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WASTE MANAGEMENT PLAN
MELIADINE WEST GOLD PROJECT

June 2007
Revised Sept. 2009

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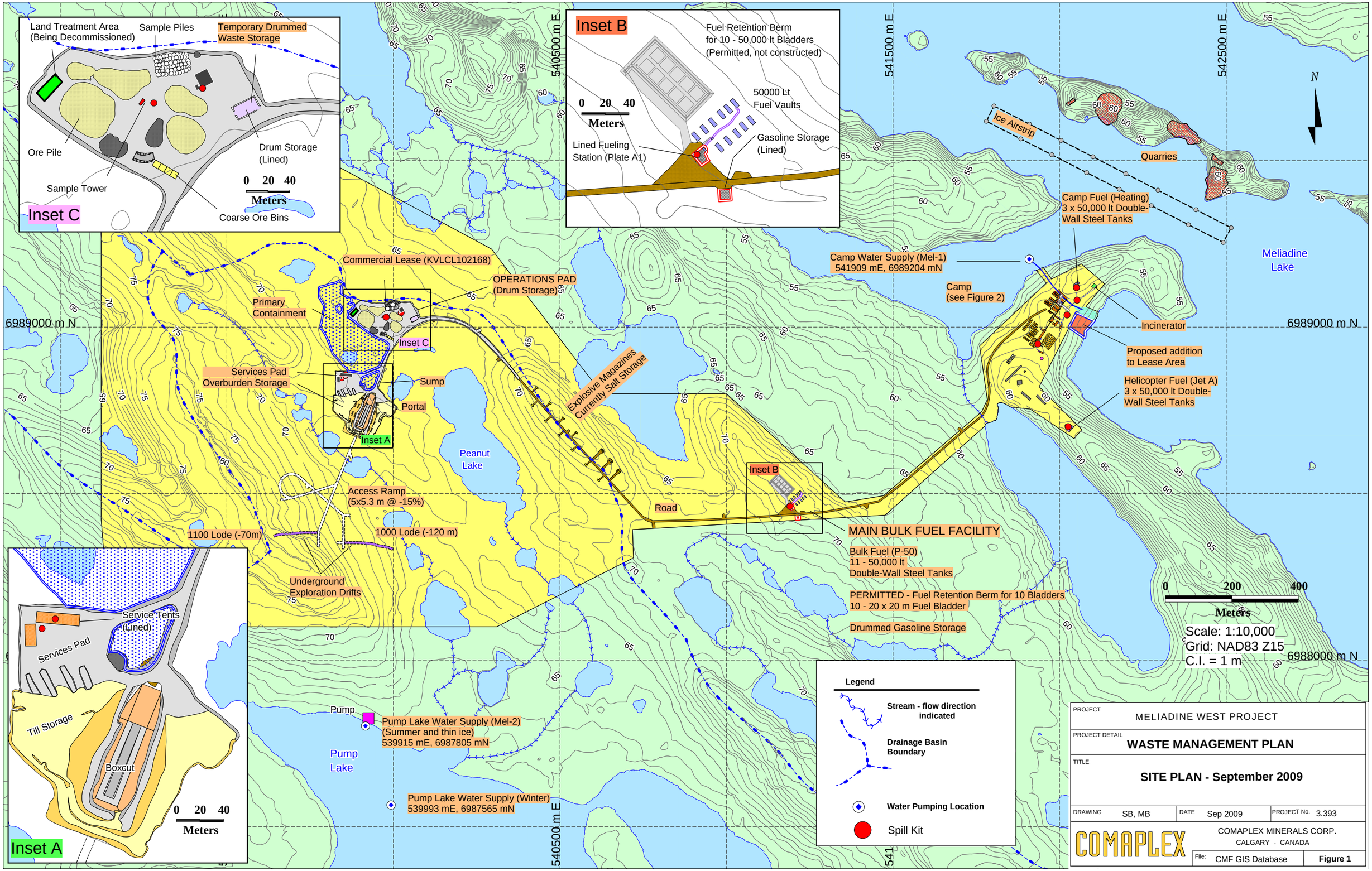
1.0 Introduction

This Waste Management Plan is designed to reduce adverse impacts on the environment at the Comaplex Minerals Corp. (CMF) Meliadine West exploration camp on Meliadine Lake, Nunavut. The plan is divided into two sections. Chapter 2 describes the proposed commissioning of a rotating biological contactor (RBC) wastewater treatment plant (BIODISK) to handle sewage wastes at the Meliadine West exploration camp. The installation of the unit is described and the operation of the treatment plant is summarized. Proposals are introduced for ongoing care and maintenance including an effluent sampling program and sludge disposal. Contingency plans are introduced in the event that the unit experiences difficulty achieving target effluent quality. Chapter 3 discusses other aspects of waste management at the camp including the operation of the on-site incinerator and the segregation of wastes designated for disposal off-site. This document is designed to comply with the terms and conditions for water use outlined in Nunavut Water Board License 2BB-MEL0914 issued to CMF July 31, 2009. A site plan showing the general layout of the Meliadine West exploration camp and associated infrastructure is given in Figure 1.



PROJECT	MELIADINE WEST PROJECT
PROJECT DETAIL	**WASTE MANAGEMENT PLAN**
TITLE	**SITE PLAN - September 2009**
DRAWING	SB, MB
DATE	Sep 2009
PROJECT No.	3.393

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File: CMF GIS Database | **Figure 1**

2.0 BIODISK Rotating Biological Contactor (RBC)

2.1 Introduction

Sewage wastes at the Meliadine Lake exploration camp are currently incinerated. Grey water from the dry and kitchen facilities pass through a sump and wetland system before reaching Meliadine Lake. CMF has proposed to replace this system with a RBC wastewater treatment system designed to handle both black and grey water and produce effluent in compliance with NWB water license 2BB-MEL0914. Over the fall of 2009 and the summer of 2010, CMF will commission the system in accordance with conditions detailed in water license 2BB-MEL0914, plans described in this document, the manufacturer's manuals and anticipated feedback from regulators. The existing system of incineration of black water and sump and wetland treatment of grey water will remain in place as a backup system for periods of low flow (mostly winter care and maintenance) and in the event that design modifications are required to bring the treatment system into compliance with the water license. These plans are detailed below.

