



CFO ADVERSE EFFECTS BACKGROUND REPORT

Pigeon Lake Watershed Association
April 2022

Application RA21045 - Greg Thalen and G&S Cattle Ltd.

Location: Wetaskiwin County

Notice of Application: <https://www.nrcb.ca/confined-feeding-operations/applications-decisions2/notice-of-applications>

Social, Economic, and Environmental Context

Pigeon Lake and its watershed have important ecological value in Alberta for migratory birds, fish, wildlife, and other ecosystem services. As a popular prairie lake, it also provides both livelihood and enjoyment for many generations of Albertans. The watershed is home to more than 5800 residents and welcomes over 100,000 seasonal visitors each year. Pigeon Lake is a popular spot for lake recreation and sport fishing. The watershed features agricultural land, hamlets, acreages and cottage communities, IR 138A, business centers, campgrounds and conservation land including Pigeon Lake Provincial Park, Zeiner Park, the George and Joan Mitchell and Pigeon Lake Conservation Areas at Tide Creek. A healthy lake and watershed optimize social experiences, agriculture, commerce and ultimately the economic strength of the region.

Pigeon Lake – a Vulnerable and Environmentally Sensitive Water Body

Pigeon Lake has been found to be especially vulnerable to nutrient inputs from the surrounding watershed causing Harmful Algal Blooms (HABS). As a result of HAB outbreaks since the early 2000's and public outcry, Pigeon Lake has been especially well studied and monitored¹. Vulnerabilities of the lake are in part due to the physical and hydrological characteristics of the lake and its watershed.

Pigeon Lake does not have the benefit of flushing headwaters from the Rockies. Instead, the lake is supplied locally with water from its small watershed, with a ~2:1 watershed (187 km²) to lake (96.7 km²) surface area ratio. Over a third of Pigeon Lake's annual water budget comes from surface runoff and ground water. The lake has a long residency or turnover rate of over 100 years. These characteristics leave the lake vulnerable to the accumulation of nutrients such as nitrogen and phosphorus from watershed sources. Annually this nutrient accumulation contributes to aquatic plant growth and Harmful Algal Blooms that adversely affect everyone around the lake.

¹ See [Pigeon Lake Watershed Management Plan 2018](#) – Page 4 for list of studies and Appendix C Technical Summary for an update of the State of the Watershed, found at: <https://www.plwa.ca/pigeon-lake-watershed-management-plan>

Community Commitment to the Health of Pigeon Lake and Its Watershed

Pigeon Lake municipalities, the provincial government, individual owners, and the Pigeon Lake Watershed Association together have invested millions of dollars to reduce nutrients from entering lake from the watershed. Initiatives have included regional sewer systems, the Pigeon Lake Watershed Management Plan, and community-based initiatives to implement nutrient reducing beneficial management practices

The Pigeon Lake Watershed Management Plan 2018 (the “Plan”) was adopted through municipal resolution by all 12 municipalities that border Pigeon Lake including the County of Wetaskiwin where the proposed CFO will reside. The Plan was endorsed by Maskwacis Cree Four Nations, the Pigeon Lake Regional Chamber of Commerce, Alliance of Pigeon Lake Municipalities, Pigeon Lake Watershed Association, and the Battle River Watershed Alliance.

The goal of the Plan is to reduce the frequency and intensity of algal blooms, improve the health of the watershed and lake, improve the recreational value of the lake, and economic health of the region.

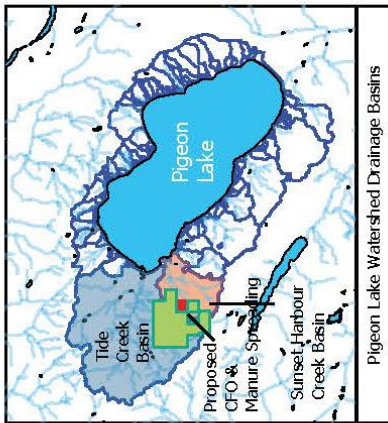
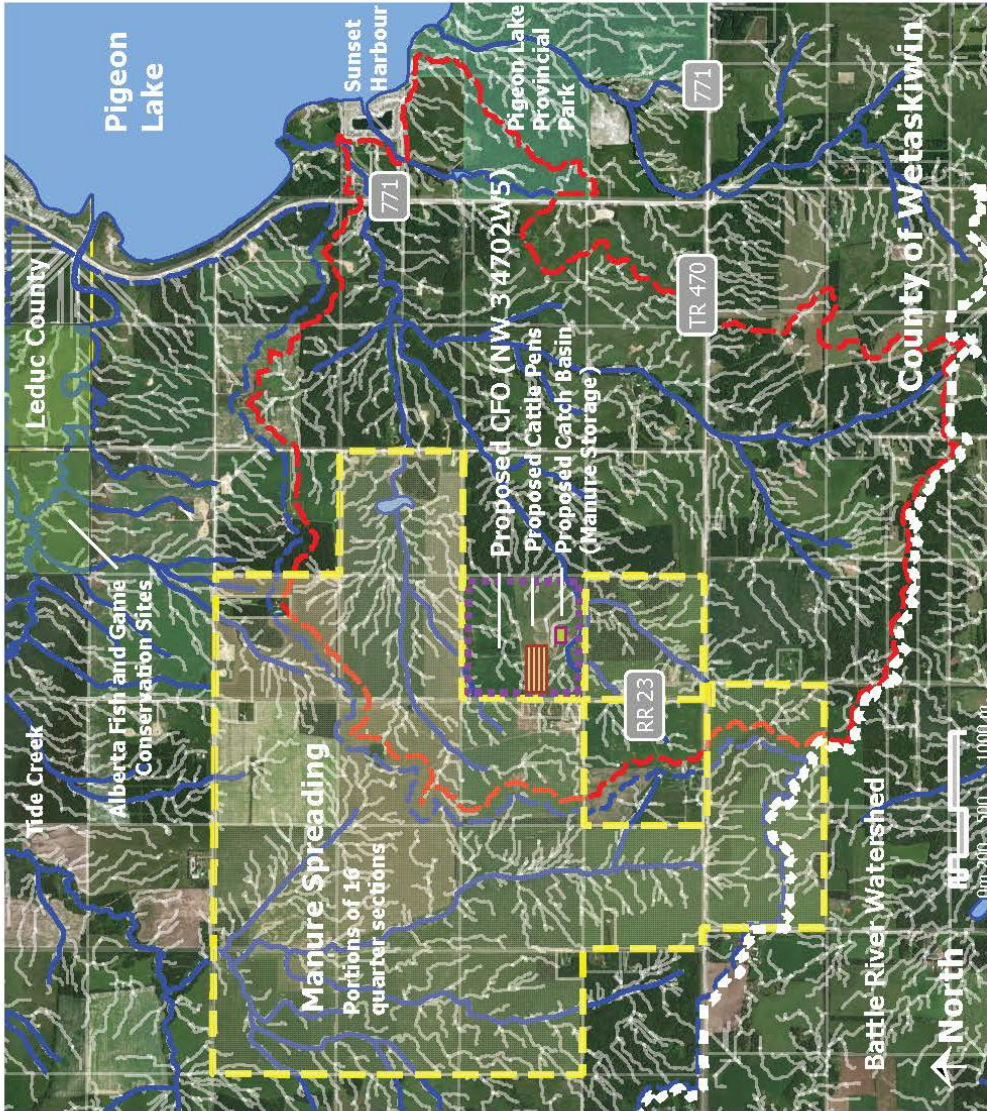
Community efforts to work together to steward the land and contribute to the liveability of this Alberta lake-centered region received provincial recognition with two awards in 2021 - [Award for Environmental Excellence, Alberta Emerald Foundation and Alberta Professional Planners Institute \(APPI\) Award of Planning Merit](#)

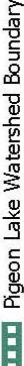

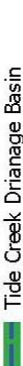
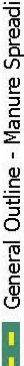
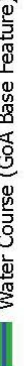

Proposed Confined Feeding Operation

Greg Thalen and G&S Cattle Ltd, an agri-business enterprise, has applied to the Natural Resources Conservation Board to build and run a 4000-head beef finisher confined feeding operation (CFO) on the west side of Pigeon Lake (NW 3-47-2 W5M, Wetaskiwin County).


The proposed location for the CFO is in the Pigeon Lake watershed. The current land use of a 17-quarter section operation is understood to include a large, existing livestock operation with quarter sections being used for grain, pastureland, and open pens. The assessment of risk and adverse effects must include consideration a new 4000-head CFO and the cumulative impact of the existing operation.

