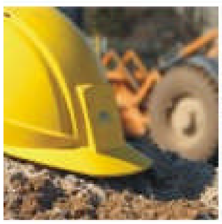
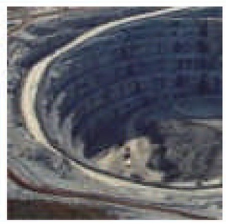
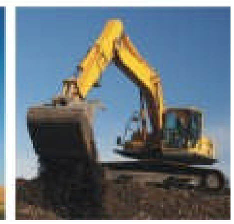
SHEAR DIAMONDS LTD.

WASTEWATER TREATMENT MANAGEMENT PLAN JERICHO DIAMOND MINE, NUNAVUT





REPORT

FEBRUARY 2011
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SHEAR DIAMONDS LTD.

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ACRONYMS & ABBREVIATIONS

AA	Atomic Absorption Spectrophotometry
ABA	Acid Base Accounting
ACM	Asbestos-containing Material
AEM	Aquatic Effects Monitoring
AIA	Aquatic Impact Assessment
AIRS	Adaptation and Impacts Research Section
ANCOVA	Analysis of Covariance
ANFO	Ammonium Nitrate Fuel Oil Explosives
ANOVA	Analysis of Variance
APEC	Areas of Potential Environmental Concern
ARD	Acid Rock Drainage
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
BACI	Before-after-control-impact
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CDA	Canadian Dam Association
CPK	Coarse Processed Kimberlite
DIAND	Department of Indian Affairs and Northern Development
DFO	Department of Fisheries and Oceans
DO	Dissolved Oxygen
EBA	EBA, A Tetra Tech Company
EC	Electric Conductivity
EIS	Environmental Impact Statement
EOC	Emergency Operations Centre
EPP	Emergency Preparedness Plan
ERP	Emergency Response Plan
ESA	Environmental Site Assessment
FSCF	Fuel Storage Containment Facility
FPK	Fine Processed Kimberlite
GC/FID	Gas Chromatograph - Flame Ionization Detector
GTC	Ground Temperature Cable
Hazmat	Hazardous Materials
HDPE	High Density Polyethylene
HVAS	High Volume Air Sampling
HWTA	Hazardous Waste Transfer Area
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
IDLH	Immediately Dangerous to Life and Health
INAC	Indian and Northern Affairs Canada
KIA	Kitikmeot Inuit Association
LBP	Lead-based Paint
LPRM	Long-term Post-reclamation Monitoring
MANOVA	Multivariate Analysis of Variance

MSDS	Material Safety Data Sheets
NIRB	Nunavut Impact Review Board
NP	Neutralization Potential
NWB	Nunavut Water Board
PHC	Petroleum Hydrocarbons
PKCA	Processed Kimberlite Containment Area
PPE	Personal Protection Equipment
QA	Quality Assurance
QC	Quality Control
RBC	Rotating Biological Contactor
RCM	Reclamation Construction Monitoring
ROM	Run of Mine
RPD	Relative Percent Difference
RRPK	Recovery Rejects Processed Kimberlite
SCBA	Self-contained Breathing Aparatus
Shear	Shear Diamonds (Nunavut) Corp.
SOP	Standard Operating Procedure
SPRM	Short-term Post-reclamation Monitoring
TDC	Tahera Diamonds Corporation
TDGR	Transportation of Dangerous Goods Act (RSNWT 1988) and Regulations
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
WSCC	Workers' Safety and Compensation Commission of the Northwest Territories and Nunavut
WHMIS	Workplace Hazardous Materials Information System
WWTP	Wastewater Treatment Plant

2011 Water Licence Renewal Documents

AEMP	Aquatic Effects Monitoring Plan
AQMP	Air Quality Management Plan
CAMP	Care and Maintenance Plan
CMP	Contingency Management Plan
EP-RP	Emergency Preparedness and Response Plan for Dam Emergencies
GMP	General Monitoring Plan
ICRP	Interim Closure and Reclamation Plan
LDP	Preliminary Landfill Design Plan
LMP	Landfill Management Plan
LFDP	Preliminary Landfarm Design Plan
LFMP	Landfarm Management Plan
OMS	Operations, Maintenance, and Surveillance Manual
PKMP	PKCA Management Plan
SWMP	Site Water Management Plan
WEMP	Wildlife Effects Management Plan

WMP	Waste Management Plan
WRMP	Waste Rock Management Plan
WTMP	Wastewater Treatment Management Plan

1.0 INTRODUCTION

1.1 General

The Jericho Wastewater Treatment Management Plan (WTMP) has been developed to provide a methodology for the operation, maintenance, and monitoring of the wastewater treatment plant (WWTP) used to treat the domestic wastewater from the accommodations complex at the Jericho Diamond Mine (Jericho).

The plan fulfills the requirements specified in the Jericho Mine Water Licence NWB1JER0410 (issued December 21, 2004), where,

In Part H, Item 5, the water licence specifies:

- The licensee shall (...), submit to the Board for approval an Operation and Management Plan for the Waste Water Treatment Plant, (...). The plan(s) shall be developed in accordance with Schedule H, Item 3.

In Schedule H, Item 3, the water licence specifies:

- (…) shall included but not necessarily be limited to consideration for the *Guidelines for the Preparation of an Operation and Maintenance Manual for Wastewater and Solid Waste Disposal Facilities in the Northwest Territories* (Duong & Kent 1996).

However, this plan is being submitted to the Nunavut Water Board (NWB) in the absence of complete historical information as Shear Diamonds (Nunavut) Corp. (Shear) only assumed control of the project in August 2010. Since that time, Shear has discovered that detailed information on the present site conditions is limited. Comprehensive historical site monitoring records were not well maintained under previous ownership and management, and the available information is incomplete or lacking detail.

The WTMP is based on existing records of the WWTP including Waste Water Treatment Plant Operations Plan (TDC 2004), Operating and Maintenance Instructions (Hannah 2010), Operations and Maintenance Manual (Dillon 2006b), and external anecdotal information where available. The plan has been redeveloped to meet the current regulatory requirements and to reflect Shear's commitment to the best practices in environmental stewardship.

The plan presents general descriptions of known WWTP design features and the procedures for operating, maintaining, and monitoring the facility. Once Shear has an opportunity to thoroughly investigate the WWTP's integrity and performance in 2011, the WTMP may be revised (if required). Subsequent revisions of the WTMP will be submitted to the NWB for review and approval prior to resuming mining operations.

1.2 Objectives of Wastewater Treatment Management Plan

The primary objective of the WTMP is to provide WWTP operation personnel general guidelines for operating, maintaining, and monitoring the WWTP. The purpose of this document is to ensure that domestic wastewater is treated to meet the criteria specified in the water licence before it is discharged to the Jericho Processed Kimberlite Containment Area (PKCA).