2.2 Location and Construction

Figure 2 is a plan of the camp area showing the locations of elements described in this document. The RBC system has been positioned on the southeast side of the camp in a position amenable to the plumbing of influent piping from the wash car, the kitchen and the dry which contains showers and clothes washers. Figure 3 is a schematic giving details of the plumbing and elements of the water supply and waste water system installed at the camp. Freshwater is drawn from Meliadine Lake at location MEL1 and pumped to storage tanks in the dry. The water system is constructed to circulate water between the dry and the lakeshore pump to prevent freezing. A water meter is positioned between the intake and the tanks to measure camp water usage (Figure 3). A pressure pump draws water from the storage tanks and delivers water to either the dry for showers, sinks and washers, to the kitchen, or to the wash car. Discharge plumbing delivers used water from these facilities to a storage tank (collection well) adjacent to the BIODISK RBC treatment plant. A grinder pump within the collection well delivers a sewage/greywater slurry to the RBC unit and is operated by a system of float. The plumbing that delivers waste water to the RBC was completed during the summer of 2009.

Figure 4 shows the results of a detailed topographic plan completed during the summer of 2009. The survey was conducted to assist in the design and construction of a post-treatment sump and wetland system to receive effluent from the RBC unit. The plan shown on Figure 4 has yet to be constructed. The plan takes advantage of natural topography in the retention of effluent in a sump and downstream storage pond that will assist in ensuring the delivery of acceptable discharge to Meliadine Lake. Execution of this plan will also entail the abandonment and restoration of the existing sump and wetland area.

PROJECT
MELIADINE WEST PROJECT

PROJECT DETAIL
WASTE MANAGEMENT PLAN

TITLE
Camp Plan Showing Proposed Biodisk Infrastructure

DRAWING	MB, SB	DATE	Sept 2009	PROJECT No.	3.393

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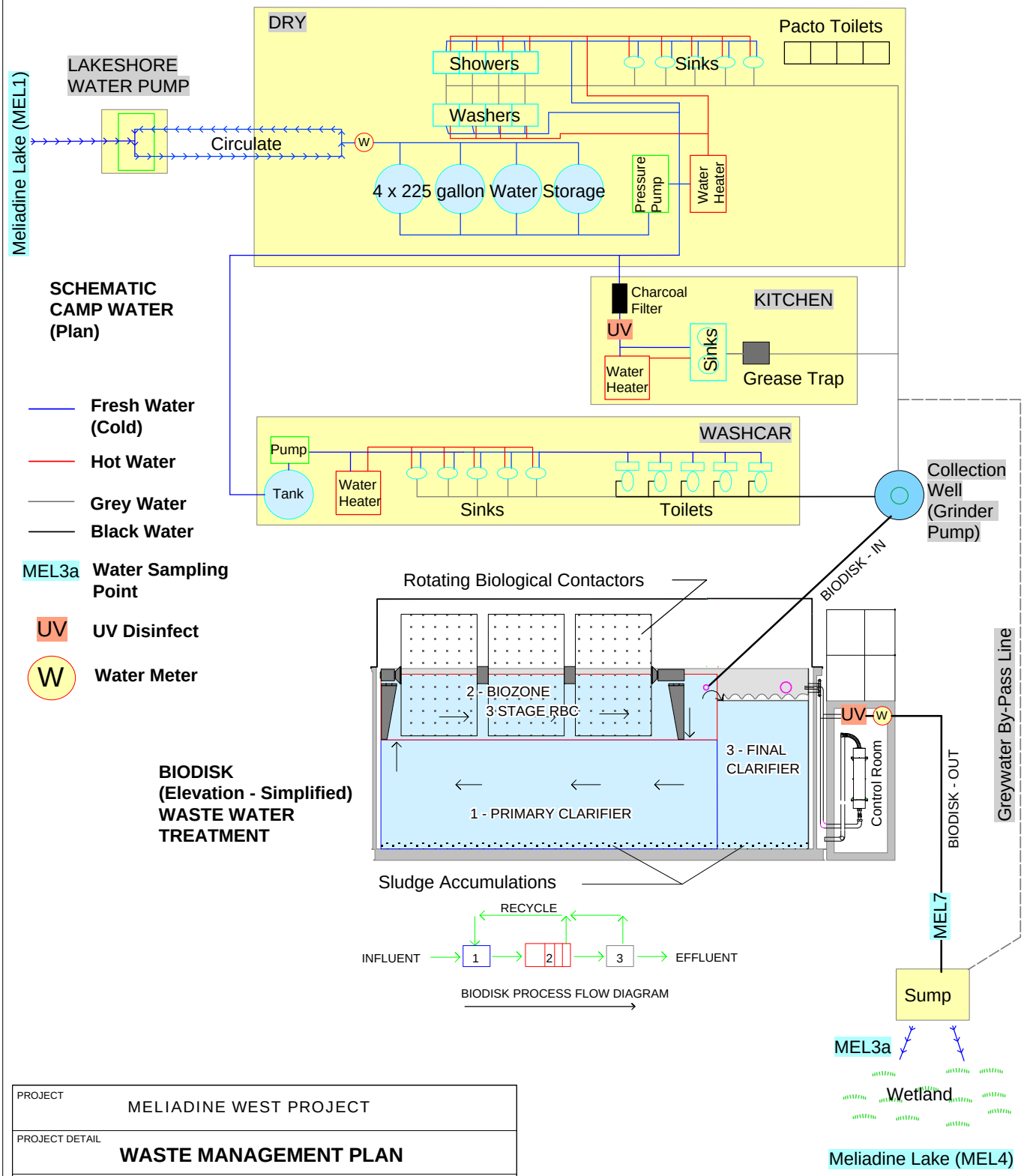
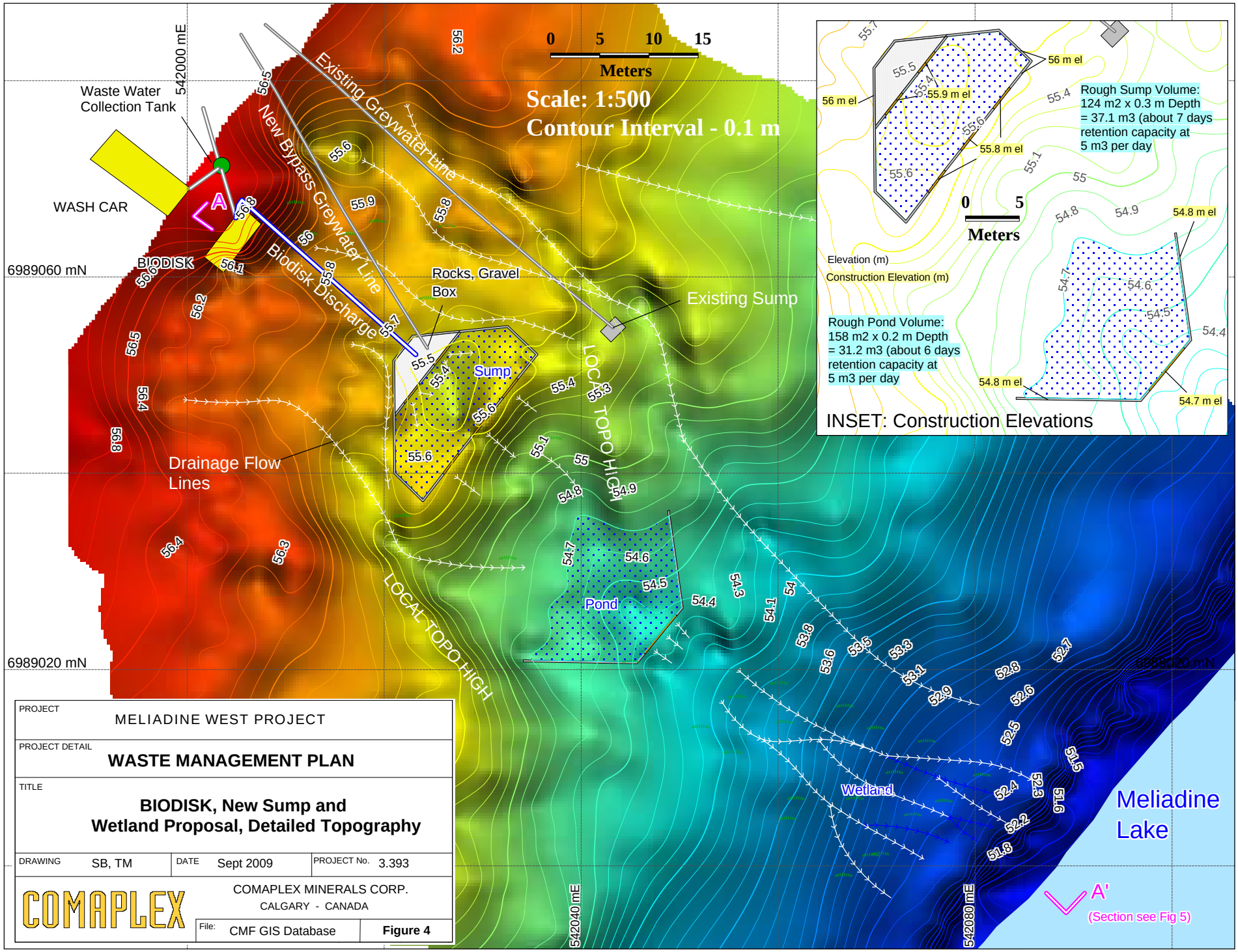
File: CMF GIS Database | **Figure 2**

