | Cornus sericea | Red-osier Dogwood | S5 | | 2 | -3 |
| x | | x | x | Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 |
| x | | | | Rubus sp. | Raspberry Species | | | | |
| x | x | x | x | Salix discolor | Pussy Willow | S5 | | 3 | -3 |
| ANGIOSPERMS (Monocots) | | | | | | | | | |
| x | x | x | x | Carex pseudocyperus | Cyperus-like Sedge | S5 | | 6 | -5 |
| | | x | x | Lemna minor | Lesser Duckweed | S5? | | 5 | -5 |
| | x | x | x | n/a | Withered / undeveloped grass | | | | |
| | | x | x | Phalaris arundinacea | Reed Canary Grass | S5 | | 0 | -3 |
| | | | x | Potamogeton sp. | Pondweed Species | | | | -5 |
| | | x | x | Wolffia sp. | Watermeal | | | 4 | -5 |
| | x | x | x | Unknown | Submergents | | | | -5 |

| 2019 | 2020 | 2021 | 2022 | FLORISTIC ASSESSMENT FOR TRANSECT 6, PLOT 2 |
|------|------|------|------|---|
| 3 | 5 | 10 | 10 | Total Species |
| 3 | 5 | 10 | 10 | Native Species |
| 0 | 0 | 0 | 0 | Introduced (exotic) species |
| 0 | 0 | 0 | 0 | Species at Risk in Ontario (END, THR or SC) |
| 0 | 0 | 0 | 0 | Rare in Ontario (S1, S2 or S3) |
| 4.7 | 4.5 | 4.5 | 3.8 | Average Coefficient of Conservatism (mean C) |
| 8.1 | 10.1 | 14.2 | 11.9 | Floristic Quality Index (FQI) |
| 0 | 0 | 0 | 0 | Highly sensitive plant species with C value of 8, 9 or 10 |
| -4.3 | -4.3 | -4.3 | -4.2 | Mean Wetness Value |



**Walker Aggregates Duntroon
Quarry Expansion, American
Hart's Tongue Fern:
2022 Annual Monitoring Report**

FINAL REPORT

March 24, 2023
File: 160901062

Prepared for:

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The conclusions in the Report titled Walker Aggregates Duntroon Quarry Expansion, American Hart's Tongue Fern: 2022 Annual Monitoring Report are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not take into account any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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Printed Name



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1 Introduction

The Duntroon Quarry has been in operation on County Road 91 in Clearview Township, County of Simcoe, Ontario since the early 1960s. Since 1995 the quarry has been operated by Walker Aggregates Inc., a wholly owned subsidiary of Walker Industries Holdings Ltd. (Walker Aggregates).

The high quality dolostone produced from this quarry is in demand as building material and for use in agricultural, recreational and environmental projects. As a result, Walker Aggregates has obtained a licence under the *Aggregate Resources Act* (ARA) through the Ministry of Natural Resources and Forestry (MNRF), following approval from the Joint Board (June 18, 2012), to expand the Duntroon Quarry operation across the road to a new parcel of property (Expansion Quarry).

Walker Aggregates' environmental commitment is to manage its lands for the provision of long-term ecological benefit. To this end, environmental initiatives detailed on the registered Duntroon Quarry ARA Site Plans and the *Duntroon Expansion Quarry Adaptive Management Plan* (Walker Aggregates, 2018) (AMP) are provided to facilitate the protection, mitigation and enhancement of natural environmental features and functions for future generations.

The AMP requires annual monitoring of an extensive American Hart's Tongue fern (*Asplenium scolopendrium* var. *americanum*) (AHTF) colony within the Expansion Quarry starting two years prior to quarry operations commencing in Phase 2B (per the registered site plans). The monitoring program is to be implemented annually for three (3) years from the commencement date, at which point the required effort will be re-evaluated. As operations are anticipated to begin in Phase 2B in 2023, a baseline assessment of AHTF conditions was completed in 2022.

The objectives of the AHTF monitoring program are:

- To determine whether the forest buffer is functioning as anticipated to protect the population and/or assess if dust from quarry activity causes a change in habitat conditions in the AHTF colony
- To identify the cause-and-effect mechanism and implement appropriate mitigation measure(s) if the plants decline as a result of quarry activity
- To document natural changes in habitat conditions unrelated to quarry activity which may be causing a change in the AHTF colony



2 Methodology

2.1 AHTF Monitoring Methods

Detailed AHTF population data was collected on September 29 and October 5, 2022, from the AHTF colony in accordance with the AMP. The data collect for the various parameters represent the baseline conditions for the AHTF Colony.

2.1.1 AHTF Monitoring Plots

Two permanent monitoring plots were established within the AHTF colony on September 29, 2022. These plots were situated in representative habitat and where AHTF densities were judged to be representative of the average density of the population. The dimensions of each monitoring plot were 2 m x 5 m.

Plot 1 was established on the north side of the colony, and Plot 2 was set in the southwest of the colony. The four corners of each plot were staked, and specific GPS coordinates were recorded. Stake locations are provided below in **Table 1** and illustrated on field data forms in **Appendix C**.

Table 1 Plot Locations

| Plot ID | Northwest UTM | Northeast UTM | Southwest UTM | Southeast UTM |
|---------|------------------------|------------------------|------------------------|------------------------|
| 1 | 17T 559399, 4915317 | 17T 559403, 4915316 | 17T 559398, 4915318 | 17T 559404, 4915313 |
| 2 | 17T 559406, 4915271 | 17T 559410, 4915272 | 17T 559408, 4915274 | 17T 559410, 4915269 |

Both plots were assessed in 2022 to obtain a baseline data of the colony condition. The attributes documented for each plot are described in the following sections.

2.1.1.1 Count of all AHTF present with fronds over 2 cm long

Each plot was subdivided into five transects spaced 1 m apart along the 5 m axis. Surveyors counted individual ferns with fronds greater than 2 cm in length along each transect and summed the total. It can be difficult to count the number of individual ferns in areas where AHTF is growing in tight groups. In these circumstances, grouped ferns were counted as a single specimen. Groups spaced 10 or more cm apart were counted individually.