The proposed CFO facilities includes four pens, a catch basin, and manure spreading on 16 quarter sections of land. All land involved in this operation is integrally connected to Pigeon Lake via the drainage systems of Sunset Harbour Creek Basin and Tide Creek Basins (Figure 1). These are the two largest sub-watersheds in the Pigeon Lake watershed.



- Map Legend:**
-  Pigeon Lake Watershed Boundary
 -  Sunset Harbour Creek Drainage Basin
 -  Tide Creek Drainage Basin
 -  General Outline - Manure Spreading
 -  Water Course (GoA Base Feature)
 -  Drainage Path Network (from LIDAR)

The Pigeon Lake Watershed Association is a membership-based nonprofit charity. For more information on the association, our mission and our work, see our website at www.plwa.ca.



**PIGEON LAKE
WATERSHED
ASSOCIATION**

Figure 1
Pigeon Lake Watershed Sub Basin Context
Proposed Confined Feeding Operation

Date Sources:
 Licensed and Open Source Spatial Data: GoA, Alberta
 Earth Image: Bing Maps Satellite Streaming Service
 Basins and Drainage Lines: Generated from 7.5m LIDAR Digital Elevation Model
 CFO Details: from NRCE Application R422045
 March, 2022

Figure 1 Pigeon Lake Watershed Sub Basin Context

Summary of Adverse Effects

The proposed CFO and manure spreading operation will cause direct adverse effects that impact the immediate surrounding agricultural producers, conservation areas and Pigeon Lake - through cause-and-effect linkages directly tied to the CFO operation. A summary of the linkages and affected environments and parties is illustrated in the following diagram. We identify six major areas of adverse effect in the balance of this statement.

Proposed Operation	vector/linkages	Receptors Affected Party	Adverse Effects
Livestock Transportation	Atmospheric transmission noise, odour, pathogens, sound e.g. truck traffic	Adjacent Producers	Nuisance, health, transportation safety
	Transportation Safety and Infrastructure		
CFO Pens & Catch Basin	Atmospheric transmission noise, odour, pathogens, sound e.g. truck traffic	Adjacent Producers	Nuisance, Financial loss, health risk
	Downstream Watercourses Fugitive release of manure Surface and ground water contamination	Pigeon Lake Provincial Park Campers and Day Users	Nuisance, reduced usership, health risk
	Water Diversion Authorization to divert and use groundwater licence (omitted in this application)	Adjacent Producers	Livelihood, Financial Loss
Manure Spreading & soil Incorporation	Downstream Watercourses Snow melt and precipitation causes runoff which removes and transports pollutants nutrients and pharmaceuticals to downstream watercourses	Spawning fish affected by pharmaceuticals	Interference with reproduction
	↓	Tide Creek Conservation Areas affected by cyanobacteria clogged watercourse and decline in fish	Conservation initiatives undermined and compromised
	Pigeon Lake at Outlets and Western Basin Pollutant laden water courses empty into Pigeon Lake with further mixing and movement in Pigeon Lake	Phytoplankton and Cyanobacteria species types and abundance influenced by increased presence of nutrients such as phosphorus and nitrogen	Harmful Algal Blooms
	↓	Entire Pigeon Lake and Lakeshore Harmful Algal Blooms form more often in lake west end and spread to all parts of Pigeon Lake	Sport Fishery Fish Health & Mortality
		Human Recreational Users of lake including Provincial Park and day use guests, boaters, fishers lakeside community property owners - directly affected	Nuisance, Loss of access to lake, Financial loss, health risk

1) *The proposed CFO will adversely affect Pigeon Lake water quality including the increased frequency and intensity of harmful algal blooms, due to increased phosphorus and pollutant-laden surface runoff and ground water that flows from the CFO operation into a vulnerable Pigeon Lake*

The primary downstream environmental and community risk introduced by an intensive CFO finishing operation is the manure that is generated including its storage, spreading, and transportation. Manure includes nutrients such as nitrogen and phosphorus, pathogens (e.g., listeria, salmonella, E. coli), growth supplements, and antibiotics. Chemicals used to clean the animals and facilities are also found in the manure.

Manure Production and Contaminant Export

Approximately 13,120 metric tonnes or 17,700 cubic meters of manure² are anticipated to be produced annually from a 4000-head beef finishing CFO.

Compared to other forms of agriculture, Intensive livestock operations and feed lots are a significant source for total phosphorus and nitrogen release into watersheds, waterways, and lakes³. The nutrient footprint of these intensive livestock operations is displayed in a map of Ecosystem Services authored by the Alberta Biomonitoring Institute. Essentially the map indicates where the land is providing water purification services for high nutrient export sites. Two images below show locations in Alberta and the Pigeon Lake Watershed that are high

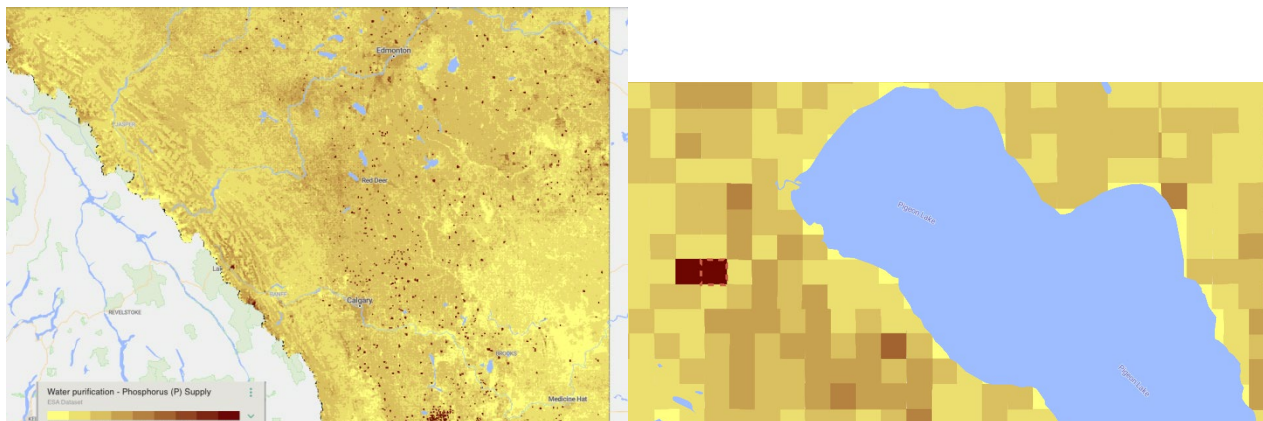


Figure 2 Ecosystem Services - Water Purification/ Phosphorus (P) Supply – Central and Southern Alberta on the left and Pigeon Lake Watershed on the right, ESA Dataset, Dark Burgundy indicates >2.00 Phosphorous Supply (kg/ha/year), Ecosystem services assessment is a system of metrics, information, and maps of ecosystem services and biodiversity across Alberta, Alberta Biodiversity Monitoring Institute

² Table 6.4 Beneficial Management Practices: Environmental Manual for Livestock Producers in Alberta, p. 58, found at: <https://open.alberta.ca/publications/4851540>

³ Feedlots have recorded orders of magnitude higher TP and TN release rates compared to other land uses including cereal crops – see Table B4, page 43 of Donahue, Wm. 2013. Determining Appropriate Nutrient and Sediment Loading Coefficients for Modeling Effects of Changes in Land use and Landcover in Alberta Watersheds. Water Matters Society of Alberta

nutrient export sites. The concentration of high nutrient export sites in the Lethbridge area corresponds to the high density of CFO and ILO sites in the region. Locally, the highest nutrient export site is the current livestock operation which is the proposed CFO and manure spreading location.

While CFO and manure management beneficial practices are intended to minimize nutrient export, release rates from the proposed operation are still expected to increase over background levels compared to the balance of the watershed. Elevated nutrients will occur in the soil horizon in the lands designated for manure spreading -- leading to increased export nutrient volumes entrained in runoff from major storms and snow melt.

The watershed lands designated for manure spreading add up to 2656 acres or 10.75 square kilometers – close to 5.8% of the entire Pigeon Lake watershed and a major component of the Tide Creek and Sunset Harbour Creek sub-drainage basins. The size of the manure spreading areas is significant in relation to the watershed and the adverse effect this operation will have on Pigeon Lake.

Manure Pollutants Entering Water Courses Draining into Pigeon Lake

The applicant indicates that manure will be spread over 16 quarter sections in the watershed (Figure 1). The proposed CFO application does not fully address the impact of fugitive release of manure pollutants on downstream drainage courses and Pigeon Lake itself. At times of high flow, surface runoff entrains manure pollutants from the soil including nitrogen and phosphorus, and pathogens such as listeria, salmonella, E. coli, growth supplements, antibiotics and other chemicals.

