

Creating Healthy Lagoons with Waste Go

A Brazeau County Case Study

Region: Buck Creek, Alberta
Client: Brazeau County, Alberta
Year: 2018
Duration: 8 Weeks

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Executive Summary

Many wastewater lagoons suffer from excess sludge accumulation. Excess lagoon sludge can lead to higher effluent levels of BOD, TSS, ammonia, phosphorous and a host of other issues. Not to mention the unpleasant odors. With environmental regulations becoming ever tighter and the issuing of monetary penalties, wastewater lagoon treatment is a common challenge among wastewater operators.

To combat these issues, operators are left with minimal choices and are most commonly dredging their lagoons due to excess buildup of undigested sludge. The costs associated with dredging a lagoon and the disposal of sludge that hasn't been properly biodegraded can be extremely high. Treating a lagoon with Waste Go can restore its health, mitigate costs and postpone dredging for incredible lengths of time. Eventually, even the healthiest of wastewater lagoons will require dredging as their capacity will be met with biodegraded dry sludge. Dry sludge that has been properly treated with Waste Go will meet or exceed all environmental standards thus making it readily available for disposal without further treatment or penalties; saving the treatment facility substantial costs.

"Excess lagoon sludge can lead to higher effluent levels of BOD, TSS, ammonia, phosphorous and a host of other issues."

In this study, treating with Waste Go proved that in just 8 weeks, the health of a lagoon can be vastly improved. The increased sludge digestion achieved will prolong the time between dredging significantly by adding capacity with superior sludge settling. At a fraction of the cost of mechanical dredging, the Waste Go formula will change the way lagoon operators go about desludging and treating their wastewater lagoons.



Buck Creek wastewater lagoon aerial photo



Buck Creek wastewater lagoon Cell 1

Challenge

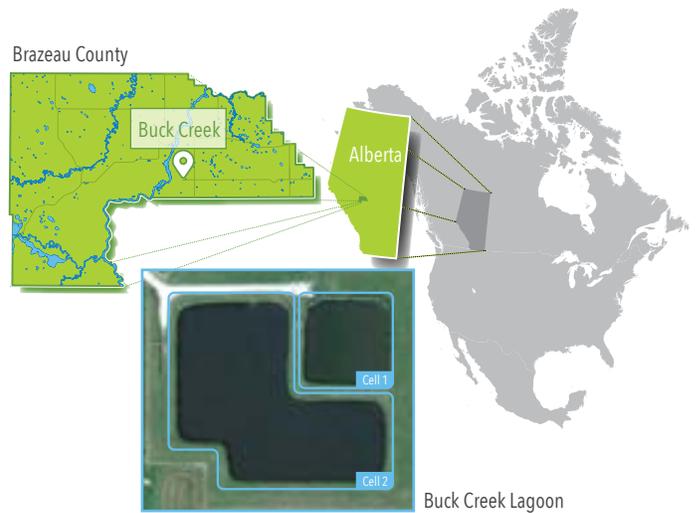
To deliver results without disruption to daily operations within an 8-week time frame. Show results including reductions in volatile sludge, BOD, TSS, Ammonia, Phosphorous, improved PH and more, in a fully operational non-aerated lagoon of Brazeau County's choosing.

To prove Waste Go is a viable and cost saving biological alternative to standard dredging and chemical additives, resulting in extended long-term lagoon health and functionality.

Location

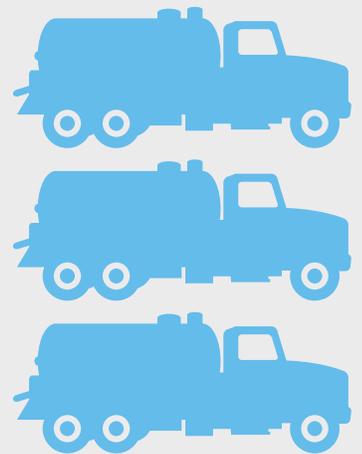
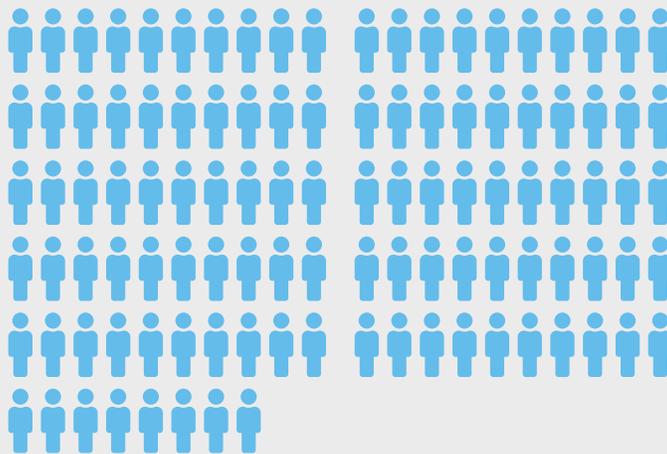
Buck Creek is a hamlet in central Alberta, Canada within Brazeau County.[1] It is located 3 km (1.9 mi) west of Highway 22, approximately 106 km (66 mi) southwest of Edmonton.