541900 m E
542000 m E
Camp Water Supply (MEL-1)
Sampling Location
Heating Fuel
Non Hazardous Waste Storage
Incinerator
6989100 m N
Sleeping Tents
Generators
Patterned Area: Commercial Lease
Greywater (MEL-3)
Greywater Outfall (MEL-4)
Office
Road to Portal
6989000 m N
Logging Facility
0 50 100
Meters
Inset
Scale: 1:2,500
Grid NAD83 Z15
Elev: MASL
Core Racks
REQUESTED ADDITION TO COMMERCIAL LEASE (0.3 HA)
General Storage
Helicopter Pad
6988900 m N
Drill Equipment
Pre-treatment Wastewater Collection Well
Wash Car
Existing Lease (Patterned)
Existing Sump (abandon)
Old Wetland (abandonned)
Wastewater Treatment (Biodisk)
New Wetland
New Sump
Pond
Jet A Tanks
Gravel Walkway
WASTE WATER TREATMENT GENERAL LAYOUT (See Figures 4 and 5)
Inset



PROJECT	MELIADINE WEST PROJECT		
PROJECT DETAIL	**WASTE MANAGEMENT PLAN**		
TITLE	**Schematic of Camp Water System Schematic of Biodisk Waste Water Treatment**		
DRAWING MB, SB	DATE Sept 2009	PROJECT No. 3.393	
COMAPLEX	COMAPLEX MINERALS CORP. CALGARY - CANADA		
File: CMF GIS Database	**Figure 3**		

NOT TO SCALE



PROJECT	MELIADINE WEST PROJECT
PROJECT DETAIL	**WASTE MANAGEMENT PLAN**
TITLE	**BIODISK, New Sump and Wetland Proposal, Detailed Topography**
DRAWING	SB, TM
DATE	Sept 2009
PROJECT No.	3.393
	COMAPLEX MINERALS CORP. CALGARY - CANADA
File:	CMF GIS Database
	Figure 4

The BIODISK discharge line will flow from a point at about elevation 59 m through a 2 inch discharge line for about 20 meters to the proposed sump shown on Figure 4. Here the discharge will exit into a cribbing filled with rocks and gravel. This feature is designed to control erosion. The cribbing will be constructed principally of rough cut, untreated 3 inch x 8 inch x 10 foot timbers that are surplus from the underground exploration program. An HDPE impermeable liner will be used to line the sump area to ensure drainage and seepage is downstream only. A schematic of construction details of the rock cribbing and balance of the sump walls is given on the elevation cross section Figure 5. The walls of the sump and cribbing will be constructed to 56.0 MASL and will be notched into the tundra surface. The maximum water elevation within the cribbed area will be 55.9 meters and the maximum water elevation within the sump will be 55.8 meters. This configuration will result in a sump capacity of about 37 cubic meters or roughly 7 days of water retention assuming an average 5 cubic meters per day of camp water usage.

The SE downstream wall of the sump is dug into a natural topographic rise that forms a natural ponding barrier. A similar low relief barrier occurs about halfway to Meliadine Lake and is the site chosen for a second timber barrier that will be built to elevation 54.8 m and designed to retain flow until water elevation reachs 54.7 meters (Figure 5). This artificial pond will have a natural tundra floor and a capacity of about 31 cubic meters or about 6 days of retention capacity assuming 5 cubic meters per day water usage.