As shown in Figure 1, every part of the 16 quarters designated for manure spreading is linked to Pigeon Lake by and surface runoff, starting as sheet flow and becoming increasingly concentrated in ephemeral channels, then creeks and then into Pigeon Lake. Pigeon Lake gets most watershed-sourced nutrients in bursts. Late winter snow melt is an important period in the export of nutrients from the operation. Downstream water courses and lake TP/TN levels are strongly influenced by the period of snowmelt or freshet⁴. Freshets produce runoff flows



Figure 3 Field Runoff west of Hwy 771 from 2020 Freshet

⁴ One Canadian study measured 25–89 % of the total annual river volume, 42–92 % of the total annual TP load, and 41–81 % of the total annual TN load were delivered during snowmelt. Corriveau, J., Chambers, P.A. & Culp, J.M. Seasonal Variation in Nutrient Export Along Streams in the Northern Great Plains. *Water Air Soil Pollut* 224, 1594 (2013). <https://doi.org/10.1007/s11270-013-1594-1>

from farm fields which pick up manure pollutants and nutrients when the soil is bare, and biological processes are dormant. Beneficial Management Practices of manure spreading and incorporation into the soil cannot fully prevent the erosional forces of surface runoff and leaching into subsurface ground water to transport manure pollutants downstream toward the lake. The added nutrient load in runoff from lands treated with manure will reach Pigeon Lake via the drainage network and water courses of the Tide Creek and Sunset Harbour Creeks. There are concerns with high nutrients and pharmaceutical residue in the creeks including: harmful algae blooms, harm to fish spawning and harm to conservation efforts and use of the two conservation sites along Tide Creek managed by the Alberta Fish and Game Association with the Conservation Association and Alberta Environment and Parks

Manure Pollutants Entering Pigeon Lake from the Sub Drainage Basins

Nutrients entrained in spring melt and major storm runoff quickly reaches Pigeon Lake via the basin drainage system. Runoff from streams and disbursed sources accounts for 22% of the Pigeon Lake phosphorus budget. Runoff has an important influence on Pigeon Lake and the development of Harmful Algal Blooms. Firstly, nutrients such as Total Phosphorus and Total Nitrogen promote algal growth. Secondly runoff entrained nutrients resupply internal nutrients that are annually released into the water column and then returned to the bed during winter. Thirdly the variability in runoff volumes can influence the intensity of algal blooms in the years following a large release.

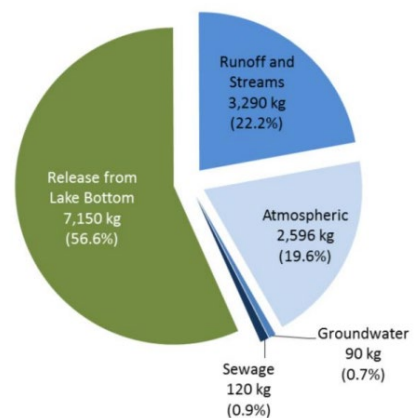


Figure 4 Phosphorus Loading Technical Report in the Pigeon Lake

The series of 2017 – 2020 satellite images (see pgs. 9-12) provide a prime example related to the large freshet that occurred in the spring of 2020. The satellite imagery for 2019 shows very little HAB development; however, following a strong 2020 freshet, a HAB resurgence occurred. Therefore, there is reasonable evidence that nutrients entrained in runoff from the watershed has a causal influence on the development of Harmful Algal Blooms in Pigeon Lake. Based on the satellite imagery, blooms quite often get started in the western basin of Pigeon Lake. The western basin is more vulnerable because it is shallower and captures the largest part of the watershed drainage.



Figure 5 August 2020 Harmful Algal Bloom Sampling following strong 2020 spring freshet.

The satellite imagery (see pgs. 9-12) shows that Harmful Algal Blooms once started in any part of the lake can migrate to all parts of the lake. Prevailing winds cause blooms to wash up on the shores all around the lake. Therefore, there is a direct unbroken causal

chain from the proposed CFO operation to all recreational users on the lake and all along the 76 kilometers of Pigeon Lake shoreline.

Pigeon Lake is particularly vulnerable to the added nutrient loads from this CFO operation:

- A. Pigeon Lake does not flush. The residence time for lake turnover is over a hundred years. These added nutrients, particularly phosphorus, bio-accumulate, year after year.
- B. Increased external nutrients in the lake are like fertilizing an agricultural field. Various organisms grow more abundant to out-of-control, including phytoplankton and cyanobacteria (blue green algae).
- C. Pigeon Lake has a history of harmful algae blooms (HABS) over the last two decades, indicating that the lake is currently over supplied with nutrients and cannot process more nutrients without

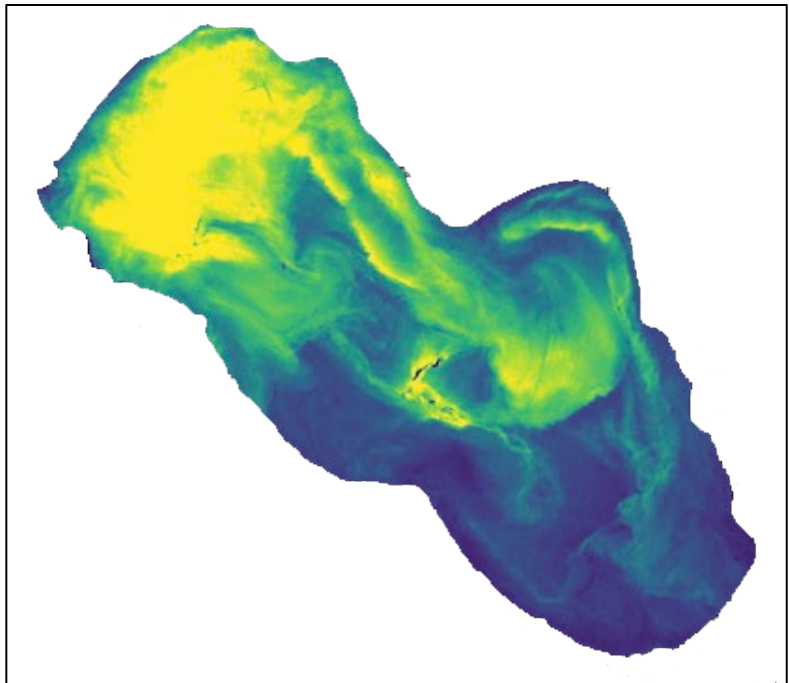
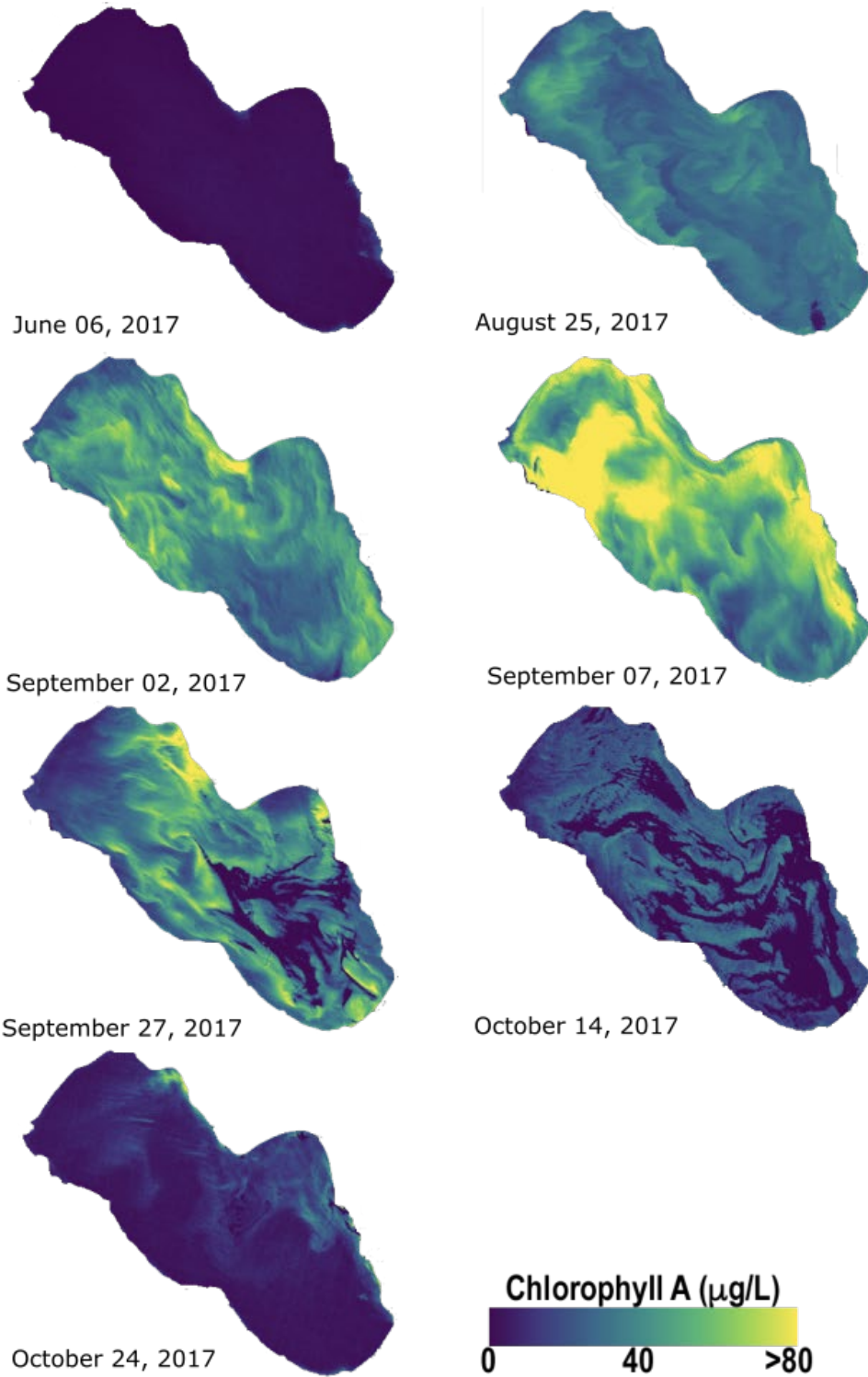