Findings from 2022 are presented in **Section 3.1.1; Tables 2 and 3**.

2.1.1.2 Photographic record of AHTF and estimated percent cover

At the time of monitoring, 2 photographs of the plot were taken from a 'birds-eye' perspective. One photo illustrated the herbaceous cover in the northeast corner of each plot, while the second photo illustrated the herbaceous cover in the southwest corner of each plot. Photos were taken from a fixed height of



1.5 m to standardize the assessment record. The permanent stakes marking the corners of the plots were intentionally situated in the lower left corner of each photograph for consistency of record. These photos will be compared to subsequent years to determine changes in percent cover and qualitative characteristics. Additionally, surveyors conducted a visual estimate of the percent cover of AHTF fronds within the surveyed 2 m x 5 m plot during the field assessment.

Photographic records for 2022 are listed in **Appendix B**.

2.1.1.3 Estimate Percent Cover of Bryophytes

Overall percent cover of bryophyte species within the 2 m x 5 m plot was recorded using visual estimates.

2.1.1.4 Documentation of AHTF Reproductive Features

Presence/absence of developing sporophytes were noted on each transect during the AHTF plot count. A general quantification of fronds with spore development was documented. This information was recorded as a percent estimate of the number of fronds over 2 cm that had spore development within the 2 m x 5 m plot.

An overall assessment of the regenerative status of each plot was conducted. If 4 or 5 of the transects within the plot were noted to have a presence of developing sporophytes, the plot was recorded as having "recurring observations of sexual regeneration". Where sporophytes were recorded as present in 1 - 3 of the transects, the plot was recorded as having "periodic observations of sexual regeneration". If no sporophytes were observed in any transects, the plot was recorded as having "no observations of sexual regeneration".

Findings from 2022 are presented in **Section 3.1.1; Table 2** and **3**.

2.1.1.5 Inventory Of All Herbaceous and Young Woody Plants and their Estimated Abundance

All herbaceous and woody species observed growing within each plot were recorded, and their general abundance was noted. For the purposes of this survey, young trees (less than 3 m height) were counted as woody plants. An estimated percent cover of each species was provided. Shrubs and young trees that occurred outside of the plot with a canopy that overhangs the plot were noted.

A list of young woody and herbaceous species and their abundance were recorded for each plot. Results and estimate of percent cover are provided in **Section 3.1.2; Table 4**.

2.1.2 Colony Analysis

Outside of the monitoring plot assessment provided in **Section 2.1.1**, The AHTF colony as a whole was assessed to obtain a baseline data of the colony condition.



The following assessments were documented in 2022:

2.1.2.1 Invasive Species Monitoring Plots

The perimeter of the AHTF Colony was monitored for evidence of intrusive plant species. Four single points were permanently staked at the north, south, east, and west outer edges of the AHTF Colony. Each stake represents the center of a 1 m radius plot. The three most abundant vascular plant species within the 1 m radius plot were documented, with an estimate of their percent cover. In addition, if a highly invasive species was observed but not well established, the species and general abundance were noted.

Findings from the 2022 invasive species monitoring are found in **Section 3.2.1**.

2.1.2.2 Colony Expansion

The perimeter of the AHTF Colony was monitored for indications of AHTF population expansion, recession, or static establishment. The outer boundaries of the Colony will be monitored yearly and updated as required to document these changes. The outer boundaries of the AHTF were recorded and mapped using an R1 GPS unit with sub-meter accuracy.

2.1.2.3 Temperature and Relative Humidity

A data logger was positioned in the AHTF Colony at a height of 1.5 m above ground to reduce exposure to snow accumulation. The data logger was positioned just outside the southeast corner of the AHTF colony boundary. The Data logger will measure temperature and relative humidity with annual calibrations to ensure accuracy. The data logger will record a reading once every three hours.

Supplementary weather data will also be collected from an existing weather station, currently positioned at the Duntroon Quarry Head Office, approximately 750 m from AHTF Colony 1. This weather station records air temperature, relative humidity, wind speed, wind direction, and precipitation and will provide comparative data to supplement the Colony 1 data logger.

2.1.2.4 Canopy Cover Analysis

An analysis of canopy cover over the AHTF Colony was completed in 2022 and will occur once every four years to detect changes in the canopy and sub-canopy.

A cross-colony transect was established at its widest point, the ends of which were GPS'd and marked with permanent stakes. Canopy cover assessments were conducted every 10 m along this transect using a spherical densiometer with a convex mirror with 24- 1/4" squares engraved on the surface. Each square of the densiometer grid is divided visually into 4 smaller squares (1/8" X 1/8"). As a result, a total of 96 dots representing smaller square areas were counted within the grid. The instrument was held level and away from the body (12" -18") at elbow height. The number of dots intersecting a reflection of open canopy were counted to a total of 96 dots. This number was multiplied by 1.04 (1/96) to obtain the percent of overhead cover.



The findings from the 2022 canopy cover analysis are found in **Section 3.2.2**.

2.1.2.5 Snow Depth Assessment

As part of the AHTF monitoring commitment, general assessment of snow depth should be completed once per winter in late January. Due to absence of snow cover in January 2023, the snow depth measurement was postponed until on February 17, 2023. Snow depths on this date were lower than anticipated; consequently, depth measurements were only taken along the colony boundaries at each invasive species plot in order to avoid disturbance to plants.

The findings from the 2022 snow depth assessment are found in **Section 3.2.4**.

2.1.2.6 Dust Deposition Analysis

Excessive dust deposition on plant material could interfere with plants' ability to photosynthesize and could interfere with sexual reproduction of AHTF. A single dust jar was installed outside of the southeast corner of the AHTF Colony boundary on February 17, 2023. The dust jar will be monitored in 2023, prior to operations in Phase 2B, to provide baseline data on naturally occurring dust accumulation, and thereafter to determine changes to deposition.