The WTMP includes:

- A description of the function of each component in the wastewater treatment system;
- General guidelines for operation;
- General requirements for maintenance and a troubleshooting guide;
- Strategies for safe operation and to deal with emergencies; and
- Methods of treatment performance monitoring.

1.3 Background Information

1.3.1 Background of Jericho Diamond Mine

The Jericho Diamond Mine is located approximately 260 km southeast of Kugluktuk, NU, and 30 km north of Lupin Mine. The Jericho Mine was constructed and operated by Tahera Diamond Corporation (TDC) between 2004 and 2008. In January 2008, mining operations were suspended by TDC and the site was placed under care and maintenance. Shortly thereafter, Indian and Northern Affairs Canada (INAC) assumed control of the care and maintenance activities for the site. In August 2010, Shear purchased the Jericho Mine and its assets and assumed the responsibility for the site.

Presently, the mine remains under care and maintenance as Shear evaluates the mineral resource. Once this evaluation is complete, a mine plan and operations schedule for the project will be established.

1.3.2 Background of the Jericho Wastewater Treatment Plant

The wastewater treatment system was supplied by P.J. Hannah Equipment Sales Corp. (Hannah, acquired by Seprotech Systems Inc. in 2007). It was installed in 2005 by the mine's previous owners. The facility is housed in an insulated metal clad building adjacent to the accommodations complex within the Processing Plant Area (Figure 1). The system was designed to treat the domestic wastewater from a camp serving about 200 occupants, and was previously operated by site maintenance personnel.

1.4 Linkage with Other Documents

The WTMP is part of the site wide management system. Other management plans that are related to or refer to the WTMP include:

- Care and Maintenance Plan (CAMP);
- Contingency Management Plan (CMP);
- General Monitoring Plan (GMP);
- Landfill Management Plan (LMP);
- Processed Kimberlite Management Plan (PKMP);
- Site Water Management Plan (SWMP); and
- Waste Management Plan (WMP).

2.0 OPERATIONAL AND EMERGENCY CONTACT INFORMATION

The communication contacts (Table 1) regarding the WWTP comprise:

- Assistance related to operation and maintenance, and
- Emergency response resulting from treatment failure.

The contact list for external emergency response is detailed in the Jericho Contingency Management Plan (CMP, EBA 2011c). Operation and maintenance assistance requests may be made by the maintenance personnel, as appropriate, but should normally be channelled through the Site Manager. Unless otherwise authorized by the VP Operations, external communications providing information on mine emergencies are directly handled by the Site Manager.

Table 1 WWTP Contact Information

Purpose	Contact	Phone Number	Email
General operation and maintenance; Emergency resulting from treatment failure	Seprotech Systems Inc.	TBD	TBD
Laboratory analysis	TBD	TBD	TBD
Environment Manager	Ms. Michelle Tanguay	Offsite: 250.362.9530	michelle@shearminerals.com
Site Manager	TBD	TBD	TBD
VP Operations	Mr. Fred Mason	403.542.8526	fred@shearminerals.com

3.0 COMPONENTS AND PROCESS

3.1 General

In a natural environment's biological cycle, bacteria play a vital role by converting soluble organic compounds into bacterial cells and inorganic materials. When domestic wastewater containing nutrients and other organic material is discharged into the natural environment, aerobic bacteria along with other microorganisms deplete dissolved oxygen in the water when consuming the organic material. Reductions in oxygen concentrations can create anaerobic conditions that subsequently may reduce the fish health and population in the receiving waterbodies. Aerobic biological wastewater treatment systems simulate and accelerate the natural biological process before the wastewater is released to the receiving environment. Treatment is achieved by supplying excess microorganisms and air under a controlled environment, thereby enhancing the growth of the microorganisms to digest nutrients without depleting the oxygen in the wastewater. The biomass generated by the bacterial growth is then removed using gravity settling and sand filtration. As a final stage, UV disinfection is used to minimize the amount of residual bacteria released to the receiving waterbody.

The biological wastewater treatment system consists of:

- Raw Wastewater Collection;

- Pre-aeration/equalization Tank;
- Rotating Biological Contactor (RBC);
- Final Clarifier;
- Tertiary Filter;
- UV Disinfection; and
- Aerobic Sludge Digester.

Figure 2 presents the schematic wastewater treatment process. The location and component designs of the WWTP are presented in Appendix A of this document.

3.2 Oil and Grease Traps

The *Operating and Maintenance Instructions* (Hannah 2010) states that if a central kitchen is a source of wastewater, properly designed grease traps are required on the outlets of all sinks, drains and dishwashers in the kitchen. All shower or toilet water should bypass the grease traps. Hannah also recommends installing a cold water injection system activated by the dishwasher discharge cycle to prevent the grease liquefying. The cold water should be injected into the dishwasher line immediately after the dishwasher outlet connection to the drain line.

Based on the *Jericho Mine Wastewater Treatment Plant Design Plan - Addendum* (Dillon 2006a), two grease traps were installed in the camp kitchen. Camp maintenance personnel cleaned these traps weekly and shipped the grease for off-site disposal. During the care and maintenance activities in 2011, Shear will investigate the feasibility of incinerating the collected oil and grease on site. Shear has not yet been able to confirm if a cold water injection system has been installed.

3.3 Raw Wastewater Collection

Based on the *Operating and Maintenance Instructions* (Hannah, 2010), the raw wastewater is collected at lift stations throughout the camp by gravity flow, and then pumped to the aerated equalization tank in the WWTP.

3.4 Aerated Equalization Tank

The collected raw wastewater enters the aerated equalization tank in the WWTP. The total daily waste flow from camp occurs in three or four short periods during the day, and the equalization tank serves to provide a constant and steady flow through the biological treatment section of the plant. The equalization tank has the added benefit of "freshening" the waste, as well as the capability of removing organic solids to reduce the biochemical oxygen demand (BOD_5). The chemistry of the wastewater is monitored at the equalization tank to evaluate the treatment efficiency of the WWTP.

Aeration of the equalization tank is provided by two positive displacement blowers (one service unit and one standby). A common air blower is used for the equalization tank and the sludge digestion tank. The rate of air flow is adjusted to maintain aerobic conditions without producing excessive foaming or splashing. Bio-soil additive or recycled sewage from the sludge digester may be added into the equalization tank to increase the population of the microorganism, which will enhance the biodegradation of the nutrients in the wastewater.

3.5 Rotating Biological Contactor

The RBC is equipped with three rotating discs arranged in two wastewater holding tanks (biozone tank): one containing a single disc, and the other containing two discs. The discs consist of rigid polypropylene media supported on galvanized steel frames and are rotated using a direct mechanical drive system powered by a 0.75 horsepower electric motor.

An underflow line from the equalization tank feeds wastewater into the first biozone tank of the RBC. A bucket wheel pump assembly, connected to the discharge side of the first disc, is used to deliver a measured dose of wastewater to the second biozone tank of treatment system.