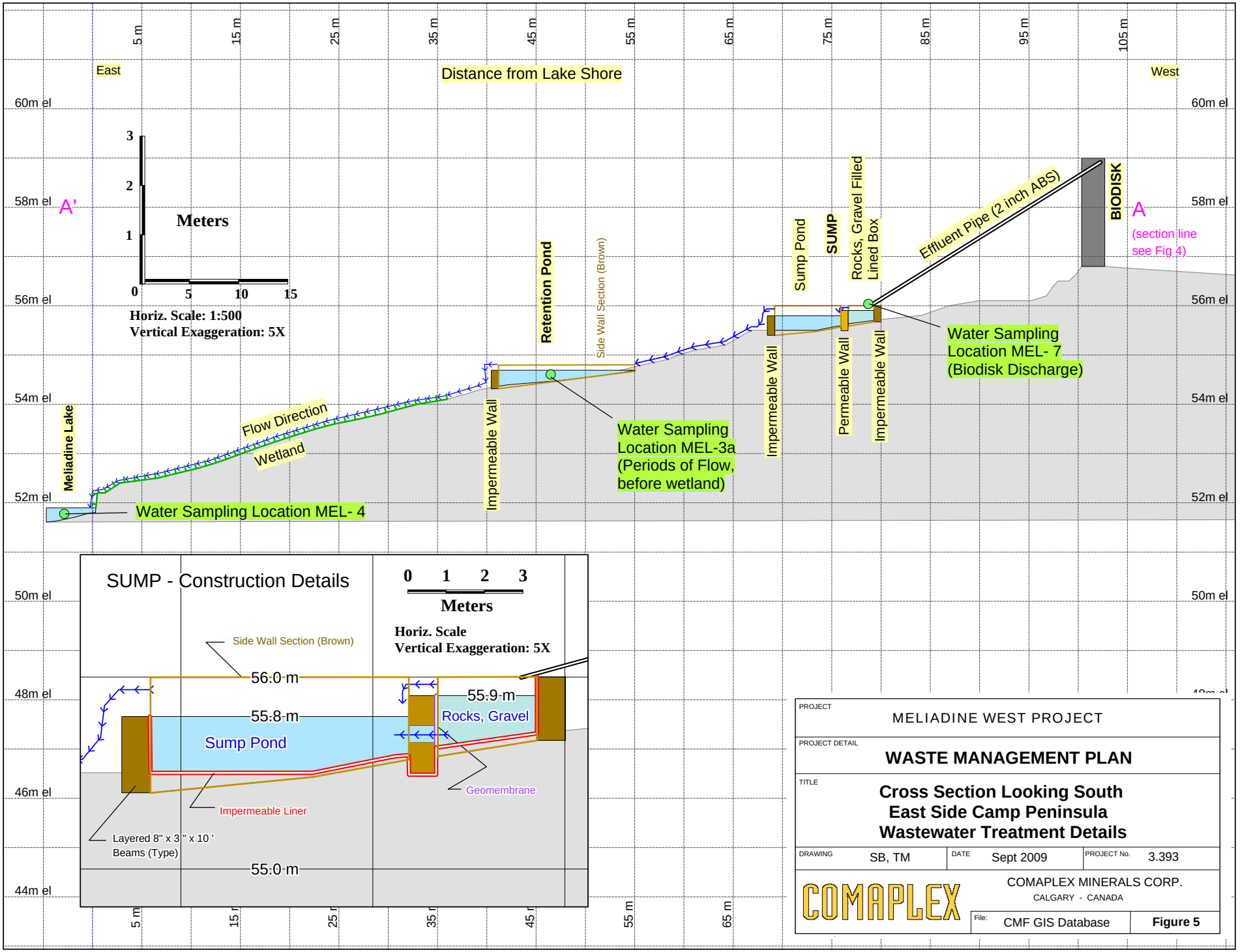
After exiting the pond, the effluent will pass through a steeper meandering wetland system before discharging into Meliadine Lake. The entire sump, pond and wetland system has a length of about 80 meters and an elevation drop of about 4.0 meters (Figure 5).

2.3 BIODISK Operation and Maintenance

2.3.1 General Description of Operation (BIODISK Operations Manual)

The following discussion is modified from the manual provided by Biodisk Corporation. Important operational components of the manual are reproduced in Appendix A. The waste water treatment facility at the Meliadine Lake exploration camp is a tertiary treatment aerobic sewage treatment plant. The unit is designed to remove phosphorus and organic material. It is comprised of the primary clarifier, the RBC tank and the final clarifier (Figure 3, 6).

Raw sewage is pumped into the primary clarifier (1 – Figure 3, 6). Fats, oils and greases (**FOG**) will float to the top of the primary clarifier. The Bio-zone location (2 – Figure 3 ,6) concentrates the scum in the area along the side walls of the tank. Settling separates the heavy solids. The clarified water enters the aeration section through the inlet slot located at the bottom of the non-drive end section of the bio-zone. This is the first section of three equal stages in the rotating biological contactor (RBC) aeration process. This process utilizes a fixed growth bacteria process, whereby bacteria are grown on a disc shaped media surface mounted on a shaft that is rotated into and out of the wastewater. The



PROJECT: MELIADINE WEST PROJECT

PROJECT DETAIL: **WASTE MANAGEMENT PLAN**

TITLE: **Cross Section Looking South East Side Camp Peninsula Wastewater Treatment Details**

DRAWING	DATE	PROJECT No.
SB, TM	Sept 2009	3.393

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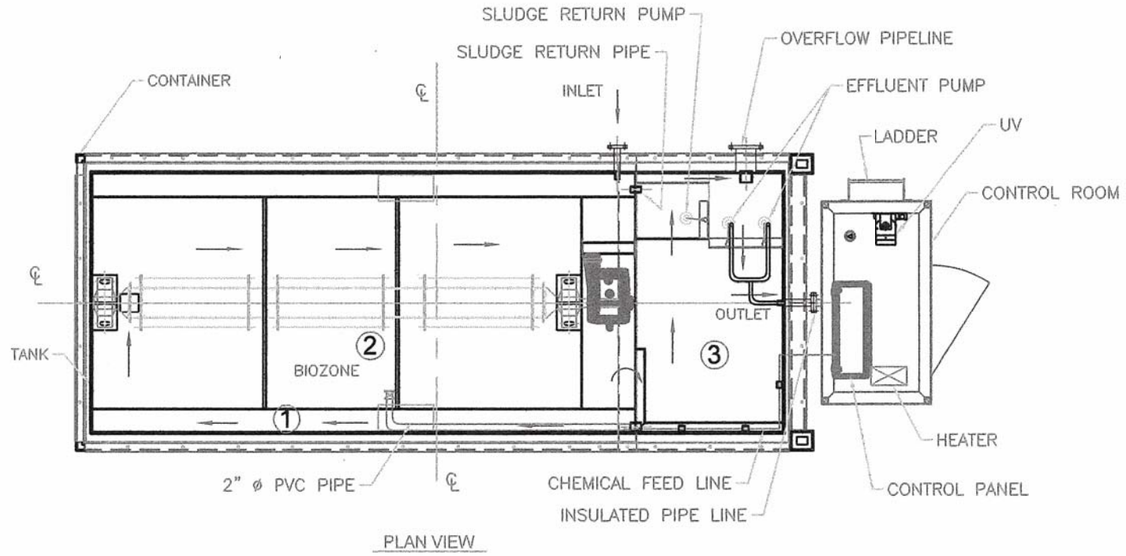
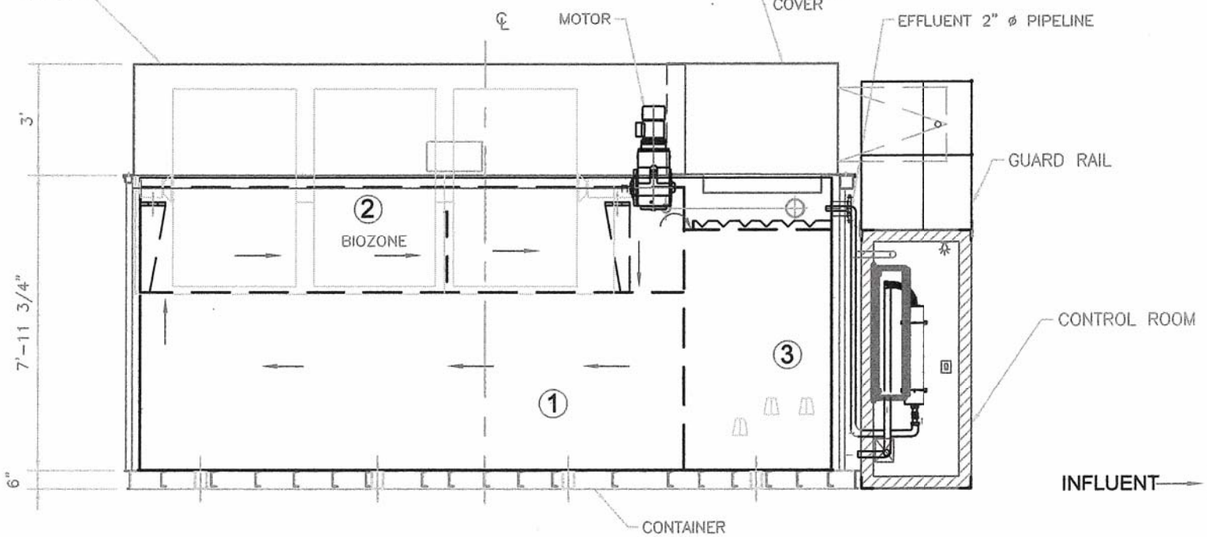
File: CMF GIS Database