3 Results

The 2022 AHTF survey collected baseline data for the AHTF colony prior to the Expansion Quarry entering Phase 2B. The purpose of this assessment is to provide “natural” or pre-operative conditions by which to compare future or post-operative conditions and determine if the quarry is impacting AHTF colony health. A summary of results of AHTF monitoring as outlined in **Section 2** are presented below.

3.1 AHTF Monitoring Plots

3.1.1 Frond Count and Documentation of AHTF Reproductive Features

Counts of all AHTF present with fronds over 2 cm long and presence/absence of developing sporophytes are noted for Plot 1 (Table 2) and Plot 2 (Table 3). Plot 1 and Plot 2 were assessed as having recurring observations of sexual regeneration for 2022.

Table 2 Plot 1 AHTF Monitoring

| Transect Number | Fern Count with Fronds over 2 cm | Number of Fern developing sporophytes |
|---------------------------------------|----------------------------------|---------------------------------------|
| 1 | 10 | 3 |
| 2 | 22 | 11 |
| 3 | 17 | 2 |
| 4 | 17 | 3 |
| 5 | 28 | 11 |
| Percent Fronds with Spore development | | 10% |
| Total bryophyte Cover | | 48% |
| Total AHTF Frond Cover | | 28% |

Table 3 Plot 2 AHTF Monitoring

| Transect Number | Fern Count with Fronds over 2 cm | Number of Fern developing sporophytes |
|---------------------------------------|----------------------------------|---------------------------------------|
| 1 | 3 | 0 |
| 2 | 5 | 2 |
| 3 | 7 | 1 |
| 4 | 13 | 4 |
| 5 | 3 | 1 |
| Percent Fronds with Spore development | | 3% |
| Total bryophyte Cover | | 35% |
| Total AHTF Frond Cover | | 10% |



3 Results

March 24, 2023

3.1.2 Inventory of Herbaceous and Woody Plants

A list of young woody and herbaceous species and their abundance and exotic invasive status were recorded for each plot. Results and estimates of percent cover are provided in **Table 4**.

Table 4 Inventory of herbaceous and young woody plants at Plot 1 & Plot 2

| Plot | Common Name | Scientific Name | Exotic Invasive Species? | Abundance% | Height (cm) |
|------|--------------------------|---------------------------------|--------------------------|------------|-------------|
| 1 | Garlic Mustard | <i>Alliaria petiolata</i> | Yes | 15 | |
| 1 | Herb of Robert | <i>Geranium robertianum</i> | No | 35 | |
| 1 | Intermediate Wood Fern | <i>Dryopteris intermedia</i> | No | 10 | |
| 1 | Bittersweet Nightshade | <i>Solanum dulcamara</i> | Yes | 1 | |
| 1 | Avens species | <i>Geum sp.</i> | No | 1 | |
| 1 | Baneberry species | <i>Actaea sp.</i> | No | 2 | |
| 1 | Alternate Leaved Dogwood | <i>Cornus alternifolia</i> | No | 1 | |
| 1 | Red Elderberry | <i>Sambucus racemosa</i> | No | 3 | 90 |
| 2 | Virginia Waterleaf | <i>Hydrophyllum virginianum</i> | No | 15 | |
| 2 | Violet species | <i>Viola sp.</i> | No | 38 | |
| 2 | Avens species | <i>Geum sp.</i> | No | 5 | |
| 2 | Red Elderberry | <i>Sambucus racemosa</i> | No | 10 | 40 |
| 2 | Alternate Leaved Dogwood | <i>Cornus alternifolia</i> | No | 8 | 50 |
| 2 | Herb of Robert | <i>Geranium robertianum</i> | No | 15 | |
| 2 | Bittersweet Nightshade | <i>Solanum dulcamara</i> | Yes | 5 | |
| 2 | Pale Jewelweed | <i>Impatiens pallida</i> | No | 1 | |
| 2 | Baneberry species | <i>Baneberry species</i> | No | 3 | |
| 2 | Spinulose Wood Fern | <i>Dryopteris carthusiana</i> | No | 3 | |
| 2 | Grass species | <i>Poa sp.</i> | No | 1 | |
| 2 | Green Ash | <i>Fraxinus pennsylvanica</i> | No | 5 | 25 |
| 2 | Black Walnut | <i>Juglans nigra</i> | No | 3 | 130 |



3.2 Colony Analysis

3.2.1 Invasive Species Monitoring Plots

Exotic species are present within the AHTF Colony and surrounding woodland. No exotic species were recorded in the invasive species monitoring plots. A list of observed species and their abundance for the invasive species monitoring plots are recorded in **Table 5** below.

Table 5 Invasive Species Monitoring Plots

| Stations | Common Name | Scientific Name | Exotic Invasive Species? | Abundance % | Notes |
|----------|-----------------------------|---|--------------------------|-------------|------------------------|
| IS_N | Herb of Robert | <i>Geranium robertianum</i> | No | 50 | |
| IS_N | Avens species | <i>Geum sp.</i> | No | 5 | |
| IS_N | American hart's-tongue fern | <i>Asplenium scolopendrium</i> var. <i>americanum</i> | No | 3 | 52 cm From Center post |
| IS_E | Herb of Robert | <i>Geranium robertianum</i> | No | 15 | |
| IS_E | American hart's-tongue fern | <i>Asplenium scolopendrium</i> var. <i>americanum</i> | No | 8 | 26 cm from centre post |
| IS_E | Bulblet Fern | <i>Cystopteris bulbifera</i> | No | 3 | |
| IS_S | Goldies Wood Fern | <i>Dryopteris goldieana</i> | No | 15 | |
| IS_S | Herb of Robert | <i>Geranium robertianum</i> | No | 5 | |
| IS_S | American hart's-tongue fern | <i>Asplenium scolopendrium</i> var. <i>americanum</i> | No | 2 | 25 cm from center post |
| IS_W | Alternate Leaved Dogwood | <i>Cornus alternifolia</i> | No | 8 | |
| IS_W | Intermediate Wood Fern | <i>Dryopteris intermedia</i> | No | 3 | |
| IS_W | American hart's-tongue fern | <i>Asplenium scolopendrium</i> var. <i>americanum</i> | No | 5 | 33 cm from center post |

3.2.2 Canopy Cover Analysis

Findings from 2022 analysis are listed in **Table 6** below. Canopy composition is mainly native species dominated by sugar maple, basswood, and green ash. The average canopy cover was estimated as 97.8%.