Figure 6. Satellite Image of Pigeon Lake - August 4, 2020. Bright yellow shows Chlorophyll A concentration sufficient to indicate a Harmful Algal Bloom (HAB) Source: Alberta Biomonitoring Institute: <https://abmignc.users.earthengine.app/view/pigeonlake-monitoring>

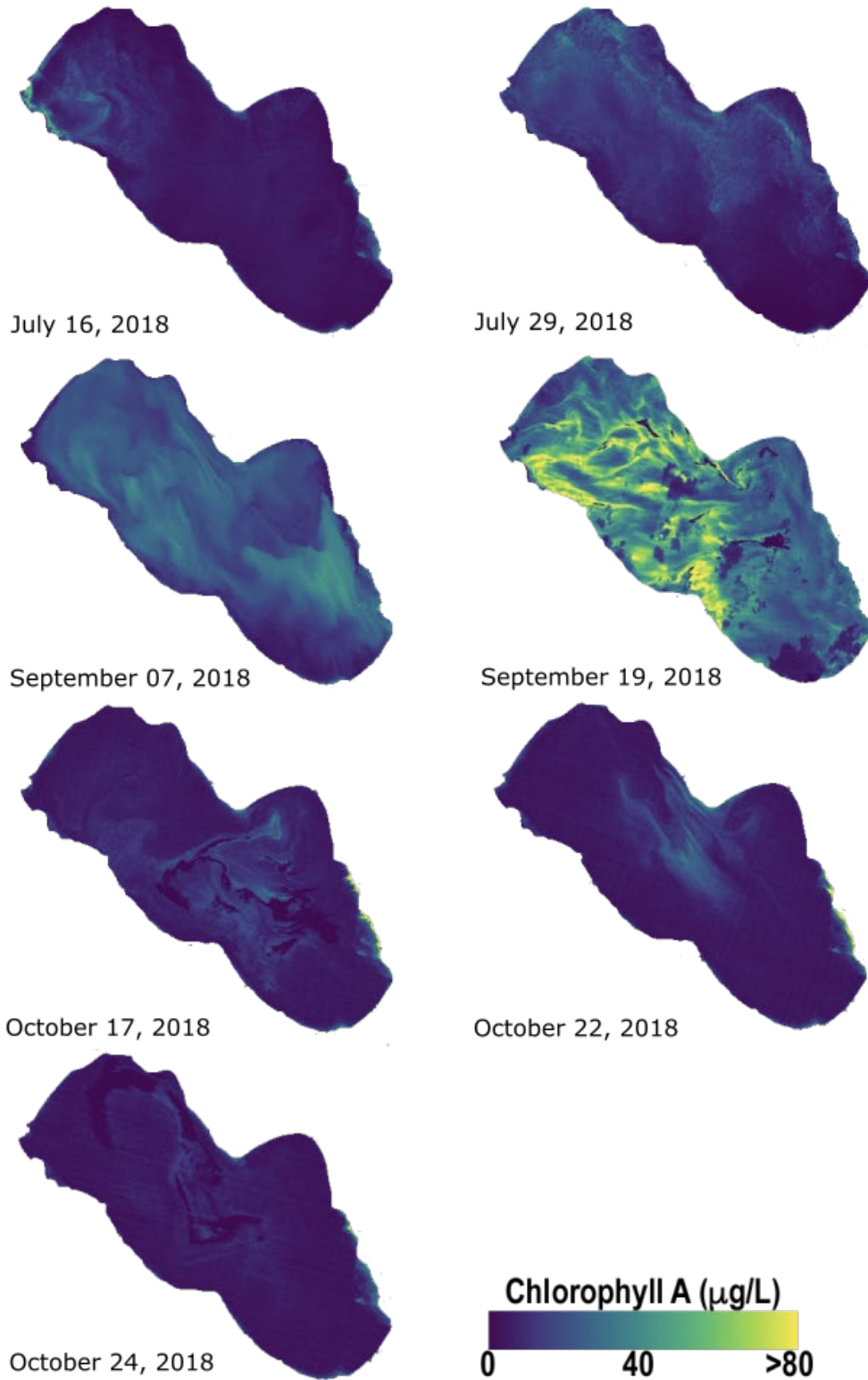
increasingly severe harmful algal blooms. During this time, significant effort has been expended to reduce the nutrient load to the lake and positive results are being achieved.

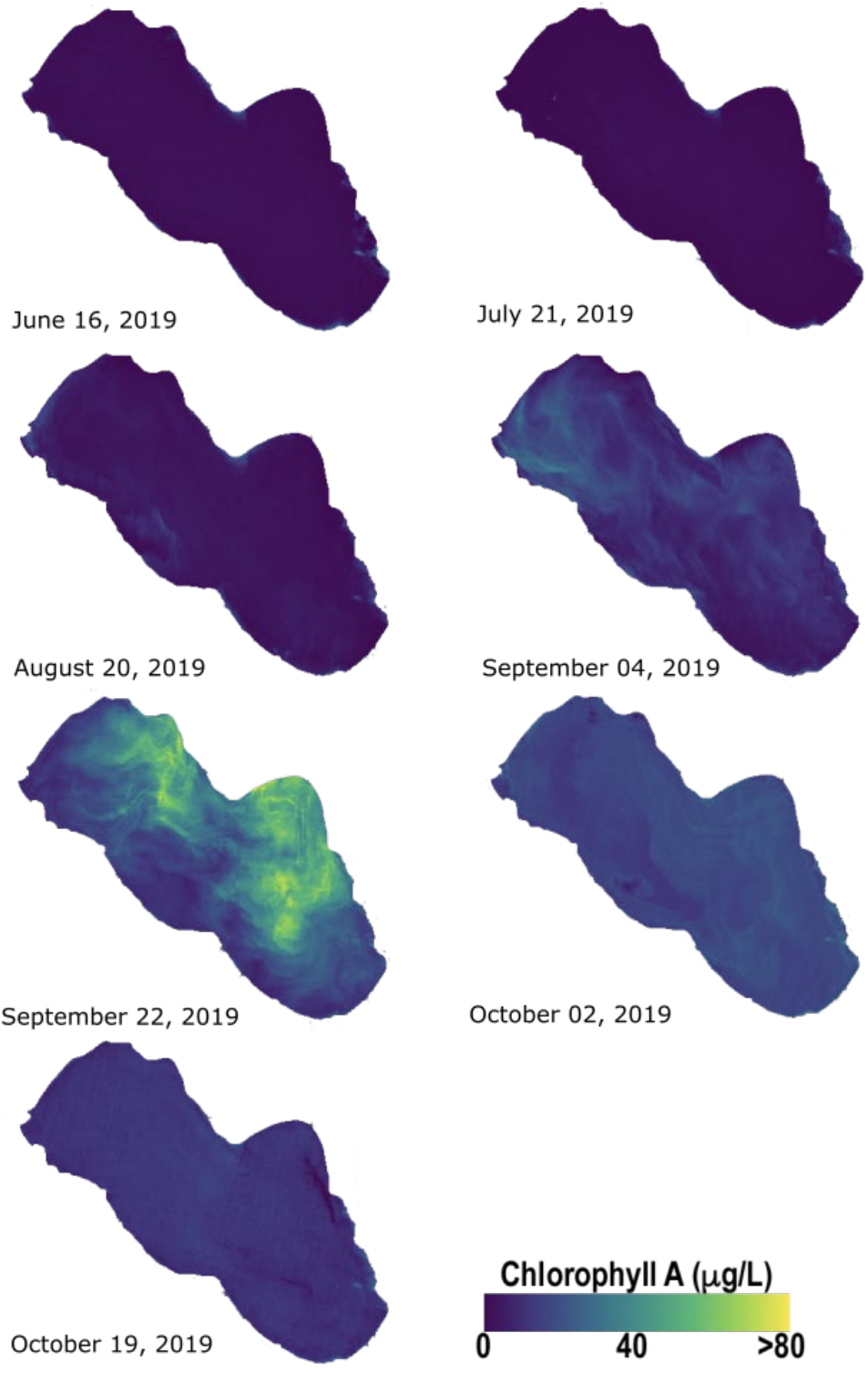
Since 2002, Harmful algal blooms in Pigeon Lake became noticeably more severe and frequent. Between 2006-2013 severe blooms were reported that covered the lake with an iridescent layer of impenetrable blooms. The satellite image galleries on the following pages present a snapshot of chlorophyll intensity, duration, and distribution for the Pigeon Lake Alberta open water seasons of 2017, 2018, 2019 and 2020. Chlorophyll has a distinctive pigment that is associated with Cyanobacteria (Blue Green Algae) and other phytoplankton species. This pigment intensity is considered a good representation of cyanobacteria intensity. While more research is needed, the satellite imagery suggests that blooms originate from the northwest end of the lake. The bright yellow colour on these images indicates the presence of chlorophyll A in sufficient density to indicate the presence of a Harmful Algal Bloom.