The RBC process provides a large surface media for bacteria and other microorganisms to grow and generate biomass. The rotation of the media, approximately one-third submerged in wastewater in the biozone tank, provides a continuous supply of nutrients and oxygen to the biomass. Shearing forces exerted on the organisms during rotation through the wastewater cause excess biomass to slough from the media into the biozone tanks. The mixing action of the rotating media keeps the sloughed solids in suspension. The sloughed solids are carried by wastewater flow to the final clarifier.

3.6 Final Clarifier

The final clarifier (settling tank) removes the sloughed solids from the effluent. The clarifier tank is equipped with four hoppers, in which the sludge pumps and piping are arranged to allow the withdrawal of sludge and floating solids (scum) from each hopper and transfer to the aerobic sludge digester. A timer-activated pump transfers settled sludge to the aerobic digester every three hours, with the transfer run time set to 3 minutes. Clarified effluent overflows to the WESCAN filter feed tank.

3.7 Tertiary Filter

Flow from the final clarifier passes by gravity to the filter feed tank and onto a WESCAN automatic backwash tertiary filter. The design and operation of the tertiary filter is presented in Appendix B.

3.8 UV Disinfection

After the treated water is filtered through the tertiary filter, it will pass through a UV disinfection system and into a backwash holding tank. The treated water will then be disposed into the PKCA by gravity flow.

3.9 Aerated Sludge Digester

The collected sludge and floating scum from the final clarifier will be pumped to the aerated sludge digester. Forced air will be supplied to the system from the bottom of the digesters to enhance the aerobic digestion thereby reducing the volume of sludge. Aeration is provided by the same blower that is used for the aeration/equalization tank. The treated sludge will be removed periodically and disposed of in the Jericho landfill. A description of the landfill and sludge pit can be found in the Jericho Landfill Management

Plan (EBA 2011g). A portion of the sludge may be recycled back to the Equalization Tank to enhance the biological activities by supplying additional microorganisms.

4.0 OPERATION AND MAINTENANCE

4.1 Start-up and Operation Procedures

Operators of the WWTP must be trained so that they have a thorough understanding of all components of the treatment process and the associated operation and maintenance procedures. Training for the system will be provided by a qualified company.

Prior to the system start-up:

- All components of the treatment system should be properly lubricated; and
- The switches of the blower, RBC motor, sludge return pumps, filter feed and backwash pumps and UV system should be at the "OFF" position.

The following sections outline the general start-up and operation procedure for each of the units in sequence of operation.

4.1.1 Aerated Equalization Tank

Once the operator has confirmed that the aeration equipment is ready for operation, raw wastewater can be introduced into the aerated equalization tank. Once the liquid level rises above the aeration diffusers, the operator should ensure blower valves are open, at which point the blower may be started by turning the blower's H.O.A. (Hand, Off, Auto) switch to "AUTO".

At this point, no liquid should be in the sludge digestion compartment. If, however, the aeration is restricted to the digestion tank, the operator must ensure that this restriction does not cause overheating of the blower.

4.1.2 Rotating Biological Contactor

Prior to the RBC start-up, the operator shall:

- Inspect the whole machine for possible obstructions, which could cause damage or injury as the shaft rotates.
- Check tightness of RBC shaft-bearing cap screws.

Once the above checks have been satisfactorily completed, the operator should:

- Turn the RBC motor switch at the control panel to "ON".
- Add grease slowly while shaft rotates. The correct amount of grease is indicated when grease begins to come out of the Alemite fitting at the bottom. The type of grease should be SKF LGEP 2 (or equivalent).

- Check direction of shaft rotation. Viewing the rotator from the drive end, the rotator should turn in a counter-clockwise direction. Direction of rotation can be corrected by changing motor lead connections. The feed buckets can only be operated in one direction.
- Once wastewater is present in the RBC biozone tank, the bucket's flow rate should be adjusted. At maximum flow, the liquid level in the first part of the biozone tank should be just below the point of overflow into the second part of the biozone tank.

4.1.3 Final Clarifier

Treated wastewater will flow into the four hoppers of the final clarifier. Once the level of the wastewater reaches the normal operating level, the operator should turn the Sludge Return Pump switch at the control panel from "OFF" to "AUTO".

4.1.4 Tertiary Filter

Silica sand and 1/8 inch gravels are used as filter material within the WESCAN unit. When routine inspection indicates that replacing the filtering materials is necessary, take the following steps:

- Remove all filtering materials.
- Carefully place new gravels into the filter through the access port on the top, ensuring the gravel surface is level.
- Carefully place silica sand on top of the gravel, once again, ensuring that the sand surface is level.

Prior to the filter start-up, the operator should ensure that:

- The Filter Feed Pump (Dosing Pump) and Backwash Pump switches are "OFF" at the control panel; and
- The Filter Feed Pump and the Filter Backwash Pump are primed. This is achieved by removing the clear plastic cover on the pump lint trap and pouring clean water until the lint trap is full. The lint trap cover should then be replaced securely.

The operator should then turn the Filter Feed Pump and Backwash Pump to "AUTO" at the control panel. The treated wastewater will automatically flow from the final clarifier to the filter feed tank. When this reaches a predetermined level, a float switch will turn on the filter feed pump.

4.1.5 UV Disinfection

Once the UV unit is full of water, the operator should turn the power switch "ON". The unit works automatically.

The UV unit should never be turned on until it is full of water.

4.1.6 Sludge Digester

The following outlines the operational procedures for the sludge digester:

1. The sludge is pumped to the digestion tank daily. The digestion tank must be continuously aerated to avoid unpleasant odours from anaerobic conditions.

2. The final clarifier sludge return pumps should be turned off when the sludge digestion tank begins to overflow into the aerated equalization tank. The aeration of the digestion tank should be paused for one hour to allow solids to settle. The aeration pump is turned off using a ball valve in the air line. The liquid above the sludge layer can then be gravity fed to the equalization tank using the decanter line.

3. When the digestion tank air is turned off, the blower should be checked to avoid overheating. If potential overheating is indicated, air should be allowed to flow through the bleed-off ball valve in the airline.

4. Before the solids content in the digestion tank exceeds the capacity of the tank and sludge begins to overflow and return to the equalization tank, the sludge must be removed using a pumper truck. The frequency of sludge removal is variable and will be dictated by volume of influent to the WWTP. Sludge pumping will therefore be on an as-required basis determined by the plant operator. The procedures are as follows:

   - Attach a pumper truck hose to the 3 inch camlock fitting on the sludge removal pipe.
   - Open the valve next to the camlock fitting and transfer the sludge into the pumper truck.
   - The sludge is then transferred to the landfill. The disposal of the treated sludge is detailed in the Landfill Management Plan (LMP).