Table 6 Canopy Closure

| Photo Station | UTM_ Northern | UTM _ Eastern | Canopy Cover Percent |
|---------------|---------------|---------------|----------------------|
| 1 | 559389 | 4915325 | 96 |
| 2 | 559390 | 4915318 | 99 |
| 3 | 559401 | 4915304 | 96 |
| 4 | 559404 | 4915298 | 97 |
| 5 | 559405 | 4915288 | 99 |
| 6 | 559407 | 4915279 | 98 |
| 7 | 559409 | 4915267 | 99 |
| 8 | 559417 | 4915262 | 98 |
| 9 | 559418 | 4915254 | 99 |

3.2.3 Temperature and Relative Humidity

Data from the installed data logger will be collected in 2023 and recorded in a subsequent report.

3.2.4 Snow Depth Assessment

Snow depth assessments were captured on February 17, 2023. The findings are recorded in **Table 7** below.

Table 7 Snow Depth Assessment

| Monitoring Station | Snow Depth (cm) |
|--------------------|-----------------|
| IS_S | 20 |
| IS_W | 28 |
| IS_N | 33 |
| IS_E | 30 |
| Average Depth | 27.75 |

3.2.5 Dust Deposition Analysis

Measurements of dust accumulation will be obtained from the dust jars in 2023 and recorded in a subsequent report.



4 Discussion

This year, baseline data was obtained prior to the expansion of the quarry into Phase 2B. The information provided in this report will be the foundation for ongoing monitoring of the health of the AHTF colony in future years, and will allow the detection of any changes in habitat conditions as the quarry progresses.

Garlic mustard is an invasive species that was recorded on the north side of the colony. Reductions in the canopy cover above the AHTF colony could increase light penetration to the ground vegetation layer, potentially creating suitable conditions for garlic mustard proliferation and expansion. This may present a threat to the AHTF colony if unchecked. Continual monitoring of invasive species on site will inform if management is required to maintain the integrity of the habitat for AHTF. If quarry activities such as tree clearing are determined to be causing an increase in exotic species abundance, then mitigation measures should take place to control the spread of non-native species in the colony.

Overall, the colony has a high canopy closure rate, and both plots have observations of recurring sexual regeneration.



5 Conclusions

This report represents the first year of baseline data for the AHTF Colony. Future years of monitoring will provide evidence of potential changes in vegetation composition, canopy cover, reproductive regeneration, and shifts in site condition.



6 References

Aggregate Resources Act (ARA), RSO 1990, c A.8, Ontario Government. Available Online:

<https://www.ontario.ca/laws/statute/90a08>

Walker Aggregates. (2018). *Duntroon Expansion Quarry Adaptive Management Plan 2018*.