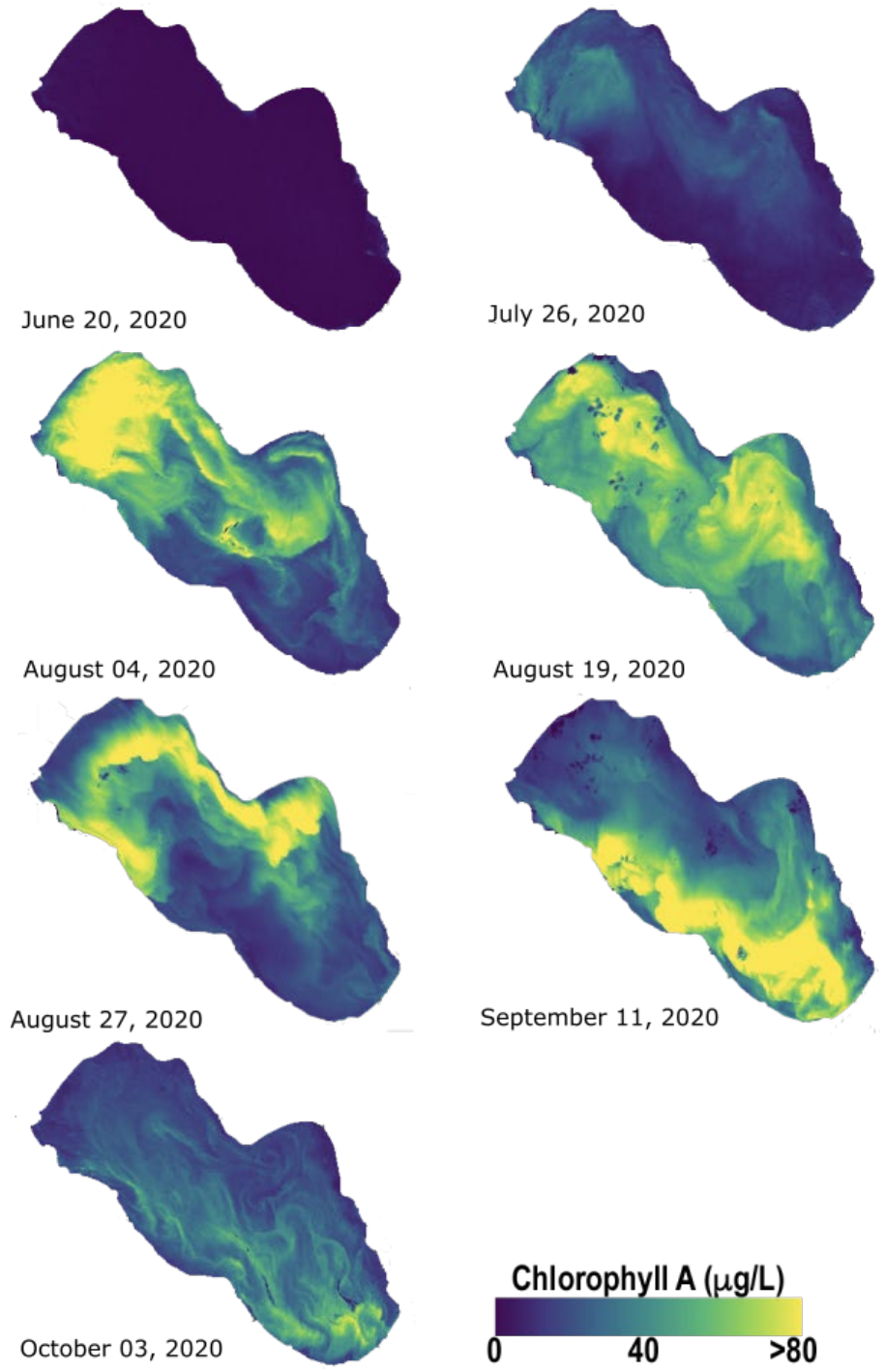
2017



2018







Sunset Harbour Creek & Tide Creek - Adverse Effects

Studies completed by Alberta Environment and Parks, as outlined in the Pigeon Lake Watershed Management Plan Technical Report, demonstrate that pollutants in creeks at Pigeon Lake contribute to the frequency of algal blooms. In 2013, studies show that Tide Creek and Sunset Harbour Creek, which drains from the land of the proposed CFO, contribute to the phosphorus and nitrogen inputs to Pigeon Lake and thereby contribute to the frequency and intensity of harmful algal blooms. (Figure 5)

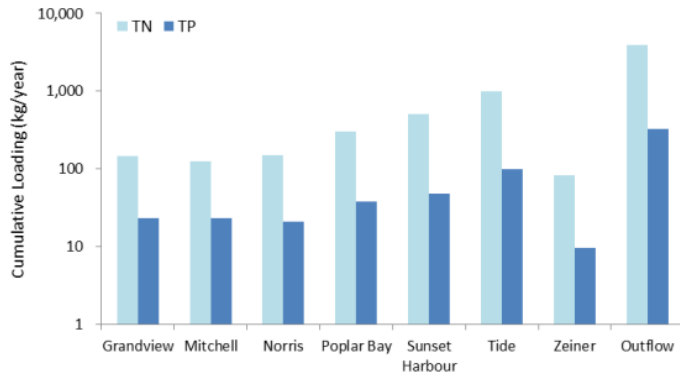


Figure 5 Summary of cumulative annual total nitrogen (TN) and phosphorus (TP) loading from inflowing streams into Pigeon Lake and exports from the outflowing stream in 2013. Data are from Teichreb et al. 2014. [Technical Report in the Pigeon Lake Watershed Management Plan 2018, Appendix C, P. 23.](#)

Water samples at in the Sunset Harbour Creek sub watershed show a substantial increase in dissolved phosphorus between 2013 & 2022. (Sunset Harbour Creek at Secondary HWY 771).

	Dissolved Phosphorus (mg/L)	
	2013	2022
Sunset Harbour Creek	0.0481	0.73

The stream chemistry from Sunset Harbour Creek at the culvert at RR 22, closer to the proposed site of the CFO, indicates even higher levels of dissolved phosphorus in 2022 of 1.6 to 2.0 mg/L.

Sources: 2013, Pigeon Lake Stream Chemistry Data, Technical Summary, Pigeon Lake Watershed Management Plan Bureau Veritas Labs, Certified Report, March 21 and 29, 2022. (Appendix 2):

Fish Habitat – Adverse Effects

Pigeon Lake is considered a premier walleye fishery as a result of provincial conservation efforts. Studies of the fish population and recent events highlight increased risk to the sustainability of the fish population.

“From a severely collapsed status in the late 1990s, this lake has recovered to become one of Alberta’s premier walleye fisheries.” Pigeon Lake FIN Summary 2020.

Alberta Environment and Parks monitors the health of fish at Pigeon Lake. Biologists assess the fish population, including spawning success, water quality, and threats to habitat to ensure Albertans can enjoy the benefits of sustainable fisheries and healthy ecosystem.

