10 APRIL, 2019

Witness Statement prepared by Karl Schiefer, PhD (Aquatic Ecologist) on behalf of the Concerned Residents Coalition (CRC) related to the proposed Hidden Quarry development and the aquatic ecosystem/fish habitat issues associated with it.

Background

On 5 November, 2014, an aquatic ecosystem and fish habitat survey was carried out on Brydson Creek nearby and downstream of the Hidden Quarry site. This survey was carried out on behalf of the CRC. The findings of this survey were reported in a document prepared in January 2015 and titled "Aquatic Habitat and Fish Survey of Brydson Creek". This witness statement and any subsequent professional testimony will rely on and reference this document.

Issues

The nature of the proposed activities at Hidden Quarry and the aquatic ecosystem features found in Brydson Creek immediately downstream of the Hidden Quarry site raise a number of potentially serious environmental issues and concerns.
These are summarized here:

1) **Prior biological knowledge of Brydson Creek**

   Blue Springs Creek, of which Brydson Creek is a headwater tributary, has long been recognized as an important cold-water stream supporting highly desirable and increasingly rare populations of brook trout and brown trout. Biological studies have been carried out on Blue Springs Creek for over 50 years in order to document and protect these species and their habitat. However, in reviewing these studies and other documents, no reference could be found related to any biological or habitat studies carried out on Brydson Creek prior to the 2014 survey. Rather, it appears that this small headwater tributary has been regarded primarily as a source of high quality spring water to Blue Springs Creek. There is some concern that the lack of basic knowledge of the aquatic and fish habitat features of this tributary watershed may have resulted in a downgrading of its importance and need for protection by a number of stakeholders in this environmental assessment process.

2) **Brydson Creek ecosystem**

   Brydson Creek was found to contain a very high quality cold-water stream ecosystem from the Brydson Pond downstream to its confluence with Blue Springs Creek. Most noteworthy, this stream was found to support a very healthy and self-sustaining population of native brook trout throughout the entire reach from Brydson Pond to Blue Springs Creek. This is described in the 2014 aquatic survey report referenced above. As indicated in point 1, there appears to be no prior documentation of the presence or status of this trout population in Brydson Creek.

3) Regional Context

Within the Grand River watershed, and Southern Ontario generally, healthy and self-sustaining populations of brook trout have become increasingly rare over the past century as the original forests have been removed for agriculture, industry and residential development. Those populations which have persisted are generally in small headwater tributaries with a secure source of high quality ground water and mature forests sheltering the stream. This is the case for Brydson Creek. Because some of these populations have been isolated for many decades, and generations of fish, they may have distinct genetic traits and adaptations to their specific habitat features. In some areas, those residual populations of the original native brook trout are regarded as an important "heritage" natural feature and afforded an appropriately high level of protection.

4) Recognition of Significance and Value

Self-sustaining populations of native brook trout in Southern Ontario are almost universally considered to be of high significance and ecological value. They are generally included in any designation of valued ecosystem components (VEC) and are an important "sentinel species" as an indicator of healthy cold-water stream ecosystems. Because they have become increasingly rare in the Grand River watershed, the Grand River Conservation Authority (GRCA) has placed a high value on cold-water habitats and brook trout. The Grand River Fisheries Management Plan identifies the need to protect *"wild, native genetic stocks"* of brook trout in these important spring fed tributaries. The Ontario Ministry of Natural Resources also generally places a high priority on protecting native brook trout populations and their cold-water stream habitats. Protecting these species and habitats may become more challenging in the future if our changing climate includes hotter, drier and longer summers. For this reason, adding additional anthropogenic – source stresses on these stream ecosystems should be avoided.

5) Brook Trout in Brydson Creek

As noted above, a number of biological studies have been carried out on Blue Springs Creek over the past 50 years because of its recognized importance as a cold-water stream supporting native brook trout. These studies did not include Brydson Creek. The 2014 survey of Brydson Creek identified what appeared to be a significantly greater frequency of brook trout spawning activity here than in Blue Springs Creek and a high density of juvenile brook trout. This greater relative abundance of brook trout and spawning activity in Brydson Creek likely relates to the higher quality of brook trout habitat found in this spring-fed tributary. The high abundance of juvenile brook trout in Brydson Creek may imply that this is an important source of juvenile trout recruitment which supports the trout population of Blue Springs Creek. More study is required to investigate this.

6) Receiving Water of Concern

A number of the technical documents produced by the proponent identify or imply that Blue Springs Creek is the downstream receiving water of concern related to potential impacts of Hidden Quarry operations. Blue Springs Creek is a greater distance from the quarry site and there is a greater opportunity for natural attenuation or dilution of any negative effects. This focus on Blue Springs Creek is somewhat understandable given the prior identification of this as an important cold-water stream ecosystem and the lack of information on Brydson Creek.
The more recent investigation suggests that Brydson Creek should be of greater concern given its proximity to the quarry site, very high quality trout habitat and brook trout populations, and potential importance as a source of juvenile brook trout to Blue Springs Creek.
Providing adequate protection for Brydson Creek also accomplishes the goal of protecting downstream Blue Springs Creek.