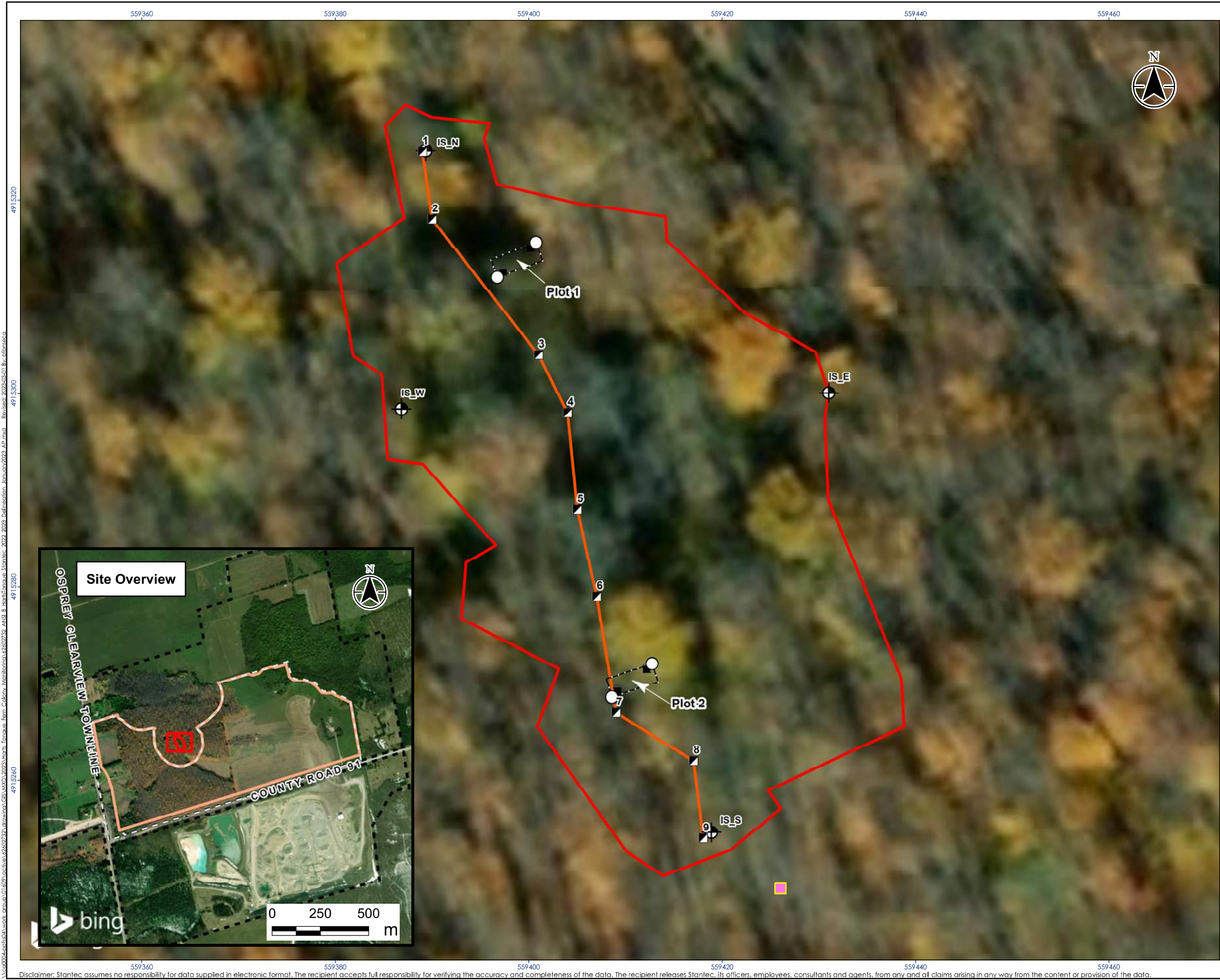


Appendices



Appendix A Figures

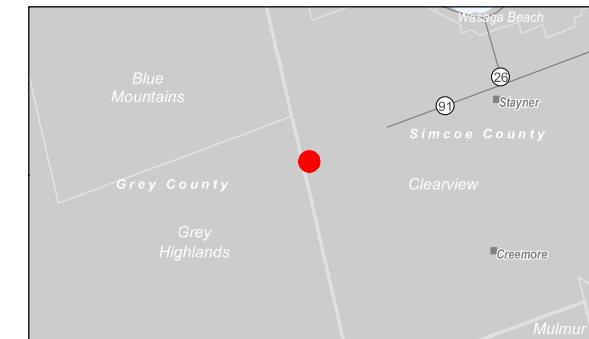




Legend

- Photo Location and Direction
- Canopy Closure Monitoring Stations
- Invasive Species Monitoring Plots
- Dust Jar and Data Logger Location
- Canopy Closure Monitoring Stations Transect
- American Hart's Tongue Fern Colony
- Monitoring Plots

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2018.
3. Orthoimagery © 2023 Microsoft Corporation © 2022 Maxar © CNES (2022)



Project Location
Duntroon, ON
62602732
Prepared by BF on 2023-03-01
Technical Review by DH on 2023-01-11

Client/Project
WALKER AGGREGATES INC.
DUNTROON QUARRY EXPANSION
ADAPTIVE MANAGEMENT PLAN

Figure No.
1

Title
**American Hart's Tongue Fern Colony
Monitoring**

Appendix B Photographic Record (2022)





Photo 1: Plot 1, Northeast corner – October 5, 2022



Photo 2: Plot 1, Southwest corner – October 5, 2022



Photo 3: Plot 2, Northeast corner – October 5, 2022



Photo 4: Plot 2, Southwest corner – October 5, 2022

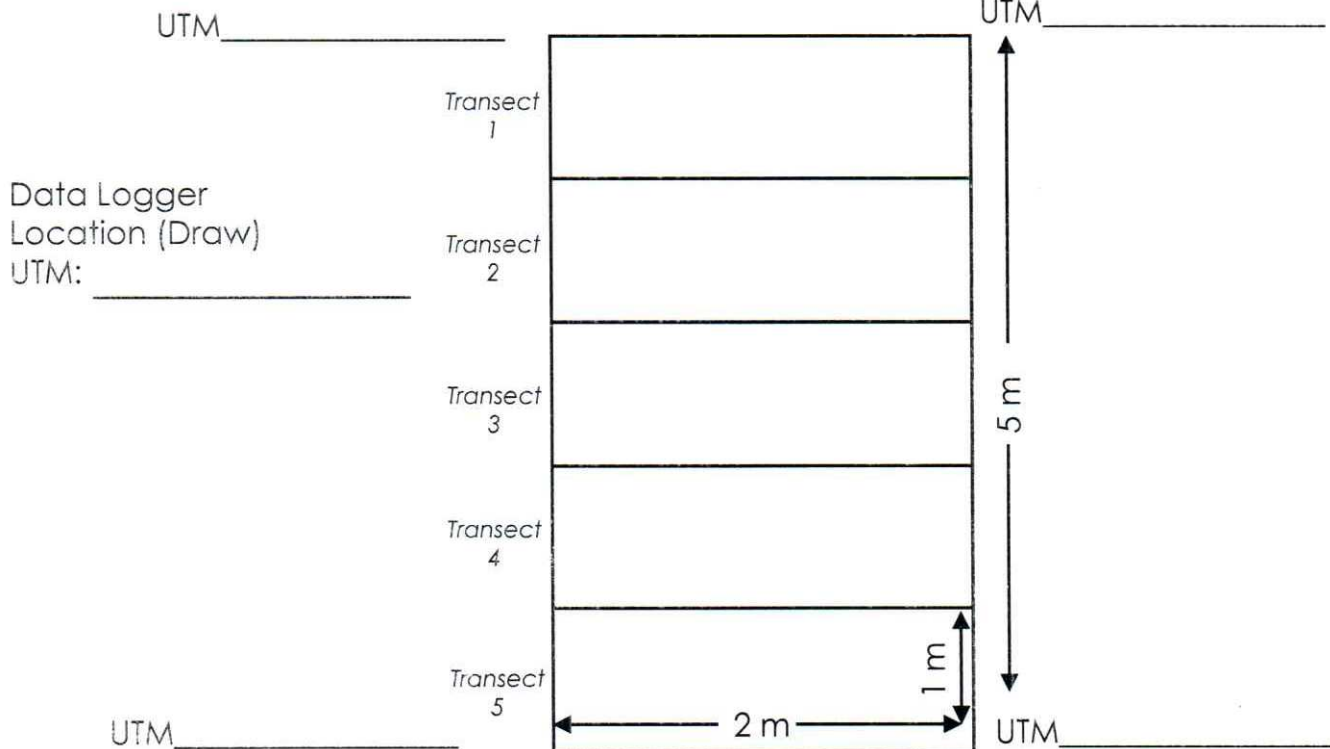
Appendix C Field Data Sheets (2022)

Duntroon AHTF Monitoring Field Data Sheet – Page 1 of 2

Surveyor(s): KRE MR Date: Sep 29, 2022 Start Time: 1230 End Time: 1600

Temp (°C): 14 Wind (dir/sp): 7/5 24 hr Precip (mm): 0

Plot



Fern count (fronds over 2 cm) Transect 1: Developing sporophytes?