5. Shear estimates that sludge removal will be required four times per month. When alum is used for phosphorous removal, the digester generates more sludge and the frequency of sludge removal is increased. At the operator's discretion, more frequent sludge removal can be carried out but will result in compressed periods for WWTP operations.

4.2 Shut-down Procedures

When the operation of the WWTP is to be suspended, the entire unit should be drained, washed, and dried. The following should be performed:

- Keep the RBC rotating while draining the biozone tank.
- Thoroughly hose off the media when the biozone tank is drained.
- Maintain operating temperature with media rotating until media is dry.
- Check tightness of mounting bolts for shaft bearings and drive system.

4.3 Routine Maintenance

Routine maintenance of each unit of the WWTP should follow the manufacturer's operation and maintenance instructions for the individual unit. The following sections provide general guidance of the plant maintenance.

4.3.1 Daily

The operator shall perform the following daily procedures:

- Inspect all components of the WWTP to ensure they are in proper working order.
- Squeegee all tanks except the equalization tank; skim and collect grease from the surface of the tanks for disposal or incineration.
- Pump sludge and floating scum from each final clarifier hopper to sludge digestion tank.
- Open the flow valve on the sludge tank return line, and transfer sludge back to the equalization tank.
- Monitor the sludge return line in the back right-hand corner of the equalization tank. When the discharge changes from an opaque to a lighter color, close the sludge line return valve.
- Check operation of all pumps of the WWTP by switching them to manual.
- Wet Bio-Soil Additive with warm water, and add it to the aeration tank.
- Check all six lift stations for pump operation and grease build-up.
- If alum is used, check the level of alum in the metering pump tank, and refill as necessary.

4.3.2 Weekly

The operator shall perform the following weekly procedures:

- Check RBC speed reducer for lubrication requirement, and lubricate as necessary.
- Check sludge and floating scum pump:
  - Actuate the solid state timer by putting it on manual override (“H” setting).
  - When the sludge pumps start up, ensure that floating scum is drawn off the top of the clarifier. This can be simulated by sprinkling sawdust on top of the clarifier for test purposes. If the floating material is not removed, it may be necessary to lower the collar around the top of the sludge lift tank. Normally, this collar is set approximately 25 mm below the water level.
  - Run the sludge return pump manually for approximately 2 minutes and ensure that the sludge return piping system is in good working order.

4.3.3 Monthly

The operator shall perform the following monthly procedures:

- Grease wheels on RBC (two locations at either end of the RBC). Turn off the RBC drive motor prior to greasing.
- Change the gearbox oil as recommended by the gearbox manufacturer.

- Check conditions of plant, steelwork, and fibreglass reinforced plastics. Depending on the surface finish, rust spots on steelwork should be wire brushed and touched up with a zinc-based paint or coal tar epoxy.
- Visually check motor current and ground connection.
- Visually check if the thermal overload in the starter is set to the rated current.
- Vacuum out grease from lift stations, and wash sides of the tanks with a pressure washer.

Table 2 summarizes the required lubrication frequency and lubricant type.

Table 2 Lubrication Chart

Item	Frequency	Amount of Lubrication	Type of Lubricant
Gearbox	Once in first 3 weeks, then ideally once in every 30 weeks	Fill up to 7.5 L of lubricant (Ensure no overfill)	Shell Omala 220 or equivalent.
Main Shaft Bearings	Every 3 months	Purge out all old grease by a grease gun with new grease (1)	SKF LGEP 2/0.4 or equivalent
Shaft Stub Ends	Check monthly	Smearing with grease for corrosion protection	SKF LGEP 2/0.4 or equivalent

Note:

1. Old grease will be pushed out from an automatic grease relief valve on the bottom of the bearing.

4.4 Potential Operational Problems and Troubleshooting

The following sections provide a brief discussion of the probable causes of operational problems that may be encountered, as well as the practical solutions to remedy these problems. The WWTP supplier should be notified before attempting any troubleshooting procedures. The contact list and communication procedures are described in Section 2.0.

4.4.1 Rotator Imbalance

When rotation of the RBC is suspended, the upper half of the discs will quickly lose water and cause the biomass to dry out. The rotator will then become imbalanced as the lower half of the discs is heavier than the upper half.

If the suspension of rotation of the RBC lasts longer than one day, the rotator may need to be turned manually through 180° to allow the biomass culture to dry for a short time. After about two hours, balance should have returned to the rotator and it may then be restarted normally. The process for manually turning the rotator is as follows:

1. Switch off power supply to the unit.
2. Remove motor end cover protecting the gearbox motor fan on TEFC motors.
3. Rotate the fan impeller by hand (this will cause the disc shaft to rotate slowly). On X.P. motors, it may be necessary to disconnect the drive or remove the motor from the gearbox and turn the rotator

manually. On gearboxes with a belt drive between the motor and the gearbox input shaft, the large sheave can be turned by hand to rotate the RBC shaft.

4. Secure the rotator to prevent it from turning.
5. Allow the rotator to dry off a little.
6. Refit end cover on the motor before starting again.

For stoppages of more than 2 to 3 days, or in the case of a serious out-of-balance situation, the shaft rebalancing should be performed, as follows:

1. Turn the rotator manually through 180°.
2. Stop the unit with the heavy half of the media at top dead centre. At this position, the rotator is likely to rotate in either direction unless secured. It is, therefore, necessary to secure the rotator in this position. This can be done by clamping the TEFC motor fan with vice grips.
3. Hose off the top half of the media, using a high-pressure hose, ensuring that it penetrates between the media. Do this as evenly as possible.
4. Check the balance by freeing the rotator and running the gearmotor.
5. If balance has been restored, it will be possible to stop the motor in any position without the rotator moving.
6. If further balancing is required, repeat steps 2, 3, and 4.

The procedure to check if the rotator is still out of balance:

1. Out of balance can be recognized by a change in the sound of the gearbox with each revolution of the shaft.
2. Run the unit for a few minutes and stop. The unit will continue to rotate due to the out-of-balance force, and the heavy half of the rotator is always at the bottom.

4.4.2 Excess Sloughing of Biomass from RBC Media

Under normal operating conditions, the biomass is continually sloughing off the RBC contactor media. Excessive sloughing of biomass, however, is usually an indication that the microorganisms are being destroyed in large numbers, which will result in a decreased treatment efficiency. Rapid destruction of the microorganisms can result from:

- Long exposure to cold temperatures, or
- Presence of chemicals such as cleaners and disinfectants which are toxic to the microorganisms.

The prevention and remedy actions include:

1. Ensuring temperature in room does not drop below 7.2°C for extended periods, and

2. Informing camp occupants not to dispose of any toxic substances in the sewer system. An advisory sheet listing substances that cannot be disposed in the toilet will be posted in the washroom as a preventive measure.