The number one cell receives daily wastewater from approximately 118 people and 3 septic trucks.



118 PEOPLE AND 3 SEPTIC TRUCKS

Approximate amount of waste water the number one cell receives daily



Test Methods

Provided by Hydrasurvey

Hydrasurvey uses sub-bottom profiling technology and RTK GNSS positioning to map both the top of sludge layer and lagoon bottom. Hydrasurvey uses both an infrared sludge interface detector and a sludge judge to correlate actual field measurements with acoustic reflectors measured using the sub-bottom profiler. Hydrasurvey also collects sludge samples and tests them for total solids and total volatile solids for computation of dry material volumes.

Sludge Survey Equipment:

Vessel: Inshore survey vessel (Commercial grade inflatable) outfitted with survey system mount and electric motor

Positioning: RTK Base and Rover GNSS system

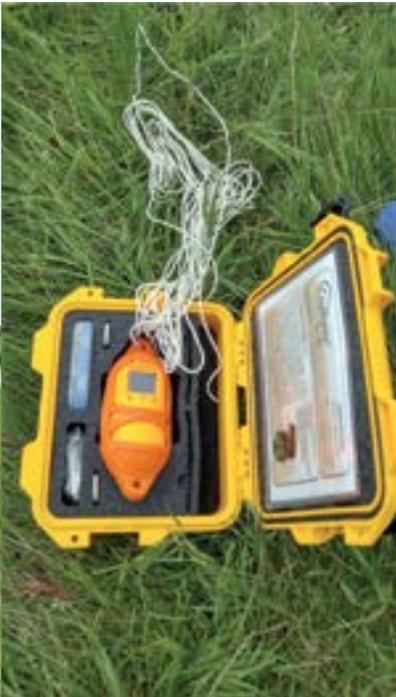
Sonar: Mutli-frequency sub-bottom profiler (High Frequency at 100kHz, Low Frequencies at 15kHz, 12kHz, 10kHz, 8kHz, 6kHz, 5kHz and 4kHz)

Sound Velocity: Portable sound velocity profiler (temperature, depth, conductivity)

Sludge measurement devices: Infrared sludge interface detector, sludge judge and Ekman grab sampler



RTK Base Station



Sound Velocity Profiler



Sub Bottom Profiler

Treatment Plan

Inoculation using Waste Go of Cell 1 at Buck Creek for 5 days. Desludging dosage of Waste Go for 20 days thereafter. It is important to note that the desludging process will continue long after the desludging dosage is applied, depending on temperature and added wastewater content conditions. A weekly maintenance dosage is required to keep the process ongoing.

The recommended dosage to be split between the two application points; Septic Truck Receiving Station and the Manhole Structure that receives wastewater from Hamlet.



Applying Waste Go to lagoon

Inoculation Phase:

10 pails of Waste Go mixed with water applied each day for 5 consecutive days.

10 PAILS
APPLIED DAILY FOR
5 CONSECUTIVE DAYS



Weekly Dosage:

5 pails of Waste Go (mixed with water) applied each week for 4 weeks (20 pails total).

5 PAILS
APPLIED WEEKLY
FOR 4 WEEKS



Application to rest for 3 weeks without pump operation before final test samples taken. Maintenance dosage will be determined by flow rate after the test phase is completed.

Application Time for Operator(s):

During the inoculation phase
(1st week) 2 hours

Application time after inoculation
30 minutes



Note:

The Buck Creek Lagoon system consists of a primary (cell 1) and secondary (cell 2) non-aerated ponds. Only cell 1 received treatment during this study.