Results from the FIN report for Pigeon Lake in 2020, while overall positive, flag concern about population and habitat: the Walleye Population status was degraded from very low risk to low risk, and Northern Pike are considered to be at very high risk with stringent conservation-based management required for the Northern Pike Population (Figure 6).

Mature Walleyes/net	Mature Pike/net	Risk to Sustainability
>29.0	>21.8	Very Low
20.3-29.0	15.3-21.8	Low
14.5-20.2	10.9-15.2	Moderate
5.8-14.4	4.4-10.8	High
<5.8	<4.4	Very High

Figure 6 Alberta’s Fish Sustainability Index risk thresholds for Walleye and Northern Pike using the standardized Fall Index Net (FIN) method. Note: Thresholds align with species management frameworks. [Pigeon Lake FIN Summary 2020](#)

White Fish Mortality Events at Pigeon Lake

In 2012 and 2021, large white fish mortality events coincided with poor water quality including depleted oxygen levels caused by decaying algae.

<https://www.wetaskiwintimes.com/news/fish-kill-at-pigeon-lake>

Technical Report, Pigeon Lake Watershed Management Plan 2018, Appendix C, P. 53.

The adverse effects of CFOs on fish have been demonstrated in studies from other regions in Alberta. The works outlined below shows evidence that supplements or pharmaceuticals that contaminate the environment in runoff, from intensive agricultural land, is resulting in hormone-like adverse effects on fish.

Evans J, Jackson L, Hamid HR, Ikonomou MG, Feminization of Longnose Dace (*Rhinichthys cataractae*) in the Oldman River, Alberta, (Canada) Provides Evidence of Widespread Endocrine Disruption in an Agricultural Basin: *Scientifica*, Vol. 2012, Article ID 521931, 2012.

Jeffries KM, Nelson ER, Jackson LJ, Hamid HR, Basin-Wide Impacts of Compounds with Estrogen-Like Activity on Longnose Dace (*Rhinichthys Cataractae*) in Two Prairie Rivers of Alberta, Canada, *Environmental Toxicology and Chemistry*, Vol. 27, No. 10, pp. 2042–2052, 2008.

2) *The proposed CFO adversely affects public health and safety in and around Pigeon Lake due to the increased presence of harmful algal blooms and bovine enterococcus which produce toxins and bacteria harmful to people and animals*

The discharge of pollutants from the CFO operation, i.e., pens, catch basin and manure spreading, increase the risk of contamination in ground water, surface runoff and airborne pathogens.

Annual testing by Alberta Health Services (AHS) at Pigeon Lake has identified two public health risks for residents and visitors - Blue green algae and fecal bacteria. Health warning trigger beach closures, limits water recreation, and prevents fishing.

- AHS issued water quality advisories for Zeiner Park Beach due to elevated levels of fecal bacteria in 2019 and 2021.
 - PCR Ruminant contaminants were found by AHS with the analysis of enterococcus data associated with the fecal bacteria warning in 2021
 - These health advisories warn gastrointestinal illness may result from ingestion of the water as well as the possibility of skin, ear and eye infections with water contact. Zeiner Park Beach is downstream from the proposed CFO.
- AHS issues the most recent Blue-Green Algae health warning in 2021. Blue Green Algae (cyanobacteria), can release toxins that are harmful for humans, pets and livestock.

3) The proposed CFO adversely effects downstream conservation and recreational sites

Tide Creek and Sunset Harbour Creek are environmentally sensitive water bodies that drain from the applicant's property to Pigeon Lake. The conservation lands are identified in Figure 1 and include: Pigeon Lake Conservation Area (D3-89) NE-15-047-02-W5M, George and Joan Mitchell Memorial Conservation Area (D3-26) NW-14-047-02-W5M, Pigeon Lake Provincial Park, and Zeiner Park (Figure 1). Alberta Environment and Parks manages or works in partnership with conservation groups to manage all of these sites.

Environmentally Sensitive Sites – Adverse Effects

- The northeast area proposed in the CFO application for manure spreading is within the Tide Creek drainage basin and is located approximately 1000 meters from the boundary of the nearest conservation area.
- Drainage courses penetrate each of the quarter sections proposed for the CFO and the manure spreading.
- Tide Creek at Sunset Harbour Creek are important spawning area for walleye, northern Pike and suckers. Branches of the creeks drain from the proposed areas where manure will be spread.
- The conservation areas are home to wildlife including white-tail deer, moose, black bear and grouse.
- The Pigeon Lake Provincial Park is directly east and downwind of the CFO operation and manure spreading area. Prevailing westerly winds increase the risk of carrying airborne odour and pathogens into the campground, potentially affecting visitor experience and respiratory health.

The applicant does not show drainage courses, ground topography and required setbacks from drainage courses and the ephemeral channels. Drainage courses are published by the Government of Alberta in base features maps for the site. The application does not demonstrate how the drainage courses will be protected from nutrient rich runoff.

4) *The proposed CFO undermines prior regional and provincial efforts to mitigate nutrient release in the watershed and improve water quality in Pigeon Lake:*

Millions of dollars have been invested by the Province of Alberta, in concert with the local municipalities and individual ratepayers, to clean up Pigeon Lake. These investments will be undermined by the addition of a CFO operation in the Pigeon Lake watershed.

Regional Waste Water System

Regional municipalities have collaboratively worked toward removing human waste generated nutrient sources from Pigeon Lake through the development of regional wastewater systems. Efforts began in the mid-1980's with the establishment of the Northeast Regional Wastewater Commission and sewer connections the northeast side of the lake. In the last decade, a regional trunk line and local collection systems were extended to south shore communities. All but a few septic fields were eliminated. The Province of Alberta has been a partner throughout and supported the initiative with major funding. Individual rate payers have had to invest in property connections to the new communal system.

Watershed Management

The municipalities have also worked together with the Pigeon Lake Watershed Association and the Province on developing and implementing a comprehensive Pigeon Lake Watershed Management Plan. The plan was together with a science-based technical report, was completed in 2018 and we now are in the fifth year of implementation.

Stewardship

Individual voluntary efforts to reduce nutrient release have occurred supported by community action initiatives of the Pigeon Lake Watershed Association.

5) *The proposed CFO does not align with Alberta's Water for Life Action Plan, the Pigeon Lake Watershed Management Plan or Municipal Regional and Statutory Plans*

The Pigeon Lake Watershed Management Plan was created to support Alberta's Water for Life Strategy to improve and maintain the health of our aquatic ecosystems by managing the cumulative impacts of point and non-point sources, promoting watershed management, and establishing water conservation objectives on all major basins. The *Pigeon Lake Watershed Management Plan 2018* is an intermunicipal commitment, adopted by the County of Wetaskiwin and requires due regard.

A confined feeding operation is not in alignment with the Pigeon Lake Watershed Management Plan,

- **Objective 2: Improve phosphorus management** for all land uses to achieve a net reduction in nutrient runoff and promote biodiversity.

- **New or Expanded Intensive Livestock Operations:** Statutory land use restrictions on new or expanded intensive livestock operations (including CFO's) are supported in this Watershed Management Plan

Statutory Plans

All relevant statutory plans identify environmental protections as a priority and recognize the vulnerability of Pigeon Lake and its watershed. These plans recognize that environmentally sensitive lands need to be protected to support a high-quality life of people around the lake.

Leduc County / County of Wetaskiwin No. 10 Intermunicipal Development Plan Bylaw 2018/08

- Section F.1.f.i. Within both Counties there are environmental sensitive area around Pigeon Lake, Wizard Lake and Coal Lake.
- Section K.6. Environmental Matters: Both Counties agree that collaboration and cumulative impact analysis may be required when considering future development around the lakes within the Plan Area

Municipal Development Plan - County of Wetaskiwin No. 10

- Statement of Purpose: The County of Wetaskiwin will strive to maintain a balanced approach to diverse development while protecting our agricultural heritage and rural environment.
- Planning Direction:
Section 1: To maintain a clean environment - to support development so long as there is no negative impact on air, natural resources, water or soil quality;
- Environmental Protections:
Section 3: Protecting the natural environment from over-development is another focus of this Plan. Concerns regarding lake water contamination, fish population decrease and ground water decline were expressed by the public during the Plan preparation.