4.4.3 High Influent BOD_5 Values

Raw wastewater with high organic content may be occasionally encountered (i.e., BOD_5 greater than 700 mg/L). It may cause a temporary organic overload condition with a resulting reduction in effluent quality. The possible causes of this problem are:

- Excessive organic solids are carried from primary settling tank, or
- Excessive organic solids are carried over from the sludge digestion tank during supernatant draw-off.

The prevention and remedy actions include:

1. Directly pumping and disposing of organic solids from primary settling tank, and
2. Shortening the decanting time of the sludge digester.

4.4.4 Poor Sludge Settling

Poor sludge settling is characterized by solids rising to the top of the final clarifier or remaining in suspension. It indicates the need to revise operational procedures. If the sludge solids remain on the bottom of the final clarifier hoppers, anaerobic conditions will be generated due to the lack of oxygen. The anaerobic bacteria, as a by-product of the digestion process, produce various gases, which may rise and carry sludge solids to the water surfaces. Solids can also hang up on the final clarifier hopper walls and, as they build up, can result in anaerobic conditions.

The prevention and remedy actions include:

1. Increasing frequency of sludge withdrawal, and
2. Scraping or vacuuming walls of hoppers more frequently

4.4.5 Change in Biomass Colour

Changes in influent wastewater conditions will affect the appearance of the biomass and in some cases may affect treatment efficiency. A change in colour or appearance usually indicates the presence of foreign substances in the raw wastewater.

The normal colour is brownish-gray on the first back progression, becoming brown on the later stages of the rotator. Gray biomass all along the rotator indicates an operational problem.

The operator should attempt to isolate the substance and prevent its reappearance. The prevention and remedy actions include:

1. Preventing further disposal of the substance to system, and
2. Checking and cleaning grease traps.

5.0 SAFETY AND EMERGENCY RESPONSE

Conditions at the plant that could trigger an emergency response may include:

- Accident, including personal injury;
- Tank rupture/spill, including any environmental damage; and
- Fire or other property damage.

The appropriate response to each of these conditions is described in the following sections.

5.1 Accident

In the event of an accident, the following actions should be taken:

1. Be alert, consider your safety first.
2. Alert camp emergency personnel.
3. Identify the cause of the accident.
4. Assess fire and safety hazards.
5. Attend to the injured person according to standard first aid principles.

5.2 Tank Rupture/Spill

In the event of a tank rupture/spill, complete the following actions:

1. Be alert, consider your safety first.
2. Alert camp emergency personnel.
3. Identify the cause of the spill.
4. Assess fire and safety hazards.
5. Attend to any injured personnel according to standard first aid principles.
6. Secure the area of the spill.
7. Take appropriate measures to stop and contain the spill.

5.3 Fire

In the event of a fire, the following actions should be implemented:

1. Be alert, consider you safety first.
2. Alert camp emergency personnel.
3. After camp emergency personnel have been notified, do what you can to either put out or contain any fires. Do this only if it is safe to proceed; otherwise, clear the area and wait for the emergency personnel.

4. Only attempt to extinguish fires if the responsible personnel have the proper training and are equipped with proper personal protection equipment (PPE) and fire suppression equipment.

In case of the electrical fire, before attempting to extinguish the fire the following conditions should be met:

1. Electrical personnel, if available, are alerted to the problem.
2. All power to the plant is isolated.
3. No one should enter site alone.
4. A self-contained breathing apparatus must be worn.
5. Only attempt to extinguish fires if the responsible personnel have electrical fires extinguishing training, and are equipped with proper PPE and fire suppression equipment.

6.0 MONITORING

6.1 Start-Up Performance:

For the first two days of operation, there will only be limited detectable biological growth on the rotating plastic media; however, the aeration and flocculation caused by the rotating surfaces will result in some BOD_5 removal. After three or four days of continuous operation, even if the biomass may not be visible, it should be noticeable by touching the rotating surfaces. After seven to ten days, biomass generated by the contactor will be visible, and considerable BOD_5 removal will be taking place. At this time, some sloughing of the biomass may occur but will not significantly affect treatment efficiency. After three to four weeks of operation, the expected level of BOD_5 removal should be achieved.

Operational procedures during cold weather are the same as for warm weather operations. However, if the wastewater temperature is less than 13°C (55°F), then the various stages of biomass development could be delayed by a factor of two or three times the normal period, depending on how low the temperature is.

A monitoring program will be implemented to assess compliance with permit discharge criteria and to continuously evaluate the treatment performance of the plant. Records of plant operating conditions are to be maintained, and can be used during troubleshooting or optimizing plant operation.

6.2 Influent Monitoring

Influent monitoring is required to track the quality of wastewater entering the WWTP; and the records can be used to evaluate the treatment performance and to assist any potential troubleshooting. The WWTP influent sample collection requirements are summarized in Table 3.

Table 3 Wastewater Influent Quality Monitoring

Sample Frequency	Sample Location	Analytical Package
Every two weeks[1]	Aerated equalization tank	On-site measurement including temperature, pH, dissolved oxygen (DO), electric conductivity (EC) Routine [2] Nutrients with additional Total Kjeldahl Nitrogen (TKN) [2] Biological [2]

Note:
1. Sampling frequency should be increased to weekly if plant loading increases or effluent quality target is not met.
2. Detailed laboratory analytical parameters in each of the packages are listed in Appendix C.

6.3 Process Monitoring

Selected process parameters should be monitored to provide information on plant operation. The process monitoring requirements are summarized in Table 4.

Table 4 Treatment Process Monitoring

Sample Frequency	Sample Location	Sample Parameters	Acceptable Range of Values [1]
Daily	Main Collection Sump	Influent flow rate	Max 45.5 m^3/day
	Plant Discharge	Effluent flow rate	Max 45.5 m^3/day
	Aerated equalization tank	pH	6.5 to 8.5
		DO	>1.0 mg/L
		Temperature	>13°C
		Settlable solids	<400 mg/L
	RBC First Stage	pH	6.5 to 8.5
		DO	>1.0 mg/L
		Temperature	>13°C
	RBC Second Stage	pH	6.5 to 8.5
		DO	>1.0 mg/L
		Temperature	>13°C
	Final Clarifier	pH	6.5 to 8.5
		DO	>1.0 mg/L
		Temperature	>13°C
		Settlable solids in influent	< 470 mg/L
		Settleable solids in effluent	< 40 mg/L
	Aerobic Digester	pH	6.5 to 8.5
		DO	>1.0 mg/L
		Temperature	>13°C
Weekly	Aerobic Digester Sludge	Settlable solids	20,000 to 30,000 mg/L

Note:
1. The acceptable range is based on Dillon (2006b).
2. The result will also be used as the on-site measurement for influent quality monitoring sample in Table 3.

The pH, DO, and temperature measurements should be collected using handheld multi-parameter device. The calibration of the meter should be checked or calibrated daily prior to the measurement. To avoid cross-contamination of the meter, the meter should be cleaned with deionized water before each measurement; and the measurement should start from the effluent to the influent end of the treatment process.