*Augmented results When Aeration is not available,
add a 2-4" pump during application which will provide
the lagoon with excellent circulation.*

Additional Setup

Cell 1 was outfitted with two pumps. A 4 inch for application/circulation and a 2 inch strictly for circulation. They ran 5 days a week for the duration of the application.



4 inch pump



Pump Locations

2 inch pump

4 inch pump

Application Notes

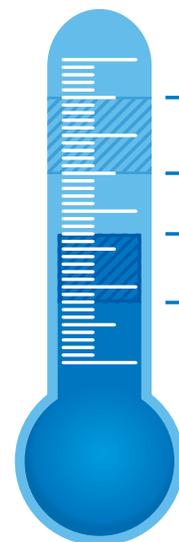
Before discussing the findings, it is worth noting that the following results were taken after only 7 weeks instead of 8, due to unexpected poor weather conditions. While biological action was still occurring in the lagoon, we thought it better to take the test samples early due to below freezing temperatures and snowfall occurrences.

It is also worth mentioning that biological products have a much better chance at delivering results in optimal air temperatures from 35 to 45 Celsius and water temperatures from 25 to 35 Celsius.

Waste Go delivered impressive results in average weekly air temperatures ranging from 18.6 to 0.3 Celsius and weekly water temperatures ranging from 17.1 to 7.8 Celsius.

Waste Go delivered impressive results at more than

17°C
BELOW
OPTIMAL WATER
TEMPERATURES



optimal water temperature 25 to 35°C

Water temperature ranged from 17.1 to 7.8°C

Tip: Maintenance dosages can be applied via manhole or lift-station upstream; keeping pumps and mains clean as an added benefit. These dosage locations can provide year round convenience and warmer temperatures during colder months.

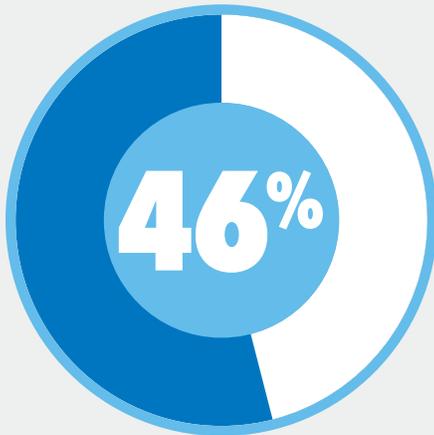


Results

Waste Go was successfully applied without any disturbance to daily operation of the lagoon. No bypasses or shutdowns were required during the Waste Go Treatment Plan.

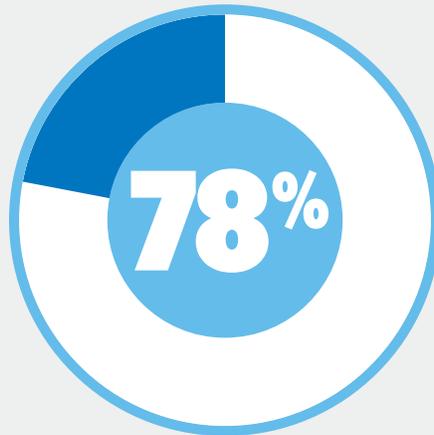
Water Quality – Following the five-week Waste Go Treatment Plan and two weeks of rest, Exova reported the following:

BOD REDUCTION



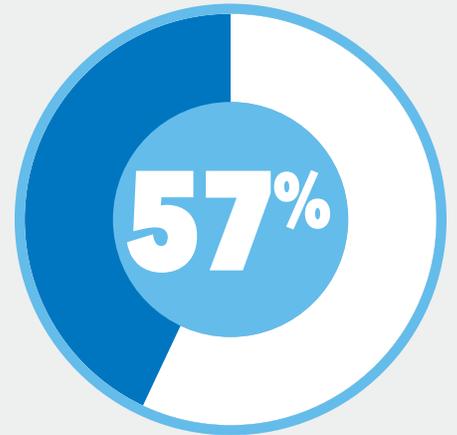
Biochemical Oxygen Demand

FOG REDUCTION



Fats, Oil and Grease

TSS REDUCTION



Total Suspended Solids

A small adjustment in pH towards neutral was measured accounting for a drop of .24 to 7.79. Waste Go has a built-in stabilizer which over time should help neutralize the lagoon.