Figure 5



PLAN VIEW

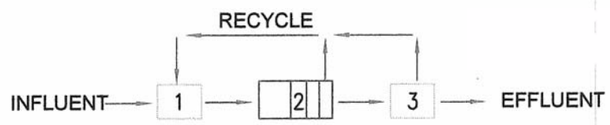


SIDE VIEW

PROCESS DETAILS		LITTLE JOHN
HYDRAULIC LOADING	(USGPD) (L/DAY)	12,500 47,100
BIO SUPPORT MEDIA AREA	(SQ.FT) (SQ.M)	7,000 650.65
BIO SUPPORT MEDIA DIAMETER	(FT) (M)	5'-4" 1.63
PRIMARY CLARIFIER CAPACITY	(CU.FT) (CU.M)	682 19.33
FINAL CLARIFIER CAPACITY	(CU.FT) (CU.M)	156 4.42
BIOZONE CAPACITY	(CU.FT) (CU.M)	68 1.93
SLUDGE STORAGE IN PRIMARY CLARIFIER	(CU.FT) (CU.M)	533 15.09
SLUDGE STORAGE IN FINAL CLARIFIER	(CU.FT) (CU.M)	21 0.59
T.W.L IN PRIMARY CLARIFIER	(FT) (M)	6'-9" 2.06
T.W.L IN FINAL CLARIFIER	(FT) (M)	6'-8" 2.03

SHIPPING DETAILS		LITTLE JOHN
OVERALL LENGTH		20'-0"
OVERALL WIDTH		8'-0"
OVERALL HEIGHT		11'-6"
SHIPPING WEIGHT	(LBS)	25,000
OPERATING WEIGHT	(LBS)	100,000

	PROCESS
1	PRIMARY CLARIFIER
2	THREE STAGES RBC
3	FINAL CLARIFIER



PROCESS FLOW DIAGRAM

NOTES

1. BRACING HEAT IS ARRANGED ALL ROUND TANK.
2. PIPE BETWEEN CONTAINER AND CONTROOL ROOM SHALL BE INSULATED.

NOTES

REV.	BY

PROPRIETARY INFORMATION MA
REPRODUCED OR DVULGED WITH
WRITTEN CONSENT OF BIODISK CC
DO NOT SCALE. IF DOUBT, PLEA

DRAWN	A. W.
CHECKED	T. S.
DATE	2008-08-2
SCALE	N.TS

PROJECT: MELIADINE WEST PROJECT

PROJECT DETAIL: **WASTE MANAGEMENT PLAN**

TITLE: **BIODISK**
Detail of General Arrangement
Courtesy of BIODISK Corporation

DRAWING	DATE	PROJECT No.
TS - BIODISK	Sept 2009	3.393

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File: CMF GIS Database | **Figure 6**

treated wastewater flows through three zones, each with a progressively higher standard of treatment. The discs are all mounted on a common shaft (Figure 6). The first section is where most of the biological oxygen demand (BOD) reduction occurs. The third section has recycle buckets allowing recycling of the clarified water back into the primary clarifier.

Normally, it is unnecessary to add anything to the process. The biomass is naturally occurring and attaches itself to the discs which are 40% submerged in the waste water and have 60% exposure to air. As the discs rotate, the biomass is exposed to oxygen in the air, and consumes pollutants when submerged. The discs revolve 3 times per minute. Two basic classes of organisms are represented. The early stages of the process are dominated by *carbonaceous consuming microbes* that eat organic material. Later stages are dominated by *nitrification bacteria* that convert ammonia to nitrate. The early stage *carbonaceous consuming microbes* are typically dark brown and coat the disc to a thickness of about 1/16th of an inch. *Nitrificiation bacteria* is lighter in colour and creates a thinner coating on the discs. Experienced operators can monitor the condition of the system by monitoring the colour and odour of the biomass. A secondary circuit has been added to the system in place at Meliadine to allow for addition of alum to remove phosphorus from the effluent stream.

Partially treated water from the RBC now enters the final clarifier (3 – Figure 6). Spent biomass settles in this chamber and no sludge is returned to the primary clarifier. Water levels in the final clarifier are controlled by a system of floats and pumps. There are two active and one spare 15 gallon per minute pumps in the final clarifier that deliver effluent at a rate compatible with the capacity of the ultraviolet (UV) disinfectors. After passing the UV disinfectors, the effluent should meet design specifications.