The settling solid concentrations should be measured in a qualified on-site laboratory or submitted to a CALA accredited laboratory. The apparatus and measurement should follow Standard Method 2540 F in the Standard Methods for the Examination of Water and Wastewater (AWWA 2005).

Daily monitoring results from Table 4 are to be recorded in the Daily Water Quality Measurements Form, and transferred to the water quality database on a monthly basis. A copy of the Daily WWTP Monitoring Record Form is included in Appendix D.

6.4 Effluent Monitoring

Effluent from the WWTP is discharged to the PKCA and further diluted with the PKCA impounded water. Prior to being discharged to the PKCA, the WWTP effluent will be analyzed; the analytical parameters are summarized in Table 5.

Table 5 WWTP Effluent Quality Monitoring

Sample Frequency	Sample Location	Analytical Package
Weekly (1)	WWTP Discharge	On-site measurement including temperature, pH, dissolved oxygen (DO), electric conductivity (EC), and turbidity
		Routine (2)
		Nutrients with additional Total Kjeldahl Nitrogen (TKN) (2)
		Biological (2)

Note:

1. Sampling frequency should be increased to weekly if plant loading increases or if effluent quality target is not met.
2. Detailed laboratory analytical parameters in each of the packages are listed in Appendix C

The weekly effluent sample will be collected as a composite sample over one operating day. It will be labelled as JER-SWQ-01 as a part of the Site Water Quality Monitoring Program under the Jericho General Monitoring Plan (EBA 2011d). The waste sample is collected and submitted to a CALA accredited laboratory for the analysis. Quality control (QC) samples including field blank, trip blank, equipment blank and duplicate samples are collected. The QC processes and methods are described in the Jericho General Monitoring Plan (EBA 2011d).

The on-site parameter measurements should be conducted using a calibrated and decontaminated multi-parameter device. To avoid cross-contamination of the meter, the onsite measurement starts at the effluent and ends at the influent part of the treatment process.

6.5 Additional Record Keeping

Table 6 summarizes operating information in addition to the analytical monitoring that should be maintained in the WWTP maintenance logbook.

Table 6 Additional Monitoring Records

Operation	Parameter
Filter Backwash	Backwash Frequency
	Backwash Duration (hour or min)
Filter Backwash	Sludge Removal Frequency
	Sludge Removal Duration (hour or min)
Filter Backwash	Sludge Volume Disposed (m^3)
	Sludge Solids Concentration (mg/L)
	Sludge Volume Recycled (m^3)

7.0 CLOSURE

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2011 WATER LICENCE RENEWAL DOCUMENTS

Management Plans

EBA, A Tetra Tech Company (EBA), 2011a. Aquatic Effects Monitoring Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011b. Care and Maintenance Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011c. Contingency Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011d. General Monitoring Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

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EBA, A Tetra Tech Company (EBA), 2011f. Landfarm Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011g. Landfill Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

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EBA, A Tetra Tech Company (EBA), 2011j. Waste Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

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EBA, A Tetra Tech Company (EBA), 2011l. Wastewater Treatment Management Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

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EBA, A Tetra Tech Company (EBA), 2011m. C1 Diversion Construction Summary, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011n. Fuel Storage Containment Facility Design Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011o. Preliminary Landfarm Design Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

EBA, A Tetra Tech Company (EBA), 2011p. Preliminary Landfill Design Plan, Jericho Diamond Mine, Nunavut. Prepared for Shear Diamonds Ltd., February 2011.

Additional Plans

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Dillon Consulting Limited (Dillon), 2006b. Jericho Mine Wastewater Treatment Plant – Operations and Maintenance Manual, prepared for Tahera Diamond Corporation, April 2006

Duong, Diep and Kent, Ron, 1996. Guideline for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories. Municipal and Community Affairs. October 1996.

P.J. Hannah Equipment Sales Corp. (Hannah), 2010. P.J. Hannah Rotating Biological Contractor (RBC) Operating and Maintenance Instructions for P.J. Hannah RBC Model DS10H BFP for 200 Man Camp Wastewater Treatment, Serial Number K17550. Provided by Chris Merritt of Seprotech Systems Inc. on December 29, 2010.

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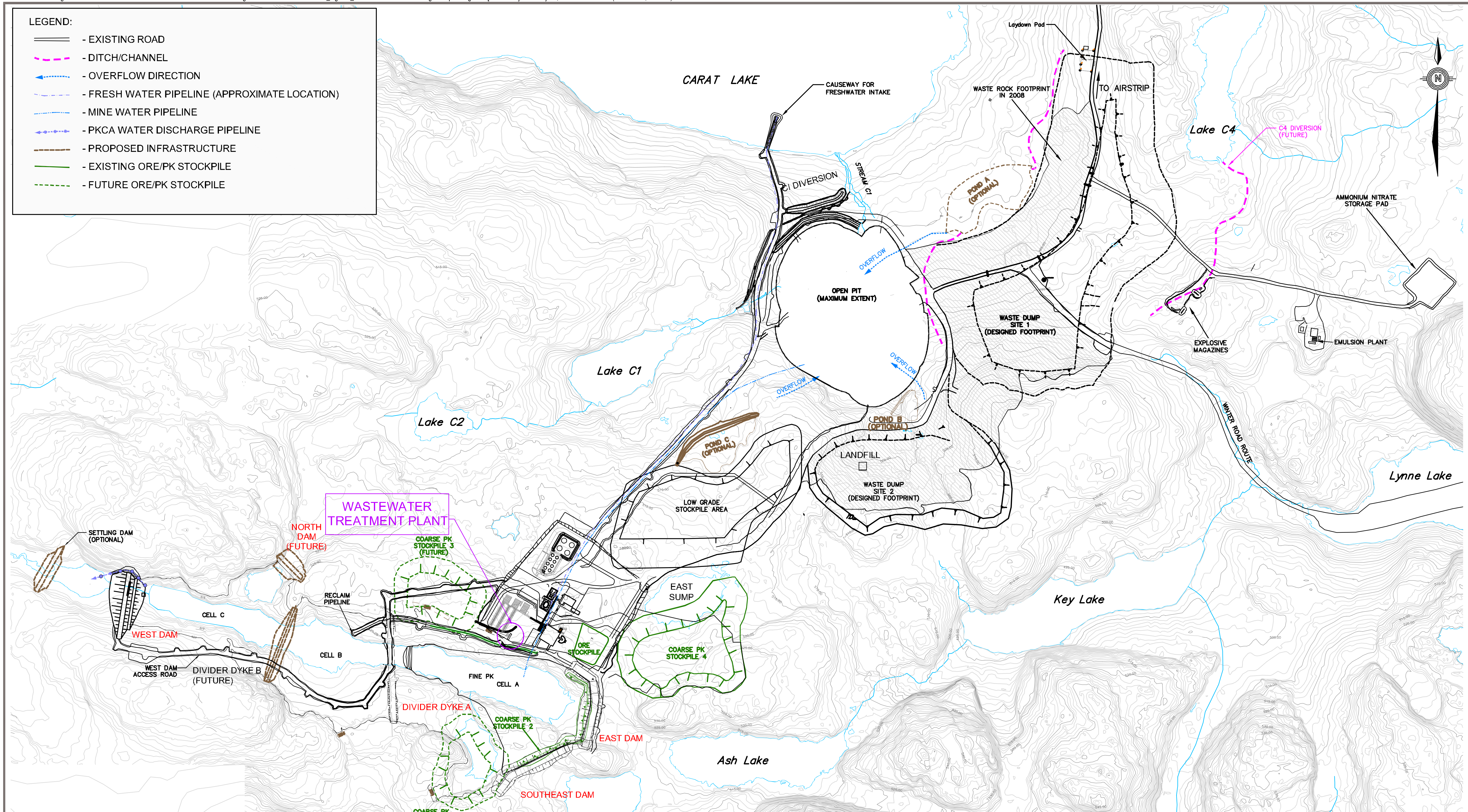
FIGURES