Fern count (fronds over 2 cm) Transect 2: Developing sporophytes?

Fern count (fronds over 2 cm) Transect 3: Developing sporophytes?

Fern count (fronds over 2 cm) Transect 4: Developing sporophytes?

Fern count (fronds over 2 cm) Transect 5: Developing sporophytes?

Total AHTF frond cover % (plot): Total bryophyte cover % (plot):

Percent fronds with spore development (plot):

Ground cover photo number (N/E corner):

Ground cover photo number (S/E corner):

Dust Plate Notes



1X1 Plot IS-W
UTM 559383 4915300

Photo Station (draw): 1

UTM 559391 4915327

Photo Station (draw): 2

UTM 559386 4915321

Photo Station (draw): 3

UTM 559390 4915306

Photo Station (draw): 4

UTM 559400 4915297

1X1 Plot IS-S
UTM 559415 4915255

Canopy Photo Transect (mark stations)

2

3

4

5

6

7

8

9

1X1 Plot IS-N
UTM 559391 4915327 N. Dir

Photo Station (draw): 5 8659

UTM 559399 4915288

Photo Station (draw): 6 8660

UTM 559403 4915279

Photo Station (draw): 7 8661

UTM 559411 4915274

Photo Station (draw): 8 8662

UTM 559415 4915265

1X1 Plot ISE (draw): 9 8663
UTM 559426 4915294

Inventory of herbaceous and young woody plants

| Plot | Species | Abund- ance (%) | Height (cm) | Notes |
|------|--------------------------|-----------------------|----------------|-----------------------|
| IS-N | HERB-ROBERT | 50 | | |
| IS-N | AVENS Sp. | 5 | | |
| IS-N | A. HART'S TONGUE FERN | 3 | | 52cm from CENTRE POST |
| ISE | HERB-ROBERT | 15 | | |
| ISE | A. HART'S TONGUE FERN | 8 | | 26cm from centre post |
| ISE | BULBLET FERN | 3 | | |
| ISS | DRYOPTERIS GOLDIANA | 15 | | DRYOPTERIS sp? |
| IS-S | HERB-ROBERT | 5 | | |
| IS-S | A. HART'S TONGUE FERN | 2 | | 25cm from centre post |
| IS-W | ALTERNATE LEAVED DOGWOOD | 8 | | |
| IS-W | DRYOPTERIS INTERMEDIA | 3 | | |
| IS-W | A. HART'S TONGUE FERN | 5 | | 33cm from CENTRE POST |
| | | | | |

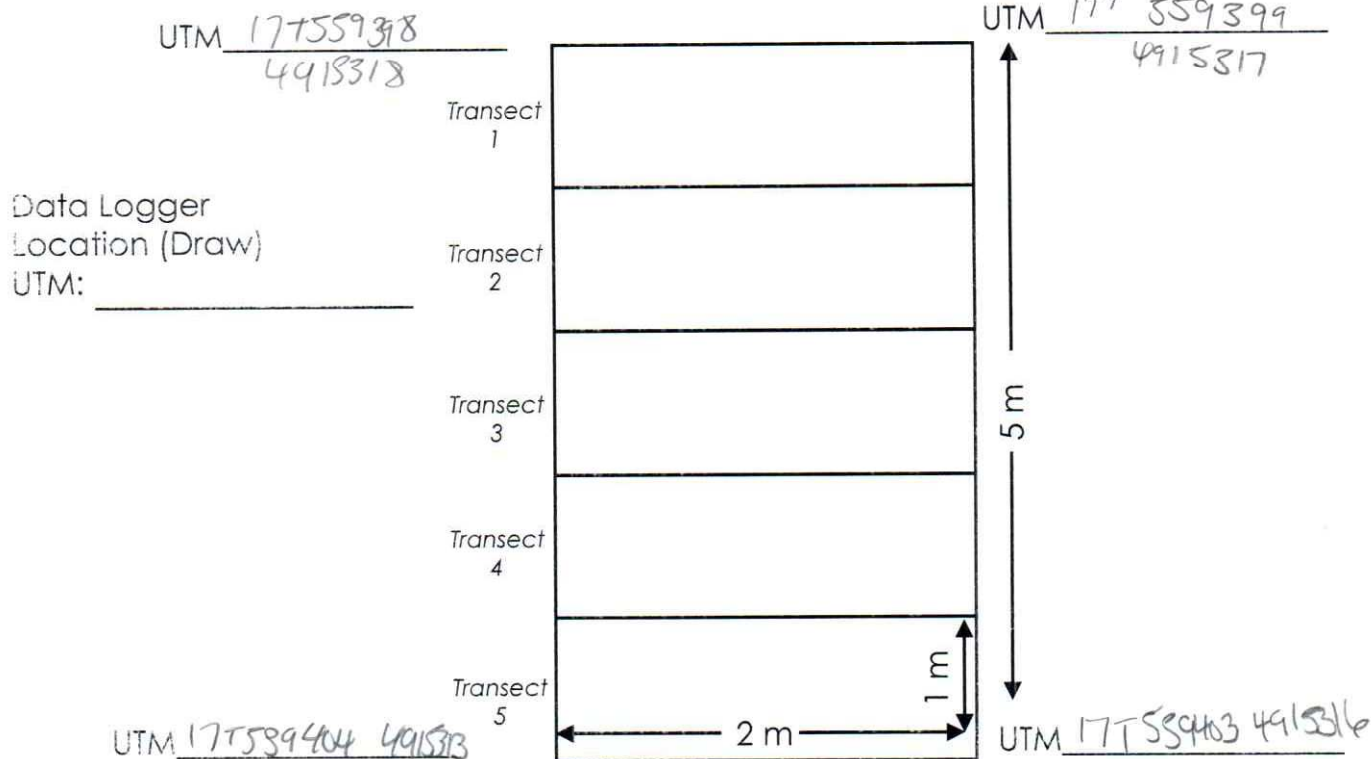
Duntroon AHTF Monitoring Field Data Sheet – Page 1 of 4