2.3.2 General Process Inspection Guideline

The process efficiency of the BIODISK system can be checked by monitoring common elements of the process. The **amount of scum** in the primary clarifier is proportional to the sludge on the bottom. Fats, oils and greases (**FOG**) need to be removed from the wastewater before it enters the RBC. At Meliadine, a grease removal trap is installed after the kitchen drain. Additional removal is possible in the primary clarifier. The scum blanket can be left unattended for 6 to 9 months in most cases. When the scum blanket completely covers the primary tank and has a depth of about 8 inches the primary tank may need pumping.

The **thickness and distribution of the biomass** is an indicator of plant capacity. When the flow is close to design maximium, the biomass will be 1/8 inch in the first stage and progressively less on the following stages. When the treatment is at capacity, biomass will be evident on the last stage. As flow is reduced, the amount of biomass on the disks will be proportional to the loading. At 50% of design, the organic removal biomass will occupy 50% of the length of the shaft. Light brown nitrification bacteria in the lag stages are a good sign.

This does not occur until the BOD is less than 30 mg/L. If the last stage is without biomass, this is a good indication that complete nitrification has been accomplished.

Biomass colour is a good process indicator. In the lead stages, the biomass colour should be medium brown in colour. In the lag stages, the disks will be lighter brown when the system is lightly loaded. The appearance of black or grey patches of biomass is not good. **Black and grey biomass** is an indicator of organic overload and or excessive FOG. This will appear first on the lead stage and may indicate the need to pump the system out.

Odour is evident when the dissolved oxygen (DO) levels are low in the RBC. Low DO in the first stage is an indicator of organic over load. If the problem causes black, grey and gelatinous biomass and is not addressed, it will lead to more odour and process break down. The problem will appear first in the first stage and will progress down the shaft as it gets worse. Generally, the RBC produces a rich loamy odour that is not offensive when operating correctly. If it is producing abnormal odour it is an indication of poor effluent, organic overload or excessive FOG.

Small amounts of **scum in the final clarifier** are an indication that nitrogen gas is being released. Nitrogen gas is released in an anoxic environment when a carbon source and nitrates are present. This indicates that de-nitrification is taking place. When the final clarifier is more than 50% covered with scum, the BIODISK may need to have the bio-solids and scum removed.

2.3.3 Electrical Controls

A control panel connecting all electrical circuits occurs within the control room of the BIODISK unit (Figure 6). Pumps and heaters are normally left in the auto position and the RBC runs 24 hours per day, 365 days per year. The effluent pumps are controlled with switches for manual or auto operation and are also hooked up to a high water alarm. The floats in the final clarifier provide the switches for the pumps. At very high flows, a float is rigged to start both pumps and also the backup pump if the primary pump fails.

There is an exterior red light outside of the control room. An **exterior flashing red** is activated by one of the following conditions:

- Drive motor amps too high or too low
- High water
- Effluent pump malfunction

The exact problem will be indicated by control panel lights within the control room

2.3.4 Biosolids Removal or Pump Out

It is not necessary to empty the tank to remove all the sludge and scum. The first step is to remove the scum blanket and then remove the sludge. Sludge is distributed over all the primary clarified tank bottom (Figure 6). Solids will also be found near the inlet and under the first stage. A suction hose can be used and should be moved around the entire tank bottom. The primary clarifier has a

sludge storage capactity of about 15 cubic meters and the final clarifier has a capacity of about 0.6 cubic meters.

The sludge blanket and the biological activity on the disks are sources of heat. Removal of sludges is best accomplished in the spring. In the winter heat from biological activity can help maintain system temperature.

2.3.5 General Operating Considerations

Good kitchen techniques can help keep the RBC unit operating correctly. A grease trap has been installed after the drain in the kitchen at the Meliadine Camp and needs to be maintained. **The largest source of problem fats, oils and greases (FOG) is the kitchen sink.** Poor kitchen techniques can double the BOD loading. All plates and pots should have food scaps removed before rinsing.

Antibacterial soaps are designed to kill bacteria and should be avoided. Normal cleaning chemicals cannot be avoided but excessive use of detergents and soaps will cause operational problems with the biological process.

Specific components of the unit require some routine maintenance. **The bearings of the RBC shaft should be lubricated every 3 months.** Look for lubricant leaks around the gear box and motor. The **UV light has an alarm** that indicates low transmission and may indicate that it requires cleaning.

2.4 Sludge Disposal

The aerobic processes within the Biodisk treatment plant will result in the accumulation of biosolids (sewage sludge). These aerobic processes should result in the destruction of disease-causing microorganisms and parasites to a level sufficient to allow the resulting solids to be safely applied to land as a soil amendment material. In addition to having properties similar to peat, the sludge will have nutrients that will promote plant growth, i.e. act as a fertilizer.

The sludge will be removed from the Biodisk treatment plant as required during its operation and prior to the closure of the exploration camp. The quantity of sludge removed will be dependent on the number of persons in camp over the field season and the frequency of sludge removal. The sludge will be placed in 205 litre drums and removed for application to drill sites needing reclamation. These drill sites will be at least 31 metres from any water body or stream, and will be relatively flat so that the sludge does not move after being applied. Drill sites receiving the sludge will be posted to keep people away and also to allow one to anecdotally note the re-establishment of vegetation over time.

The use of sewage sludge in reclaiming drill sites is a sustainable practice that conserves organic matter and completes nutrient cycles. It removes the need to reclaim drill sites by applying peat and fertilizer.

2.5 Performance and Monitoring

Monitoring Program Station MEL-7 was established to monitor the performance of the BioDisk treatment plant. The parameters monitored include BOD_5, faecal coliforms, TSS, pH, and oil and grease. Monthly samples will be collected to document the performance of the plant with the results submitted to the Water Board in the monthly reports.

At times that the camp is on care and maintenance, or during fall shut down and winter or spring startup, the biodisk system will be brought online slowly and checked for performance during the establishment of the biomass. During this time, the existing waste water treatment procedure using the pacto toilet system entailing the incineration of black water and the sump and wetland treatment of grey water will be employed.

3.0 Other Wastes Management Policy

3.1 General Waste Policy

All inert nonhazardous combustibles are incinerated on a daily basis. This includes food scraps, and most office and room waste. The waste management policy is designed to remove materials with the potential to create problematic contaminants upon incineration. These wastes will be treated in accordance with government guidelines and either landfilled in Rankin Inlet or shipped to facilities with the capability to treat them in an environmentally responsible manner. The waste management policy stipulates that materials are segregated at the source to minimize the potential for inadvertent loading of the incinerator with problematic materials.

The main thrusts of the policy are;

- The minimization of the creation of **dioxin and furan compounds** that are a byproduct of the incineration of some wastes. This is principally accomplished through the segregation and **elimination of plastics** from the incinerated wastes.

- The **elimination of potential mercury sources** from the incinerated wastes.

- The segregation and elimination of **waste oils and oil stained materials** from the incinerated waste

- The segregation and elimination of **industrial and household hazardous wastes** from the incinerated waste.