County of Wetaskiwin Land Use Bylaw related to CFOs, found at:

<https://www.county.wetaskiwin.ab.ca/630/Bylaw-Department>

- Section 9.6.1: Confined Feeding Operations (CFOs) are regulated by the Agricultural Operations Practices Act (AOPA) and under the jurisdiction of the province. As such, CFOS are required to obtain provincial permits as regulated by AOPA and Associated regulations; however, it is the County's intent that any negative effect from CFOs should be minimized. The Municipal Government Act required the municipality to identify where new CFOs should locate. (Amended by Bylaw 2019/44)
- Section 9.6.9: In accordance with Object 1.4 of the County's Municipal Development Plan, A development permit for an existing, expanding or proposed intensive livestock operation may be refused if the proposed development is within: c) all other unspecified

environmental features, including but not limited to lakes not specified in (b), wetlands, and watercourses shall have setbacks in accordance with Alberta Operations Practices Act and Regulation (AOPA) as amended.

Other related planning documents:

- *Large-scale confined animal operations are not appropriate in the Pigeon Lake watershed.* County of Wetaskiwin, Pigeon Lake Watershed Area Concept Plan, section 5.5.2 Agriculture, Located at: <http://www.communityconserve.ca/wp-content/uploads/2017/05/County-of-Wetaskiwin-Pigeon-Lake-Watershed-Area-Concept-Plan-Excerpts.pdf>.

Pigeon Lake municipalities have completed two Intermunicipal Development Plans (IDP) within the Pigeon Lake Watershed that embed the goals of the Plan. The Pigeon Lake South Intermunicipal Development Plan (PLSIDP), is nearing completion and will closely follow the precedents of the other approved IDPs.

6) The proposed CFO application does not address water diversion based on the requirements of the Water Act

Water wells identified on the application are used for the current operation. Water well placement and draw for the new CFO are not identified. Without disclosure of water wells for the proposed application, a complete environmental risk screening, which is required for all NRCB CFO applications cannot be completed.

Water conservation objectives i.e., the protection of the Sunset Harbour Creek and Tide Creek, which drain from designated manure spreading areas through neighbouring lands and conservation land, as a natural water body and their aquatic environment, and for the protection of tourism, recreation, and fish management under the Water Act, must be addressed for consideration under the Environmental Protection and Enhancement Act.

Request Referral Agency Involvement

The NRCB approval officer required to consider and address all responses from the referral agencies, the following agencies, information, and reports should be included:

- 1. Alberta Health Services:**
 - a. Enterococcus Health Advisory data from eDNA beach sampling analysis (2019 and 2021) including analysis of the enterococcus data in 202, which indicates evidence of PCR Ruminant contaminants.
 - b. Blue green algae health advisory for 2021 and any additional years.
- 2. Alberta Environment and Park:**
 - a. Pigeon Lake Water Quality Reports from 2012-2013.

3. **Alberta Conservation Area, Alberta Fish and Game Association, Zone 3 Fish and Game clubs and Alberta Environment and Parks** as managers of the Pigeon Lake conservation area and the George and Joan Mitchell Memorial conservation area, which are located two quarter section downstream of the CFO by 1000 meters or less.
4. **Alberta Parks** should be asked to provide an impact assessment on Pigeon Lake Provincial Park and Zeiner Park. Both include conservation land in the drainage basins where 16 quarters have been designated for manure spreading.
5. **Alberta Fisheries and Wildlife** should be contacted to provide an explanation on the most recent fish kill at Pigeon Lake as well as the Pigeon Lake FIN Summary 2020.

The Pigeon Lake Watershed Association requests the Natural Resources Conservation Board deny Application RA21045 for a Confined Feeding Operation based on the adverse effects listed in this report.