Inorganic Non-metallic Parameters are not considered important in this study as Waste Go is not formulated to cause an effect in such regards. Waste Go is only formulated to interact within Organic Metallic Parameters.

The floating scum layer was eliminated and an increased total volume of dry sludge to be removed by 22.7m³ was achieved.

Results (continued)

Sludge Amounts - After five weeks of treatment, two weeks of settling and constant delivery of daily wastewater, the Hydraulic Capacity of Cell 1 was increased by 6 cubic meters (m³) due to the digestion of the estimated volume of wet sludge to be removed. Effectively, Waste Go digested a cubic meter of wet sludge per week.

The lagoon achieved much better settling and a total decrease in volatile solids of 16%. The floating scum layer was eliminated and an increase in total volume of dry sludge to be removed by 22.7m³ was achieved.



6 CUBIC METRES

The increased Hydraulic Capacity of Cell 1 due to digestion of wet sludge

This is beneficial as it means the lagoon has settled better and has fewer volatile solids; eventually hauling away much less capacity. This dry sludge is fully biodegraded and is considered a high-quality sludge.

The total estimated dry volatile solids quantity increased by 6m³ due to the digestion of wet sludge.

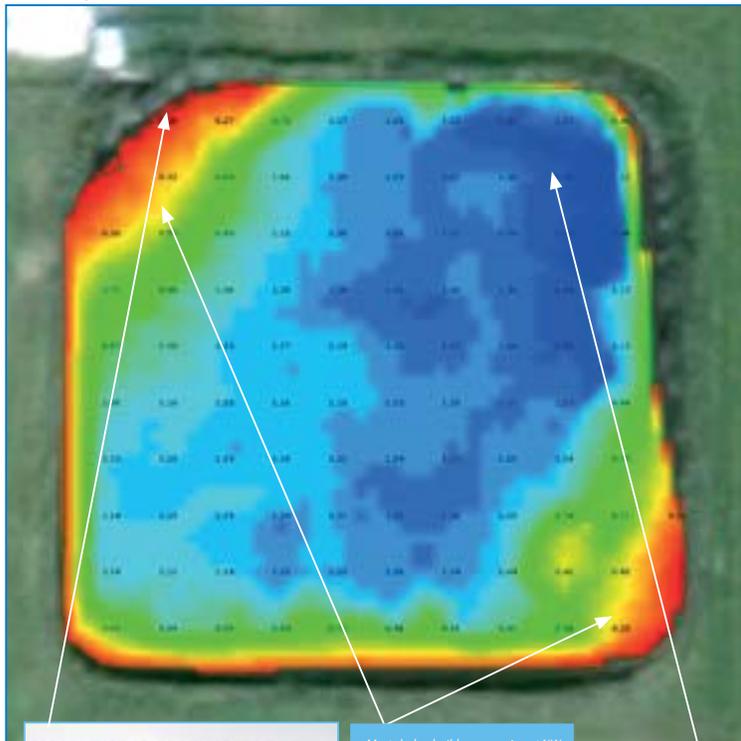
September 8th - The Scum layer is gone



Results (continued)

Detailed Sludge Survey Findings

Initial survey August 7, 2018 Figure 1A - Cell 1 depths to top of sludge (m)



Most sludge build-up occurring at NW and SE corners. Forcemain inlet enters lagoon at SE corner and vac truck dump area is at NW corner.