Wastes that are deemed not combustible in camp will be treated in the following manner.

Non-hazardous solid “inert” waste generated (i.e. Scrap metal, pipe, wood, plastics, liners, Styrofoam) will be disposed of in approved landfills.

All hazardous wastes and waste items that cannot be incinerated are securely packaged, flown out on aircraft backhauls, and are either recycled or disposed of in a licensed landfill.

Prior to disposal, the hazardous waste will be properly packaged, labeled, and stored and manifested in a Transportation of Dangerous Goods (TDG) approved shipping container.

The container will have the appropriate hazardous waste labels.

All Federal, Provincial and Territorial regulations will be adhered to.

3.2 Used Container Disposal

It is important to ensure the proper disposal of used containers that have contacted, collected or contained a hazardous or regulated substance (e.g., paint cans, oil cans, acid containers, aerosol cans). Generally residual liquids will be collected in 45 gallon drums, manifested as hazardous waste and shipped to a licensed hazardous waste treatment facility. The containers will be allowed to dry and disposed off locally in a landfill.

Metal containers can be disposed as scrap metal in the approved landfill after being allowed to dry and crushed.

3.3 Hazardous Waste Generation and Disposal

Comaplex has applied for a hazardous waste generator number and expects to ship about 4 drums of oil filters, oily rags and glycol south by barge in the fall of 2009. These waste drums and their labeling will be inspected by an accredited person in Rankin Inlet and appropriate paperwork will be kept on file in camp. Details of the types, amounts, documentation and destination of hazardous wastes will be documented in the annual report delivered to the NWB.

3.4 Used Drum Disposal

The majority of used fuel drums for Jet-B fuel and diesel (205 litre or 45 gallon drums) can be returned to the supplier for refund or reused locally. Generally, Comaplex uses bulk fuels and only keeps a limited number of used drums on-site. However, during operations drums may be used for storage of other "used" products (i.e. used glycol, used oil, materials from spill cleanups etc). These drums will have to be properly labeled and stored prior to acceptable removal and disposal usually off-site at an approved facility.

3.5 Used Tire Recycle and Disposal

Used tires must be recycled or disposed of on-site if recycling is not possible. In general, all tires smaller than 24.5 inches (wheel rim size) must be recycled with an approved tire recycler.

No commercial recycling options exist for tires larger than 24.5 inches in diameter, so these tires may be disposed of in the approved landfill and or designated area within the country rock pile (if mining has commenced). Generally, larger tires are in demand at mine sites for the construction of safety barriers along roads and thus these spent tires will be kept for such purposes.

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BIODISK
Natural Purification of Wastewater

LITTLE JOHN

OPERATION

MANUAL

BIODISK Corporation

August 2008

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BIODISK
Natural Purification of Wastewater

1.0 SUMMARY OF OPERATION

We recommend that daily inspection be done for the first month followed by weekly inspections. It is often the testing requirement that governs the frequency of visits. Whenever the operators are at the Little John, they need to look at the process and listen to the equipment. Please read section 2.0 – VISUAL AND AUDIBLE INSPECTION.

A) The Little John wastewater treatment plant supplied by BIODISK Corporation is a secondary treatment plant designed to remove phosphorous and organic material. It is comprised of the primary clarifier, the RBC tank and the final clarifier.

B) Raw sewage is pumped into the primary clarifier. Fats, oils and greases (FOG) will float to the top of the primary clarifier. The Bio-zone location concentrates the scum in the area along the side walls of the tank. Settling separates the heavy solids. The clarified water enters the aeration section through the inlet slot located at the bottom of the non-drive end section of the bio-zone. This is the first section of three equal stages in the rotating biological contactor (RBC) aeration process.

The normal color of the bacteria in the 1st stage is dark brown. This is the stage where most of the BOD reduction occurs. The succeeding 2nd and 3rd stages are mounted on the same shaft. The 3rd disk bank has recycle buckets. Recycled water has many operational benefits. See www.Biodisk.ca for additional information.

C) Partially treated water from the RBC now enters the final clarifier. Spent biomass settles in this chamber. No sludge is returned to the primary clarifier.

D) There are two effluent pumps and one spare. The rated capacity of each pump is limited to 15 gpd to ensure adequate UV disinfection. The two effluent pumps and floats are installed under the hatch in the cover extension. There are four floats in the final clarifier called stop, start, high water (alarm) and override floats. It is suggested that the high water alarm float be set as the third high's float. The highest is override float that starts the standby pump and allows both pumps to operate. The lowest is the stop float. The stop float is set 60" below the top of the tank, start float 21", the alarm float 19" and the override float switch 17" below the top of the tank, respectively.

Putting the alarm float between the start float and the override float will tell the operator that there has been a higher pumping requirement than normal or that only one pump is working. Both conditions are important and can be addressed.

Each effluent pump has a check valve on the pump. The UV is designed to treat 15 gpm. This flow rate is maintained by adjusting the valve located in the control room.

E) The UV light is rated for 15 gpm. Please see the manufactures instruction for cleaning requirements.

F) A flow meter is provided.

2.0 VISUAL AND AUDIBLE INSPECTION

The Biodisk does not have any noisy components. Check valves are the part of the noise component. The splash of the disk going through the water is a constant as is the hum of the motor. Noises should be low level and constant. There are three sources of noise to listen from the drive, the bearings and the rotating assembly.

The drive motor is a constant hum. High speed noises are generally associated with motor bearings or reducer input bearings. Low speed noises are reducer output noises. The drive is selected for the occasional start up condition. While in continuous operation, the drive is under loaded and draws 60% of the hp provided. Many years of operation are expected before drive noises become an issue

Bearing noises are often cyclonical. The rotation speed of the shaft is 4.8 rpm. Bearing can also squeak continuously. This type of noise needs to be addressed ASAP.

The rotating assembly consists of the shaft and the disk banks. The disk banks are bolted to the shaft. Lock Tight is used on the disk collar bolts. Movement in the collar bolts will loosen the disk bank and allow it to move. This movement will be evident on every revolution and may be accompanied by a thud. If left unattended, the loose components will eventual break down. Tighten all components that have any movement.

An experienced operator can tell if the Biodisk is working properly by looking at the process. The amount of scum, biomass thickness, coverage, texture, color, odor, final clarifier scum and time are visual indicators of process efficiency.

Scum will float in the primary clarifier is in proportion to the sludge on the bottom. If left unattended, the scum can lift the floor grating. Scum formation is normal. Fats, oils and grease (FOG) are not beneficial to biological growth and needs to be removed from the wastewater flow before the RBC process. The removal happens in the primary clarifier of the Biodisk The scum blanket can be left unattended for 6 to 9 months at design flows and longer for lightly loaded systems. The depth of scum is an indicator to the operator. The thickest scum blanket will be at the non-drive end of the primary tank. This is also the location of the bio-zone inlet. When the scum blanket completely covers the primary tank and has a depth of about 8" the primary tank may need pumping.