Q:\Edmonton\Drafting\DIVISIONS2007\E141\E14101118\Wastewater Treatment Management Plan\Acad\E14101118_Figure 1_Waste Water Treatment Management plan.dwg [FIGURE 1] February 10, 2011 - 8:55:02 am (BY: KIROS, TIGISTI)



NOTES:

1. LAYOUTS ARE APPROXIMATE, AND MAY NOT REFLECT ACTUAL SIZE AND LOCATIONS
2. FOOTPRINTS OF WASTE ROCK PILES, COARSE PK STOCKPILES, AND ORE STOCKPILES ARE SHOWN IN MAXIMUM LIMITS, ACTUAL FOOTPRINTS MAY VARY

0 500

Scale: 1: 10 000 (metres)

STATUS
ISSUED FOR USE

CLIENT

SHEAR DIAMONDS LTD.

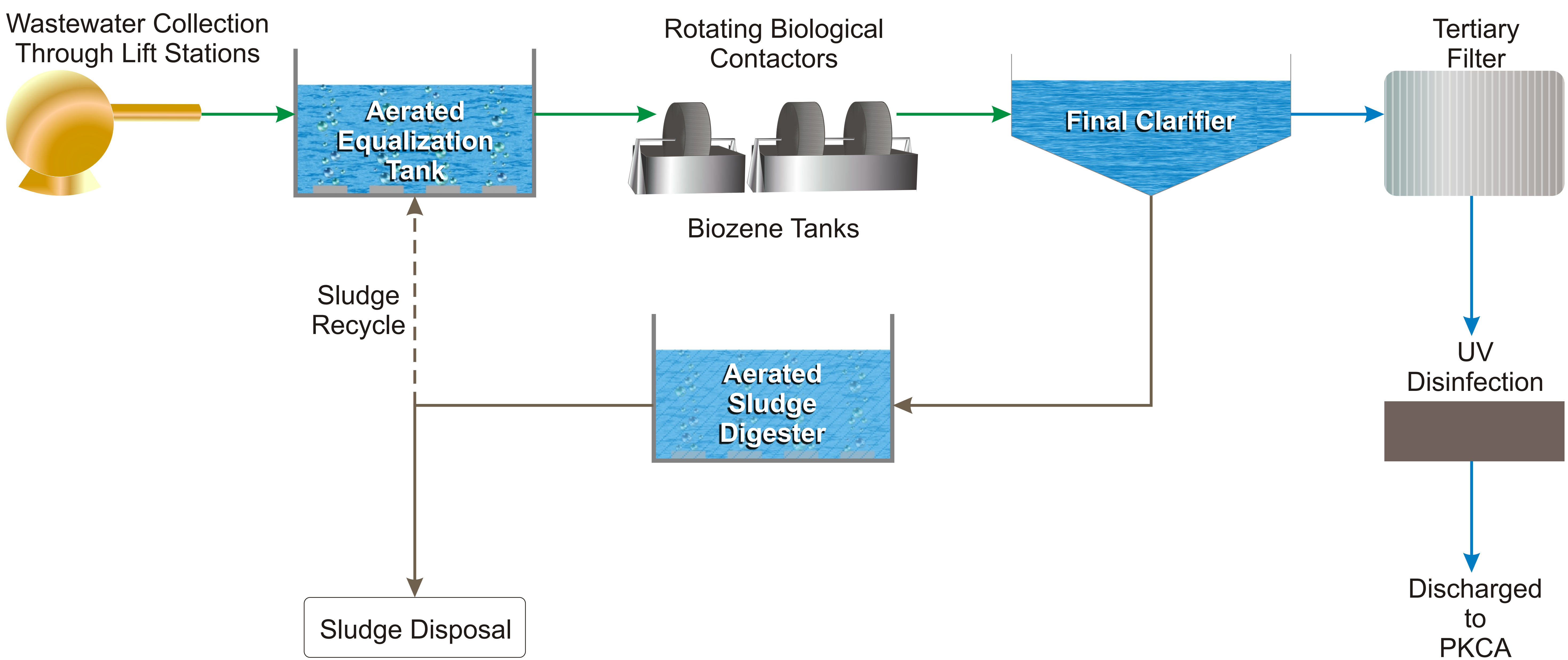
eba
A TETRA TECH COMPANY

WASTEWATER TREATMENT MANAGEMENT PLAN
JERICHO DIAMOND MINE, NUNAVUT

SITE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
E14101118	DBD/TK	WL	0
OFFICE	DATE		
EBA-EDM	February 9, 2011		

Figure 1



LEGEND

- Wastewater
- Sludge
- Treated Wastewater

NOTES

STATUS
FOR INTERNAL USE ONLY

CLIENT
SHEAR DIAMONDS LTD.

WASTEWATER TREATMENT MANAGEMENT PLAN
JERICHO DIAMOND MINE, NUNAVUT

Wastewater Treatment Process Flowsheet

PROJECT NO.	DWN	CKD	APVD	REV
E14101118	CLS	WL		0

OFFICE	DATE
EBA-EDM	February 2011

Figure 2

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APPENDIX A

APPENDIX A HISTORICAL WWTP LOCATION AND DESIGN PLANS

DILLON
CONSULTING

January 30, 2006

Dillon File: 05-5605-0100

Tahera Diamond Corporation - Jericho Project
Box 2341
Yellowknife, NT X1A 2P7

Attention: Mr. Mike Tanguay and Ms. Cheryl Wray

Dear Sir and Madam:

Jericho Mine Wastewater Treatment Plant Design Plan - Addendum

Attached please find the final report for the above-noted project.