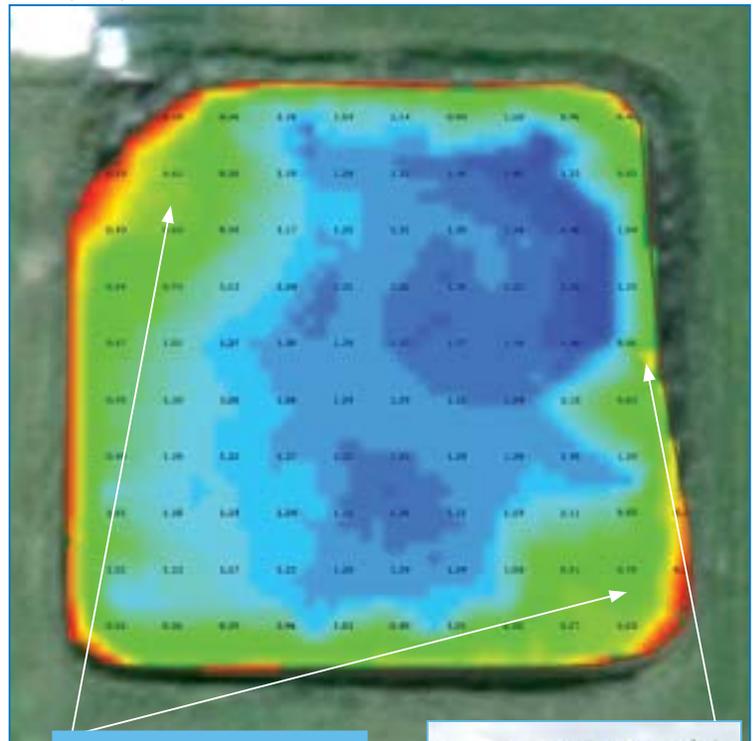


Cattails are growing out into the lagoon along the north shore. The image to the left shows the vac truck dump area with metal sheet piling and cattail growth into lagoon.



A floating layer of scum is present on the lagoon at the NE corner.

Follow-up survey October 1, 2018 Figure 1B - Cell 1 depths to top of sludge (m)

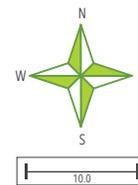


Most sludge build-up occurs at NW and SE corners. Forcemain inlet enters lagoon at SE corner and vac truck dump area is at NW corner. When probing at these locations the sludge feels significantly more dense than at other locations in this lagoon. Better mixing in these areas may help to digest sludge. However, there appears to be a notable reduction of sludge in both these locations.



There was no apparent floating layer of scum on cell 1 any longer. Cattails and vegetation were removed since the initial survey. The image above is looking north along the east shoreline of Cell 1.

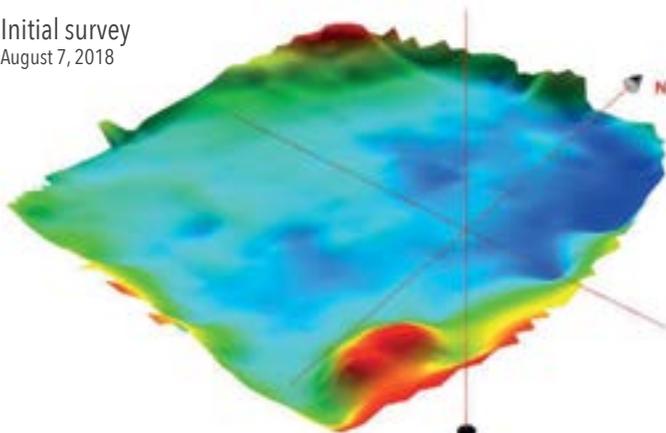
0.00	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.38	1.44	1.50
0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.38	1.44	1.50	1.56



Results (continued)

Detailed Sludge Survey Findings

Initial survey
August 7, 2018



Follow-up survey
October 1, 2018

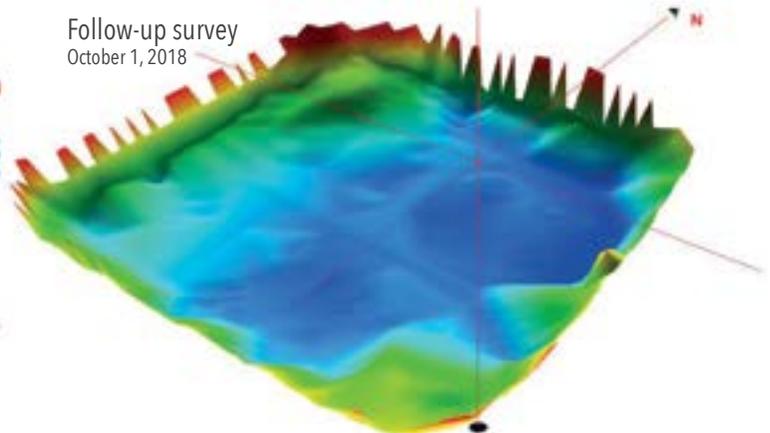


Figure 2 - Cell 1 top of sludge before and after 3D isometric view looking NW

As depicted by the imaging, you can see a noticeable reduction of buildup in the northwest and southeast corners. This is due to Waste Go quickly digesting volatile sludge.