Appendix 2

2013 Pigeon Lake Stream Chemistry Data

Sample No.	Station No.	Station Name	QC Sample?	Sample Date	Oxygen Dissolved (Field Meter) (mg/L)	Oxygen Dissolved (Winkler) (mg/L)	pH (Field) (pH units)	Phosphate Dissolved Ortho (mg/L)	Phosphorus Total (P) (mg/L)	Phosphorus Total Dissolved (mg/L)	Residue Filterable (mg/L)	Residue Nonfilterable (mg/L)	Specific Conductance (Field) (uS/cm)	Temperature Air (Deg C)	Temperature Water (Deg C)	Turbidity (Visual) At Site (n/a)
13SWE02755	AB05FA2040	Grandview Heights Creek	N	26-Apr-13	4.16		7.57	0.113	0.214	0.171	157	5	195.7	16	6.5	0
13SWE02751	AB05FA2025	Mitchell Beach Creek	N	25-Apr-13	10.68		7.16	0.289	0.4	0.333	114	10	213.4	12	0.4	0
13SWE02758	AB05FA2025	Mitchell Beach Creek	N	2-May-13	7.37		6.83	0.0258	0.137	0.0728	252	L3	372		3.13	0
13SWE02768	AB05FA2025	Mitchell Beach Creek	N	6-May-13	7.12		6.68	0.0211	0.0936	0.0427	234	66	370.9	21	6.54	0
13SWE02776	AB05FA2025	Mitchell Beach Creek	N	13-May-13	6.75		7.54	0.023	0.0598	0.0371	245	L3	409	17	9.85	0
13SWE02780	AB05FA2025	Mitchell Beach Creek	N	27-May-13	6.27		7.29	0.0269	0.0637	0.0481	249	L3	420.9	15	11.26	0
13SWE02822	AB05FA2025	Mitchell Beach Creek	N	10-Jun-13	4.6		7.33	0.0318	0.0678	0.0475	348	L3	514	14	10.27	0
13SWE06622	AB05FA2025	Mitchell Beach Creek	N	24-Jun-13	4.1		7.16	0.0213	0.0811	0.0443	376	L3	567.7	17.7	12.02	0
13SWE06675	AB05FA2025	Mitchell Beach Creek	N	8-Jul-13	3.21		7.04	0.0126	0.166	0.0279	436	L3	666.7	21.3	12.42	0
13SWE06704	AB05FA2025	Mitchell Beach Creek	N	16-Jul-13	4.47		7.2	0.0334	0.102	0.0482	380	L3	589	16.7	10.99	0
13SWE06733	AB05FA2025	Mitchell Beach Creek	N	22-Jul-13	6.88		7.06	0.0184	0.143	0.0524	435	8	661	17.1	18.15	0
13SWE02754	AB05FA2045	Norris Beach Creek	N	26-Apr-13	10.74		7.5	0.0784	0.164	0.113	162	25	212.3	16	4.96	1
13SWE02762	AB05FA2045	Norris Beach Creek	N	2-May-13	10.92		7.4	0.0341	0.108	0.0745	231	5	346		8.11	1
13SWE02763	AB05FA2045	Norris Beach Creek	Y (temporal triplicate)	2-May-13				0.0404	0.107	0.0752	236	8				
13SWE02764	AB05FA2045	Norris Beach Creek	Y (temporal triplicate)	2-May-13				0.0426	0.108	0.0771	228	10				
13SWE02760	AB05FA2055	Pigeon Lake Creek	N	2-May-13	13.78		8.34	L0.001	0.031	0.0076	97	L3	144		3.1	0
13SWE02772	AB05FA2055	Pigeon Lake Creek	N	6-May-13	13.67		8.57	0.0061	0.0373	0.008	118	9	203.3	30	9.46	1
13SWE02779	AB05FA2055	Pigeon Lake Creek	N	13-May-13	10.32		7.74	0.0012	0.156	0.0115	168	109	281.6		9.49	0
13SWE02784	AB05FA2055	Pigeon Lake Creek	N	27-May-13			8.14	0.0037	0.0202	0.0053	189	4	321	23	13.75	0
13SWE02825	AB05FA2055	Pigeon Lake Creek	N	10-Jun-13	9.48		8.57	L0.001	0.26	0.0058	211	182	328.8		13.16	2
13SWE06629	AB05FA2055	Pigeon Lake Creek	N	24-Jun-13	10.11		8.56	L0.001	0.0198	0.0066	190	5	322	23.9	20.59	1
13SWE06682	AB05FA2055	Pigeon Lake Creek	N	8-Jul-13	10.12		8.72	L0.001	0.0179	0.0075	193	L3	316	26.2	19.22	0
13SWE06711	AB05FA2055	Pigeon Lake Creek	N	16-Jul-13	10.96		8.65				197	111	317		22.51	2
13SWE06740	AB05FA2055	Pigeon Lake Creek	N	22-Jul-13	9.39		8.55	0.001	0.0245	0.0069	198	L3	324	20	20.08	0
13SWE06792	AB05FA2055	Pigeon Lake Creek	N	6-Aug-13	8.82		8.57	L0.001	0.0261	0.0077	204	L3	325	21.7	20.87	0
13SWE06960	AB05FA2055	Pigeon Lake Creek	N	20-Aug-13	9.65		8.84	L0.001	0.0433	0.0071	179	4	268	19	19.37	0
13SWE07009	AB05FA2055	Pigeon Lake Creek	N	3-Sep-13	9.34		8.6	L0.001	0.0261	0.0081	204	L3	312	19.8	20.88	0
13SWE07040	AB05FA2055	Pigeon Lake Creek	N	17-Sep-13	8.77		8.38	L0.001	0.238	0.009	185	76	325	18.8	17.74	2
13SWE07041	AB05FA2055	Pigeon Lake Creek	Y (temporal triplicate)	17-Sep-13				0.0031	0.111	0.0118	185	174				
13SWE07042	AB05FA2055	Pigeon Lake Creek	Y (temporal triplicate)	17-Sep-13				L0.001	0.189	0.0085	188	212				
13SWE02752	AB05FA2035	Poplar Bay Creek	N	25-Apr-13	11.49		7.49	0.0526	0.263	0.0814	171	112	214.5	13	0.68	3
13SWE02766	AB05FA2035	Poplar Bay Creek	N	2-May-13	9.84		7.05	0.0185	0.127	0.0593	239	18	398.9		8.01	1
13SWE02771	AB05FA2035	Poplar Bay Creek	N	6-May-13	8.29		7.45	0.0197	0.124	0.0353	276	17	456.4	30	15.06	1
13SWE02783	AB05FA2035	Poplar Bay Creek	N	27-May-13	8.35		7.47	0.0421	0.132	0.068	255	16	417.1	24	12.12	0
13SWE06708	AB05FA2035	Poplar Bay Creek	N	16-Jul-13	8.09		7.66	0.0787	0.214	0.114	272	16	403	23	17.74	2
13SWE02753	AB05FA2030	Sunset Harbour Creek	N	25-Apr-13	11.58	11.1	7.55	0.0481	0.211	0.0844	157	82	197.5	13	2.11	3
13SWE02765	AB05FA2030	Sunset Harbour Creek	N	2-May-13	11.28		7.53	0.0198	0.0955	0.0526	209	11	314.7		4.86	0
13SWE02770	AB05FA2030	Sunset Harbour Creek	N	6-May-13	9.76		7.57	0.0218	0.0889	0.0445	243	12	377	30	10.01	0
13SWE02778	AB05FA2030	Sunset Harbour Creek	N	13-May-13	8.83		7.56	0.0102	0.0734	0.0301	270	4	447.5	19	11.39	0
13SWE02782	AB05FA2030	Sunset Harbour Creek	N	27-May-13	9.28		7.61	0.0324	0.102	0.0453	270	7	416.7	17	10.02	0
13SWE02824	AB05FA2030	Sunset Harbour Creek	N	10-Jun-13	7.99		7.91	0.0141	0.112	0.0354	298	13	448.2	14	12.58	0
13SWE06625	AB05FA2030	Sunset Harbour Creek	N	24-Jun-13	6.85		7.75	0.0293	0.108	0.0514	289	7	455.6	20.3	16.42	0
13SWE06678	AB05FA2030	Sunset Harbour Creek	N	8-Jul-13	6.74		7.68	0.0329	0.147	0.0581	338	8	519	17.5	15.3	1
13SWE06707	AB05FA2030	Sunset Harbour Creek	N	16-Jul-13	8.33		7.62	0.05	0.135	0.0762	239	10	363	21.3	15.1	2
13SWE06736	AB05FA2030	Sunset Harbour Creek	N	22-Jul-13	6.15		7.54	0.0556	0.209	0.091	294	7	440	19.1	17.21	1
13SWE06956	AB05FA2030	Sunset Harbour Creek	N	20-Aug-13	6.65		7.6	0.0388	0.213	0.0677	320	7	509	16.2	15.04	0
13SWE02757	AB05FA2027	Tide Creek	N	30-Apr-13	9.17		7.25	0.0296	0.11	0.0629	147	4	169		4.26	0
13SWE06706	AB05FA2027	Tide Creek	N	16-Jul-13	1.35		7.26	0.0593	0.153	0.101	229	3	305	22.6	14.7	2
13SWE02756	AB05FA2047	Zeiner Creek	N	26-Apr-13	9.96		7.13	0.0811	0.145	0.106	228	L3	309.5	15	0.36	0
13SWE02759	AB05FA2047	Zeiner Creek	N	2-May-13	7.74		6.82	0.045	0.148	0.0653	274	7	390.6		0.95	0
13SWE02769	AB05FA2047	Zeiner Creek	N	6-May-13	6.45		6.72	0.0709	0.107	0.0896	286	L3	405.2	20.6	4.48	0
13SWE02777	AB05FA2047	Zeiner Creek	N	13-May-13	5.92		7.03	0.0527	0.0736	0.0652	298	L3	456.2	19	7.97	0
13SWE02781	AB05FA2047	Zeiner Creek	N	27-May-13	5.91		7.29	0.092	0.144	0.134	279	L3	412.3	19	6.88	0
13SWE02823	AB05FA2047	Zeiner Creek	N	10-Jun-13	5.4		7.45	0.101	0.145	0.115	356	L3	502.5	14	8.77	0
13SWE06623	AB05FA2047	Zeiner Creek	N	24-Jun-13	4.68		7.14	0.193	0.303	0.295	315	L3	420.6	18.9	11.18	0
13SWE06676	AB05FA2047	Zeiner Creek	N	8-Jul-13	3.93		7.36	0.148	0.279	0.194	403	21	575	17.8	11.83	1
13SWE06705	AB05FA2047	Zeiner Creek	N	16-Jul-13	4.73		6.95	0.192	0.284	0.26	326	L3	424	21.3	10.22	1
13SWE06734	AB05FA2047	Zeiner Creek	N	22-Jul-13	4.25		7.25	0.275	0.326	0.313	389	L3	552	17.8	14.04	1
13SWE07043		Field Blank	Y (field blank)	17-Sep-13				L0.001	L0.001	L0.001	L10	L3				
13SWE07044		Trip Blank	Y (trip blank)	17-Sep-13				L0.001	L0.001	L0.001	L10	L3				



Site Location: Pigeon Lake
Your C.O.C. #: 46414

Attention: BRADLEY PETER

Alberta Environment and Parks c/o ALMS
4816-89 Street
Edmonton, AB
CANADA T6E 5K1

Report Date: 2022/03/28
Report #: R3152820
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C218604

Received: 2022/03/23, 10:40

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Total Phosphorus-Dissolved-Lab Filtered (1, 2)	4	2022/03/25	2022/03/25	AB SOP-00024	SM 23 4500-P A,B,F m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8

(2) Dissolved Phosphorus > Total Phosphorus Imbalance: When applicable, Dissolved Phosphorus and Total Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Amanda L'Hirondelle, Key Account Specialist
Email: Amanda.lhirondelle@bureauveritas.com
Phone# (780)577-7117

=====
This report has been generated and distributed using a secure automated process.

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For Service Group specific validation please refer to the Validation Signature Page.



Alberta Environment and Parks c/o ALMS
 Attention: BRADLEY PETER
 Client Project #:
 P.O. #:
 Site Location: Pigeon Lake

Sample Description : Sun H, #2
 Sample Date & Time : 2022/03/21 15:00
 Sampled By : ALM
 Sample Type :
 Sample Received Date : 2022/03/23
 Sample Station Code :

Bureau Veritas Sample Number : AQL759
 Bureau Veritas Job Number : EC218604
 Sample Access :
 Sample Matrix : Water
 Report Date : 2022/03/28

PARAMETER DESCRIPTION	Results	UNITS	INST.	VMV Code	QA/QC BATCH	RDL	DL
Lab Filtered Nutrients							
Dissolved Phosphorus (P)	0.22	mg/L	KONE	2010	A535183	0.0030	0.0030

DL = The lowest concentration that will be reported for a specific test
 RDL = Reportable Detection Limit – Calculated on the basis of the detection limit, the dilution used, and the weight of the sample
 Good Condition



Alberta Environment and Parks c/o ALMS
 Attention: BRADLEY PETER
 Client Project #:
 P.O. #:
 Site Location: Pigeon Lake

Sample Description : RR 22, North, #1
 Sample Date & Time : 2022/03/22 16:00
 Sampled By : ALM
 Sample Type :
 Sample Received Date : 2022/03/23
 Sample Station Code :

Bureau Veritas Sample Number : AQL761
 Bureau Veritas Job Number : EC218604
 Sample Access :
 Sample Matrix : Water
 Report Date : 2022/03/28

PARAMETER DESCRIPTION	Results	UNITS	INST.	VMV Code	QA/QC BATCH	RDL	DL
Lab Filtered Nutrients							
Dissolved Phosphorus (P)	2.0	mg/L	KONE	2010	A535183	0.075	0.0030

DL = The lowest concentration that will be reported for a specific test
 RDL = Reportable Detection Limit – Calculated on the basis of the detection limit, the dilution used, and the weight of the sample
 Good Condition