Surveyor(s): KRE MR Date: Oct 5 2022 Start Time: 1256 End Time: 1405

Temp (°C): 20 Wind (dir/sp): S ESE 24 hr Precip (mm): 0



Plot 1



Fern count (fronds over 2 cm) Transect 1: ☒ Developing sporophytes? ..

Fern count (fronds over 2 cm) Transect 2: ☒ ☒ .. Developing sporophytes? ☒ ..

Fern count (fronds over 2 cm) Transect 3: ☒ ☐ Developing sporophytes? ..

Fern count (fronds over 2 cm) Transect 4: ☒ ☐ Developing sporophytes? ..

Fern count (fronds over 2 cm) Transect 5: ☒ ☒ ☒ 94 Developing sporophytes? ☒ 29

Total AHTF frond cover % (plot): 25 Total bryophyte cover % (plot): 48

Percent fronds with spore development (plot): 10

Ground cover photo number (N/E corner): SEE PHOTOLOG

Ground cover photo number (S/W corner): 11

Dust Plate Notes

Duntroon AHTF Monitoring Field Data Sheet – Page 2 of 4

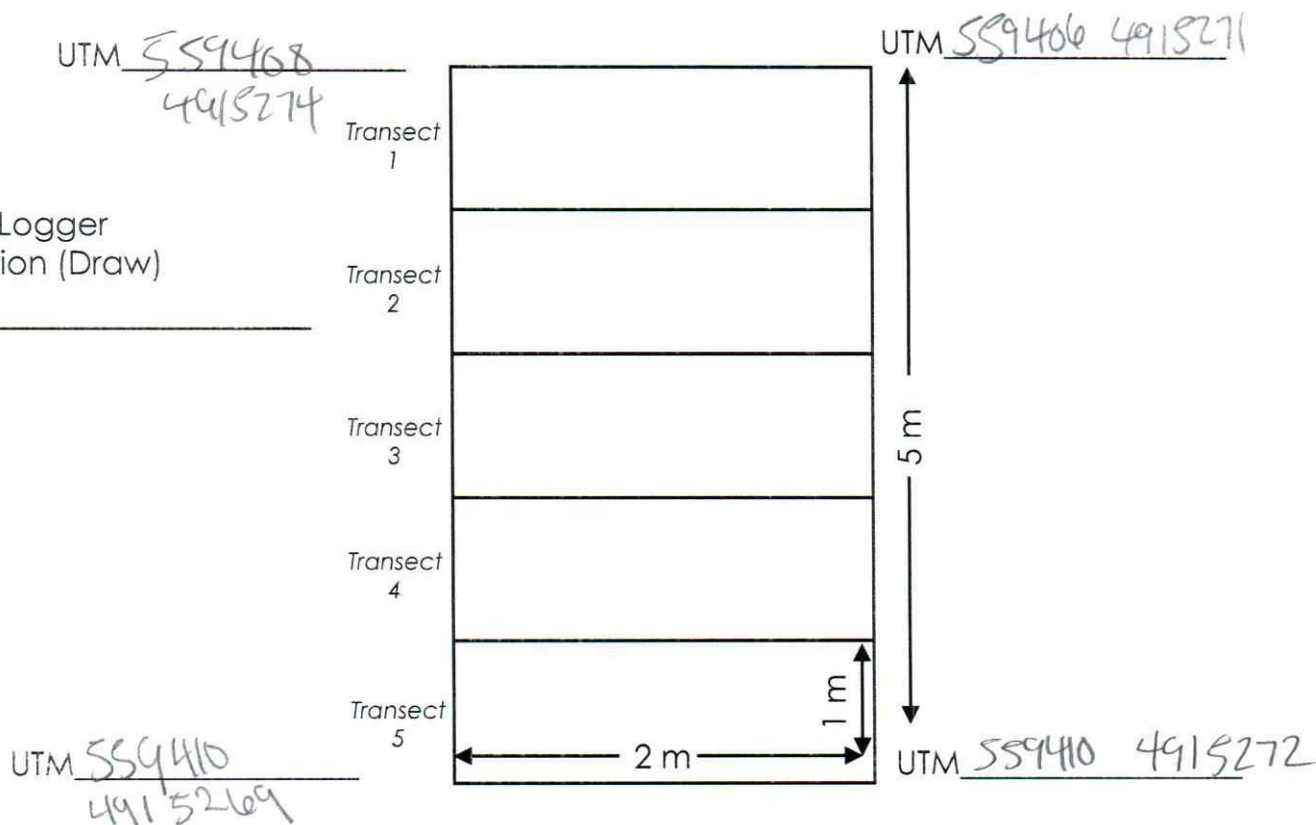
Surveyor(s): KRE MR Date: Oct 5, 2022 Start Time: 18:30 End Time: 16:16