Total solids increased due to the superior settling and the reduction of volatile solids by the Waste Go formula. In fact, Waste Go nearly doubled the settling of the lagoon in just 7 weeks!

A major achievement of the preceding results is that we are now holding and settling significantly more solids within the same Lagoon capacity. The higher the concentration of these solids, the longer the Lagoon can operate without the need for mechanical dredging.

Sludge Quality - Per results, Nitrogen is down, and this is because Waste Go uses Nitrogen to operate. Ammonia Nitrogen is also down, and this is because Waste Go is using up the Nitrogen as a nutrient that typically becomes Ammonia Nitrogen.

Phosphorus, Chromium, Mercury, Nickel and Zinc, all show reductions and we can attribute this to Waste Go as our bacteria use the elements as nutrients during their life cycle.

Heavy metals may also look down due to weight/grouping and how the tests are taken. Waste Go is not formulated to reduce these metals, but we usually see a reduction as we do here when treating lagoons.

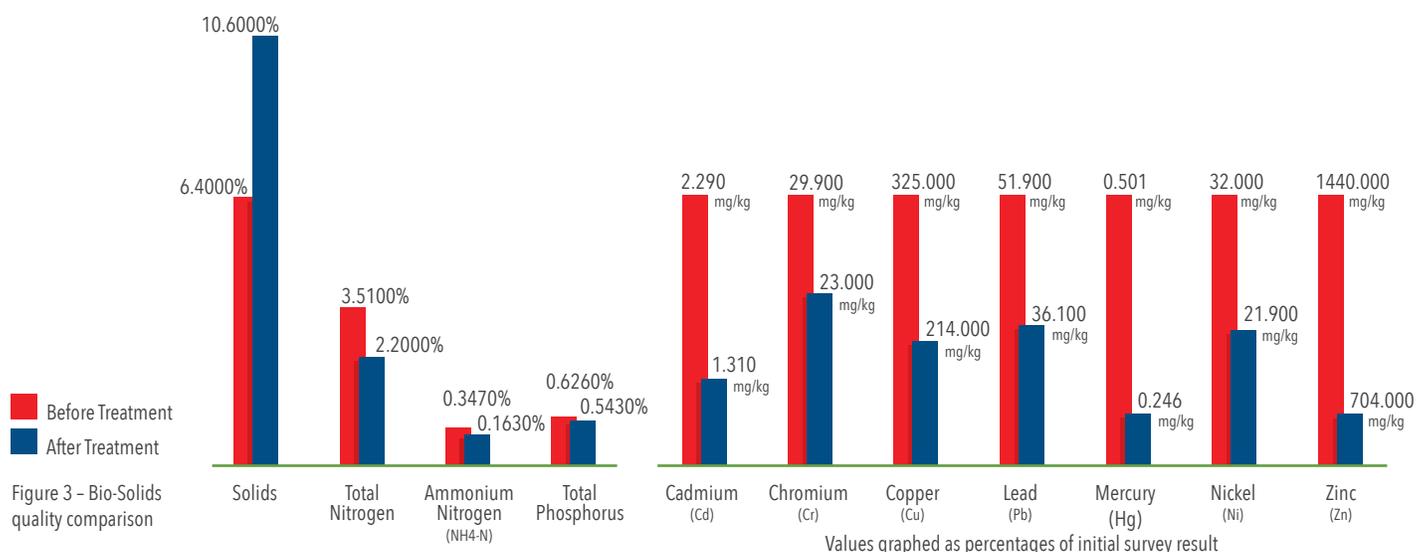
Odor Control - Due to Waste Go digesting the Nitrogen that would have become the Ammonium Nitrogen that produces the unpleasant odors typically associated with wastewater lagoons, operators detected a drop-in odor of over 60% in just 7 weeks. Although no scientific metering devices were used, operators noted that at the beginning of treatment, odor was at what they described as 8/10. During the 7th week of observation, odors had reduced to 2/10. As they say, the nose knows best.

“Even with the colder temperatures while de-sludging Buck Creek lagoon, we observed good results. We are planning on using this product in the future to meet our lagoon de-sludging needs.”