The thickness and distribution of the biomass is an indicator of plant capacity. When the flow is close to or at design, the biomass will be 1/8" in the first stage and progressively less on the following stages. When the treatment is at capacity, biomass will be evident on the last stage. As the flow is reduced, the amount of biomass on the disks will be proportional to the loading. At 50%

of design, the organic removal biomass will occupy 50% of the length of the shaft. Light brown

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nitrification bacteria on the lag stage is a good sign. Nitrification does not occur in the Biodisk until the BOD is less than 30 mg/l. If the last stage is without obvious biomass it is a good indicator that complete nitrification has been accomplished

Biomass color is a process indicator to the operator. The biomass in the lead stages will be a medium brown in color. In the lag stages, the disks will be lighter brown when the system is lightly loaded and heavier color shows when designed for nitrification. Colorless or no biomass is a sign of an under loaded system. The appearance of black and grey patches of biomass is not good. Black and grey biomass is an indicator of organic overload and or excessive FOG. This will appear first on the lead stage. It may be time to have the system pumped out.

Often black and grey spots are accompanied by gelatinous material. This unhealthy bacteria hangs of the ends of the tie rods. This is also a sign of organic over load, FOG and excessive use of detergents or cleaners.

Odour is evident when dissolved oxygen (DO) levels are low in the RBC. Low DO in the first stage is an indicator of organic over load. If the problem causing the black, grey and gelatinous biomass is not addressed, it will lead to increased odour and process break down. The indicators will appear on the first stage and eventually progress down the full shaft.

Odour under the RBC cover is not offensive. A healthy biomass smells like rich earth or loam. In some application, the RBC has been used as an odour eater. If the RBC is producing odour, it is an indicator of poor effluent, organic over load or excessive FOG.

The amount of scum in the final clarifier is an indicator. A small amount of scum is an indicator that nitrogen gas has being released. Nitrogen gas is liberated in anoxic environments when a carbon source and nitrates are present. This process is called de-nitrification. When more than 50% of the final clarifier is covered with scum, it is an indicator that the Biodisk may need to have the bio-solids and scum removed.

The Biodisk is designed to store sludge for 6 to 9 months or longer. Sludge storage time is directly related to the organic load per day. Lightly loaded systems have long term sludge storage. Scum, biomass thickness, coverage, texture, color, odour and time are all indicators to tell the thickness of the sludge. The removal of bio-solids needs to be addressed. A pump-out truck normally does the sludge removal. A particular point to emphasize is that the biological growth (biomass) on the disks should not be washed off. The sludge can be disposed of at municipal environmental friendly locations.

Looking and listening can tell the operator the health status of the Biodisk. We expect that Little John # 261 will have 20 years life and we need your help to achieve this.

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3.0 ELECTRICAL CONTROLS

The detailed wiring diagram has been provided on the inside of the panel and in this binder. Little John #284 has a control panel designed specifically for your requirements. All of the electrical power requirements pass through the panel. The panel has been designed for a 120, 3 hp, 60 HZ and a neutral wire power supply. The panel has a 200 watt forced air panel heater.

Breaker protection with 10 or 15 amp have been provide for all components including duplex outlets, base board heater, lights, RBC drive, duplex effluent pumps, heaters and heat trace terminals.

The panel lights will show what equipment is running. Pumps, heaters are normally left in the auto position and the RBC runs 24h/365d in the on position.

Duplex alternating effluent pump controls are provided with hand-off-auto switches and high water alarm. The floats in the final clarifier start and stop the pumps. The fourth and highest float allows two pumps to operate at the same time for high flows. This feature will also start the stand by pump when the primary pump has failed. The third float is for a high water level alarm.

An exterior flashing red will be activated by the RBC drive motor when the motor amps are too high or too low, high water and effluent pump malfunction. The control panel lights will indicate the component that triggered the alarm.

One or two extra heat trace contacts have been provided for your use.

4.0 BIOSOLIDS REMOVAL OR PUMP OUT

It is not necessary to remove all the tank contents or all the sludge and scum. Be sure to remove the scum blanket first and then remove the sludge.

Sludge is distributed over all of the primary clarified tank bottom. More solids will be near the inlet and under the first stage. The nozzle of the hose must be moved around the tank bottom. Sludge can funnel at 60 degrees if the suction hose is stationary. Your Little John has a primary tank sludge storage volume of 15 cu m (533 cu ft/3,300 gallons). The final clarifier has 0.6 cu m (21 cu ft/130 gallons).

The sludge blanket and the biological activity on the disk are both a source of heat. Removal of biosolids can be done in the spring if possible. Winter removal of all bio-solids will reduce the heat generated from biological activity. If required, partial removal of bio-solids in the winter is recommended.

Removing sludge is like vacuuming under the bed. If you do not move the nozzle all around at different points, you will not get all the dust

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5.0 KITCHEN WASTE

The kitchen wastewater needs to have a well maintained grease trap. The biggest source of FOG and BOD is from the pot sink in the kitchen. All food scraps need to be removed before the plates and pots are rinsed. All domestic wastewater has some kitchen wastewater or a grey water component. Camp food preparation methods can double the BOD loading. Good kitchen techniques will save money and time.

6.0 ANTIBACTERIAL SOAPS

The Biodisk uses naturally accruing micro-organisms to consume pollutants. Antibacterial soaps and detergents are designed to kill all bacteria. Normal cleaning chemicals are part of the wastewater characteristics. Excessive use of detergents and antibacterial soaps will cause operational problems with any biological process. Try to avoid using this type of products.

7.0 ROUTINE MAINTANENCE

Please see the detailed information provided for each component.

The item that requires attention is the bearings. **Lubricating the bearings every three months is essential.** Bearing grease turns white and losses its beneficial qualities in the presence of water. Re-grease the bearing after any flooding has occurred.

The bearings, gear box and motor have been lubricated with long life synthetic lubricants. Look for leaks.

The UV light has an alarm that indicates low transmission. The UV light may need cleaning.

Sludge removal frequency is 6 to 9 months. Remove scum before vacuuming the tank bottom. It is not necessary to remove all the water or all the sludge.

A sample tap has been provided in the control room for grab sampling.

Biodisk will provide technical support for any process concerns or malfunction for the life of the equipment. **We can be reached at 416 503-4100, rbcguy@biodisk.ca and at www.biodisk.ca**

8.0 SPARE PARTS

There are no spare parts required or recommended for the Little John.