7) Brydson Creek Watershed Overview

The spring sources which form Brydson Creek within and below Brydson Pond depend entirely on the groundwater recharge areas which occur at higher elevations to the north and west of Hwy 7, including an area on the Paris Moraine. The springs, ponds and wetlands on the De Grandis farm to the north of the quarry site were also investigated during the 2014 site visit. The majority of drainage from these higher elevation source areas is as groundwater which reemerges on the Brydson farm and forms Brydson Creek. Placing a large industrial bedrock extraction and processing facility between these headwater recharge areas and the spring discharges which form Brydson Creek creates a potential high risk of disrupting the natural process which create and protect the ecological integrity of this tributary system. Any significant alteration to the quantity, quality or seasonality of groundwater discharge could negatively impact this stream ecosystem and its population of brook trout. If one superimposes on this the additional stresses which may occur in the future related to our changing climate, there is cause for concern. Some of the potential impacts are discussed below.

8) Water Quantity

A number of the proponent's documents state that there will be no net loss of water from the quarry site which would reduce groundwater discharge below the site. Essentially, what water enters the site will leave the site. This is clearly not the case. Several factors will result in a loss of water at the quarry site compared to the present situation:

- The conversion of subsurface groundwater to surface ponds on the site will increase water loss through evaporation. This could be significant when summer surface waters in the ponds reach temperatures of 25° C and in the winter when rock extraction activity breaks up any ice cover and the water is warmer than the cold, dry winter air.
- The use of large volumes of water in the wash plant will also result in significant evaporation losses.
- The use of water for dust suppression on the site will add to evaporation losses.

- Water adhering to the crushed rock product after washing will be removed from the site.
- As bedrock is removed from the site, an equivalent volume of water will be needed to replace the void created. This water will remain on the site and result in a reduction of groundwater discharge from the site.

The net effect of these water losses could reduce groundwater discharge at the Brydson springs, especially during a hot summer drought when the losses listed above will be at their maximum while normal groundwater discharge is at a seasonal low. Unfortunately, this condition could increase in both frequency and intensity as our climate changes in the future.

9) Water Quality

There are a number of factors which could negatively impact water quality at the quarry site. These include the use of underwater explosives and their soluble residues; oil, grease, gasoline, antifreeze, etc related to the use heavy machinery on the site; de-icers used in winter on roads and equipment; accidental spills on the site; etc. These will all wind up in surface or groundwaters leaving the site and into Brydson Creek. Unfortunately, brook trout are a very sensitive species to many forms of water quality impairment. The effects can be direct mortality, reduced reproductive success, sub-lethal effects on the fish's physiology or behavior, or a reduction of their food base.

Nitrate levels may represent one of these water quality issues. Nitrate levels measured by Harden in the waters of Brydson Spring and Creek over the past 2 years have averaged around 4 mg/L with a range of 3.5 to 4.4. A review of nitrate toxicity to aquatic animals by Camargo, Alonso and Salamanca (2005) found that a nitrate concentration of 10 mg/L can adversely affect, at least during long-term exposures, sensitive freshwater Salmonid fishes, such as the Brook Trout, aquatic invertebrates, which are important in the fish food chain, and amphibians. They go on to suggest that a maximum level of 2 mg/L would be an appropriate target for nitrate to protect the most sensitive freshwater species. Background nitrate measurements in Bryson Creek are already double this level. Any activity which has the potential to further elevate nitrate levels in Brydson Creek should be avoided if aquatic species are to be protected.

10) Water Temperature

Cold-water stream ecosystems and the brook trout that they support depend on cold, clean spring waters for their existence. We know that surface waters in the quarry ponds will reach or exceed 25° C in the summer, much warmer than ambient groundwaters entering them. The proponent is relying on evidence from other sites to predict the rate of thermal attenuation at this site to support the conclusion that there will be no effect on groundwater temperatures at the Brydson springs. Extrapolation of this type of conclusion can be perilous given the high variability of physical conditions between sites. At a minimum, it adds another element of risk

for downstream effects. The other condition of possible concern related to water temperature could occur during extremely high summer rainfall events when warm surface run-off waters from the quarry site flow into Brydson Creek at the same time that cold groundwater discharge is at a seasonal low, or perhaps even lower because of issue 8 above. Unfortunately, the uncertainty of future climate change effects could magnify these risks and impacts.

11) Cumulative Risk Factors

When dealing with a series of risks to the environment, in this case a cold-water stream ecosystem, we may predict that each risk is low and manageable but, because of the uncertainty involved with each, these could be considered potentially cumulative in effect. An unforeseen event in any of these, or smaller negative and synergistic changes in several factors, could have a relatively large negative effect on the ecological integrity of Brydson Creek and its brook trout. We have not seen a comprehensive risk assessment for Brydson Creek. In view of the potential for cumulative risks for a number factors, a higher degree of caution is appropriate here.

12) Significance of Impact

The loss or impairment of a native, self-sustaining population of brook trout in a tributary of the Grand River watershed would be an ecologically tragic, but avoidable, event. As a potentially distinct genetic population of brook trout, it would be irreplaceable. We should place a higher value on this type of natural feature in our environment and take the extra measures necessary to protect it. This becomes even more important as the uncertainty of future changes in our climate looms large.

13) Comparative Perspective

On a comparative basis, the cold-water ecosystem of Brydson Creek and its native population of brook trout is far more regionally rare and exceptional than several hectares of limestone bedrock for extraction. There are many locations in Southern Ontario where limestone can be mined. There are many fewer locations supporting this type of cold-water steam ecosystem and its native brook trout.

14) Professional Opinion

For the reasons outlined above, it is my professional opinion that this type of industrial development is inappropriate for this site and its associated environmental features. This is based on over 40 years of assessing developmental impacts on aquatic ecosystems, stream habitats and their fish communities.