-Darcy Mulroy, Utilities Supervisor

Results (continued) Bio-Solids Quality Report

Overall, the sludge quality report shows us a much healthier lagoon system.



Soil Matrix

Positive results were also found within the matrix tests. Waste Go reduced:

- Kjeldahl by 1.31
- Good reduction in Strong Acid Leachable Metals
- **Ammonia was reduced by more than half from 3470 to 1630.**

Cell 2 Enhancements

Cell 2 Volatile Solids cut by 50% without direct treatment! Dry and volatile sludge were lower per lesser amounts of solids transferring from cell 1 due to the excellent biological breakdown while treating with Waste Go.

50%
AMOUNT VOLATILE SOLIDS REDUCED IN CELL 2 WITHOUT DIRECT TREATMENT

Water depth also increased while the lagoon operated at normal capacity levels. An increase of 8 inches was recorded, showing a biological activity increase. We can confidently attest this increase to the fact that as Waste Go biodegrades sludge, water molecules are released. During the seven-week test, with limited precipitation, the results showed a big increase in Hydraulic Capacity. This increase was achieved in a short period of time due to the biological activity of Waste Go.

*While eliminating the need for mechanical dredging,
Waste Go will keep Buck Creek healthy for 15 years (est.)*

Cost comparison Mechanical VS Waste Go

There are a few different methods of lagoon dredging, all of which involve mechanically removing sludge from the lagoon. Once the sludge is removed, it is dried and is transported to either a landfill or a land application facility. This is extremely laborious, costly and disruptive to regular operations. Recently quoted costs in Alberta, Canada were received at \$125,000.00 to dredge cell 1 at the Buck Creek Lagoon Facility.

Waste Go treatment will require an investment of \$40,000.00 - \$45,000.00 depending on the salaries of the Operator(s) in charge of application.



\$125,000

Estimate to dredge Cell 1

\$45,000

Estimated investment for Waste Go Treatment

For Buck Creek, this includes an estimated 80 pails of Waste Go in the first year of treatment and Operator costs. Other less obvious savings/benefits include non-disruption of service (Operator expenses) and exceeding environmental regulations.

To continue the treatment and ensure a long healthy life of the lagoon, Buck Creek will be required to add an estimated 8 - 12 pails per year plus application costs estimated at a total cost between \$5,000.00 - \$7,000.00 per annum.



Applying Waste Go to Cell 1



Cell 1 at beginning of treatment phase

Conclusion

Waste Go succeeded in delivering high quality results, in a short period of time and in less than optimal weather conditions. The overall health of the lagoon has been vastly improved. From the quality of the sludge and increased capacity of the lagoon, to the water quality and complete elimination of foul odors, cell 1 and 2 at Buck Creek have begun their journey to an increased life span and enhanced biological breakdown for as long as Waste Go is used. By increasing hydraulic capacity and creating a much healthier and environmentally friendly lagoon system, Waste Go will postpone mechanical intervention until capacity becomes limited. This limited capacity will be due to quality non-volatile dry sludge that will be harmlessly reabsorbed by the environment, with no special disposal required.

Waste Go has recommended a continuing maintenance dosage for Buck Creek that will see to the continued biological breakdown of sludge, new incoming wastewater and healthy water quality levels. Brazeau County will continue the dosage and Waste Go will have Hydrasurvey or another third-party lagoon tester to take new samples and tests at the end of summer 2019. This will prove that for a fraction of the cost of traditional treatments and mechanical dredging, Waste Go can be a long-term solution to a healthy lagoon system.

A much healthier lagoon after treatment





Acknowledgments

Thank you to the entire wastewater team from Brazeau County.

Special thanks to Darcy Mulroy and Rick Evans who shared our vision of creating healthier lagoons and helping give Waste Go the opportunity to prove it's effectiveness in an environment that all Canadian Operators can relate to.

Thank you to HydraSurvey for their timely and professional services prior to and after initial treatment.

Finally, a special thank you to our Western Canadian Waste Go Distributor, Mr. Norm Grexton (NGInc.) whose dedication, commitment and expertise in the field, contributed to this project above and beyond expectations.

All third party test data available in pdf format at:

<https://www.wastego.ca/pdf>



www.wastego.ca

1-866-286-5931