Temp (°C): 21 Wind (dir/sp): 9ESE 24 hr Precip (mm): 0



Plot 2

Data Logger
Location (Draw)
UTM: _____



Fern count (fronds over 2 cm) Transect 1: 1 Developing sporophytes? 0

Fern count (fronds over 2 cm) Transect 2: 1 Developing sporophytes? 0

Fern count (fronds over 2 cm) Transect 3: 1 Developing sporophytes? 0

Fern count (fronds over 2 cm) Transect 4: 2 Developing sporophytes? 0

Fern count (fronds over 2 cm) Transect 5: 1 Developing sporophytes? 0

Total AHTF frond cover % (plot): 10 Total bryophyte cover % (plot): 35

Percent fronds with spore development (plot): 3

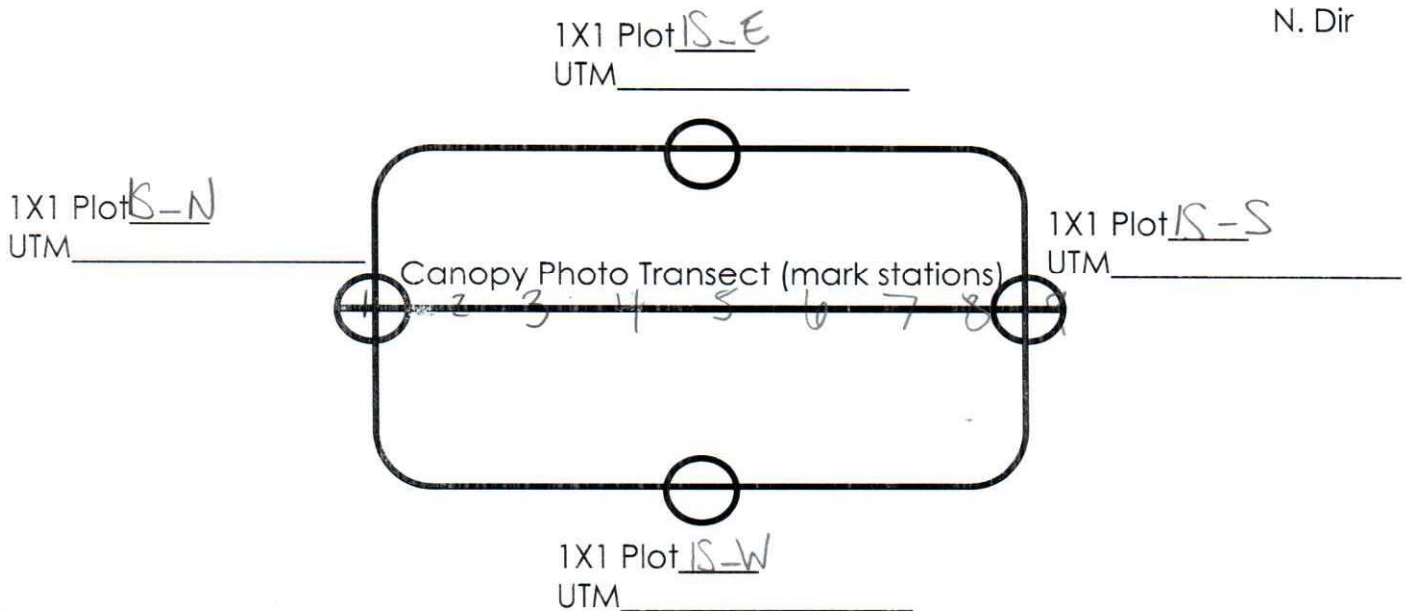
Ground cover photo number (N/E corner): 300 PLANTULOG

Ground cover photo number (S/W corner): 11

Dust Plate Notes



N. Dir



Canopy Closure Data

| | |
|--------------------------------------|----------------------------------|
| Photo Station (draw): <u>1</u> | UTM <u>559389</u> <u>4915325</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>96</u> |
| Photo Station (draw): <u>2</u> | UTM <u>559390</u> <u>4915318</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>99</u> |
| Photo Station (draw): <u>3</u> | UTM <u>559401</u> <u>4915304</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>96</u> |
| Photo Station (draw): <u>4</u> | UTM <u>559404</u> <u>4915298</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>97</u> |
| Photo Station (draw): <u>5</u> | UTM <u>559405</u> <u>4915288</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>99</u> |
| Photo Station (draw): <u>6</u> | UTM <u>559407</u> <u>4915279</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>98</u> |
| Photo Station (draw): <u>7</u> | UTM <u>559409</u> <u>4915267</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>99</u> |
| Photo Station (draw): <u>8</u> | UTM <u>559417</u> <u>4915262</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>98</u> |
| Photo Station (draw): <u>9</u> | UTM <u>559418</u> <u>4915254</u> |
| Dot Count: <u>5.2 4.16 2.12 2.12</u> | Canopy Cover Percent: <u>99</u> |

Inventory of herbaceous and young woody plants (continued)

| Plot | Species | Abund- -ance (%) | Height (cm) | Notes |
|------|-------------------------------------|------------------------|----------------|-------|
| 1 | GARLIC MUSTARD | 15 | | |
| 1 | HERB-ROBERT | 35 | | |
| 1 | DRYOPTERIS INTERMEDIA | 10 | | |
| 1 | SOLANUM DULCAMARA | 1 | | |
| 1 | AVENS Sp. | 1 | | |
| 1 | ACTAEA Sp. | 2 | | |
| 1 | ALT. LVD DOGWOOD | 1 | | |
| 1 | SAMBUCUS RACEMOSA | 3 | 90 | |
| 2 | VIRGINIA WATERLEAF | 15 | | |
| 2 | VIOLA Sp. | 38 | | |
| 2 | AVENS SP. | 5 | | |
| 2 | SAMBUCUS RACEMOSA | 10 | 40 | |
| 2 | ALT. LVD DOGWOOD | 8 | 50 | |
| 2 | HERB-ROBERT | 15 | | |
| 2 | SOLANUM DULCAMARA | 5 | | |
| 2 | PALE JEWELWEED | 1 | | |
| 2 | ACTAEA Sp. | 3 | | |
| 2 | DRYOPTERIS CARTHUSIANA | 3 | | |
| 2 | POA Sp. (VIRGINIANUM OR BUTLERBUSH) | 1 | | |
| 2 | GREEN ASH | 5 | 25 | |
| 2 | BLACK WALNUT | 3 | 130 | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |