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MEMORANDUM

TO:	Ian Chadwick, EHD Consulting Ltd.
FROM:	Patty Skinner, Triton Environmental Consultants Ltd.
DATE:	23/07/2019
FILE #/NAME:	Project 10331/Duck Lake Environmental Values
RE:	Duck Lake – TOR Qualified Professional Checklist for Environmental Values

Mr. Ryan Whitehouse (Senior Aquatics Ecologist, FLNRORD) contacted Triton Environmental Consultants Ltd. (Triton) on July 19, 2019 concerning the TOR Qualified Professional Checklist for Environmental Values submitted by Triton for the Duck Lake Mineral Water Bottling Plant. Mr. Whitehouse asked for additional information on rare plant and plant communities; species at risk observed; and general impacts of decreased lake levels to plant communities. Additional photographs were also requested.

Species at risk and rare plant/communities observed during May 14, 2019 site visit

As outlined in the TOR Qualified Professional Checklist for Environmental Values, the site was visited in the spring of 2019 to observe Species at Risk, rare plant and plant communities and the presence/absence of Great Basin Spadefoots (*Spea intermontana*). All observations relating to these plants/animals listed are outlined below:

Species at Risk:

American Badger – An American Badger den was observed in a gravel bank along the north edge of Duck Lake. It did not appear to have been recently used.

Swallow cavities – Swallow cavities were observed north of Duck Lake, within a gravel cut bank. Birds were not observed so species was not verified. The landowner was notified of location and informed of the Bird Breeding Window timelines.

Great Basin Spadefoot – No spadefoot toads were observed during the toad field investigations conducted on May 7, May 22 and June 12, 2019.

Rare Plants:

No rare plants were observed during the May 14, 2019 site visit. The area was heavily disturbed by cattle and had weed infestations along the northern edge of Duck Lake. Trembling aspen stands were noted just east and west of Duck Lake. No black cottonwood was observed. Other plant species observed are in Table 1.

Table 1. Plant species observed during site visit on May 14, 2019

Common Name	*Scientific Name*
Trees	
Douglas fir	*Pseudotsuga menziesii*
Ponderosa pine	*Pinus ponderosa*
Red-osier dogwood	*Cornus stolonifera*
Sitka alder	*Alnus viridis*
Trembling aspen	*Populus tremuloides*
Willow sp.	*Salix sp.*
Drummond's willow	Salix drummondiana
Pacific willow	Salix lucida
Shrubs	
American vetch	*Vicia americana*
Black hawthorne	*Crataegus douglasii*
Common dandelion	*Taraxacum officinale*
Common juniper	*Juniperus communis*
Common snowberry	*Symphoricarpos albus*
Kinnikinnick	*Arctostaphylos uva-ursi*
Prickly rose	*Prickly rose*
Small sagebrush	*Artemisia nova*
Yellow penstemon	*Penstemon confertus*
Wildflower	
Sagebrush buttercup	*Ranunculus glaberrimus*
Showy daisy	*Erigeron speciosus*
Wild strawberry	*Fragaria virginiana*
Yarrow	*Achillea millefolium*
Grasses	
Alkali bluegrass	*Poa juncifolia*
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Crested wheatgrass	*Agropyron cristatum*
Spangle-top	*Leptochloa fascicularis*
Reed canary grass	*Phalaris arundinacea*
Moss	
Club moss	*Lycopodiaceae sp.*
Sedges and rushes	
Beaked sedge	*Carex rostrata*
Common spike-rush	*Eleocharis palustris*
Great bullrush	*Schoenoplectus tabernaemontani*
Water sedge	*Carex aquatilis*
Noxious or Invasive Plants	
Canadian thistle	*Cirsium arvense*
Great mullein	*Verbascum thapsus*
Spotted knapweed	*Centaurea maculosa*

Rare Plant Communities

No rare plant communities were observed during the May 14, 2019 site visit. There was a competent riparian zone along the west and south edges of Duck Lake which included Drummond's and Pacific willow, trembling aspen and black hawthorn/rose communities.

Impacts of decreased lake levels to plant communities

Although the hydrogeologist reports outline the production of aquifer pumping is to be limited to an annual average of 10% of the sustainable aquifer yield, any drawing down of Duck Lake would be unlikely but not impossible. The decreasing of the water level in Duck Lake may cause alteration to the surrounding wetlands and associated riparian ecosystem. General impacts to the fauna include, but are not limited to:

- Erosion and degradation of the shoreline in which riparian vegetation may be eliminated;
- Decrease water quality;
- Increased areas of exposure to freezing and snow cover;
- Exposure of submergent and emergent species;
- Loss in riparian plant germination that require adequate moisture from highwater;
- Decrease of species richness;
- Reduction of benthic invertebrate density;
- Invasion by exotic plants; and
- Introduction of water-stress to trees.

The plant communities most impacted would be the submergent and emergent species which require saturation for survival. Submergent plants create valuable habitat for small invertebrates and food for waterfowl. Emergent plants live near the water's edge and often have deep dense roots that stabilize shallow soils. They provide important habitat for birds, insects and other animals living near water.

Mitigation

The mitigation proposed for any possible drawdown of Duck Lake is to restore water levels by introducing water from the existing 6" well on the property, with telemetric monitoring systems to identify the drawdown response. The 6" well is in the same aquifer as the production well. The water that would be introduced in its raw form is the same as the Duck Lake water, although it has a much lower total dissolved solids (TDS), as Duck Lake TDS increases due to evaporation, when compared to the well. Low TDS water tends to be slightly acidic and has fewer minerals than water with higher TDS. Some of these wetland plants absorb and store these minerals for plant growth.

The hydrogeological report by Hy-Geo recommended that the monitoring systems should be installed in Duck Lake prior to production. This will develop technical understanding of the typical annual water level changes that are currently observed visually throughout the seasons at Duck Lake.

If you have any questions or concerns regarding this additional information, please contact me at 250-319-2130.

Photograph 1. East view of Duck Lake. May 14, 2019

Photograph 2. West view of Main Duck Lake. May 14, 2019

Photograph 3. West view of Duck Lake #2. May 14, 2019

Photograph 4. West view of Duck Lake #3. May 14, 2019

Photograph 5. View of trembling aspen stand between Lakes 2 and 3. May 14, 2019.

Photograph 6. View of upland vegetation. May 14, 2019.

Photograph 7. East view of riparian vegetation. May 14, 2019.

Photograph 8. South view of riparian vegetation. May 14, 2019.