This report was prepared for the Tahera Diamond Corporation (Tahera) in order to fulfill certain requirements of Nunavut Water Board (NWB) Water Licence Number NWB1JER0410. The report represents an addendum prepared to address deficiencies identified by NWB and INAC during their reviews of the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera; April, 2005).

We conclude that – together with previous reports, and Tahera's commitment to update the Operation and Maintenance Manual for the wastewater treatment plant and to conduct influent and effluent monitoring – this present report:

- Corrects inconsistencies in design parameters, and addresses INAC and NWB queries and concerns relating to Design Plan deficiencies.
- Fulfills requirements of Schedule D Item 8 of the Licence.
- Confirms, under a valid NAPEGG stamp, that the Jericho Mine sewage wastewater treatment plant is designed to handle and treat the sewage from the camp to levels compliant with the Licence requirements.

We hope that the attached report meets your present needs. It has been a pleasure to work with Tahera on this present assignment, and we look forward to now turning our attention to the WWTP Operation and Maintenance Manual update.

Please contact the undersigned if you have any questions or require further information.

Sincerely,
Dillon Consulting Limited

John Hart, P.Eng.
Associate, Project Manager

REGISTERED PROFESSIONAL ENGINEER
G. STRONG

Gary Strong, P.Eng.
Partner, Technical Reviewer

Dillon Consulting
Limited

Jericho Mine Wastewater Treatment Plant Design Plan - Addendum
Tahera Diamond Corporation

January 30, 2006

Our File: 05-5605-0100

Submitted to:

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Jericho Project
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Submitted by:

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TABLE OF CONTENTS

FIGURES (attached in Appendix A)

APPENDICES

1.0 Introduction

This report was prepared for the Tahera Diamond Corporation (Tahera) in order to fulfill the requirements of Nunavut Water Board (NWB) Water Licence Number NWB1JER0410. Part D Item 8 of NWB Licence states that:

> *The Licensee shall submit to the Board for approval, a detailed Waste Water Treatment Plant Design Plan (…) including drawings stamped by an Engineer. The plan shall be developed in accordance with Schedule D, Item 8.*

Schedule D Item 8 of the NWB Licence refers to essential items to be included in the wastewater treatment plant (WWTP) design plan, and Tahera submitted to the NWB the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005).

Following the Indian and Northern Affairs Canada (INAC) May 25, 2005 review, NWB requested in their July 28, 2005 correspondence that Tahera prepare a re-submission, and confirm within it the following items:

- That identified deficient items from Schedule D Item 9 have been satisfied, namely:
  - b. Design criteria/parameters.
  - e. Treatment efficiency expectations.
- Corrections to any inconsistencies in design parameters and expectancies already raised by the parties and/or Board's Technical Advisor.
- Include a thorough understanding of flow and waste constituent loading to the plant.
- Treatment mechanics of the RBC.
- Verification that treatment efficiency will meet requirements of Licence Part G Item 6(a)(i).

Thus, this present report is an addendum to the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005), prepared in order to address the above-noted re-submission requirements. As such, and for clarity's sake, some limited information has been restated in this present report regarding the mine and the WWTP in question. For additional details regarding this WWTP, refer to the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005).

1.1 Background

Benachee Resources Inc., a wholly owned subsidiary of Tahera, has constructed and operates the Jericho Diamond Project near the north end of Contwoyto Lake in Nunavut Territory (NT), 65°59'50" N Latitude, 111°28'30" W Longitude.

Operations will commence with an open pit mine at the north end of Contwoyto Lake in West Kitikmeot. Ore will be mined and processed year round. With current resources the mine and processing plant will have an 8-year life and employ a total of approximately 105 to 175 people (including employees and contractors), with approximately half that number on site at any rotation. The camp is designed to accommodate 100 people in a single occupancy arrangement. However, if required to run at double occupancy the camp could hold 192.

A WWTP package system was installed at the mine site in the early construction phase, at the same time as the camp. It is housed in a stand alone, metal clad, insulated building located next to the accommodations complex at the mine site (refer to Figures 1 and 2). The WWTP building was founded on a prepared pad of crushed rock under rig mats for ground insulation, and is supplied heat from baseboard electrical heaters. The WWTP is sized to service 200 people, and will be operated by site maintenance personnel.

2.0 Wastewater Treatment

2.1 Wastewater Sources

The WWTP was designed to treat domestic sewage and grey water originating at the camp. Wastewater sources include the following:

- Laundry facilities.
- Washroom/shower facilities.
- Kitchen (equipped with grease trap).
- Two 1000 L sewage holding tanks: one located at the Emulsion building; and one in the construction office trailers (to be decommissioned shortly).

Note that the contents of the floor drainage sump within the Emulsion building will be trucked via vacuum truck to the main mill site, and drained into the plant process water system. The WWTP design is incapable of handling either the volume (~16 m^3/week) or expected elevated ammonia and nitrate concentrations from the Emulsion building sump water.

2.2 Estimated Flows and Loadings

Design parameters for the plant were estimated using 200 people as the maximum camp occupancy. A per-capita daily wastewater generation rate of 227 L/person-day was selected to estimate the average daily flowrate to the plant. This value was obtained from the BC Sewerage System Standard Practice Manual, and is the value provided for a work camp. The Harmon Equation was used to estimate peak flow. Design flowrates are summarized in Table 1 below, and process calculations are presented in Worksheet #1 in Appendix A.

Table 1: Theoretical Flowrates

Parameter	Value
Design Average Daily Flowrate (184 persons)	45.4 m^3/day
Theoretical Peak Hourly Flowrate	7.85 m^3/hr

Flows through the treatment system are equilibrated, so the flowrate into the RBC is equal to the flowrate out of the RBC.

In their May 25, 2005 correspondence to NWB, INAC queried regarding the "impacts of operating the WWTP at 50% (or less) of design capacity." Since RBC technology is typically well-suited in applications with dilute flows, and per discussion in sections 3.1 and 3.2 regarding loadings to this WWTP, we do not anticipate any negative impacts from dilute sewage or reduced flowrates.

Referring to early monitoring data from Jan.13 to 15, 2006 (refer to Worksheet #2 in Appendix B), note that the current metered flowrates to the WWTP (current occupancy 180 people) are roughly half of the anticipated flows at full camp occupancy (192 people). Because of this, and since the camp population will drop to approximately 100 occupants within the coming months, we have utilized the maximum Design Average Daily Flowrate, and not peak flows, in calculating the design capacity of this WWTP. Given the current body of meter data, we believe that utilizing the maximum Design Average Daily Flowrate is appropriate for the present exercise.

Wastewater composition was estimated using typical industry parameters. Refer to Worksheet #1 in Appendix B, and the summary in Table 2 below.

Table 2: Wastewater Influent Composition

Parameter	Concentration
BOD_5	375 mg/L
Total Suspended Solids (TSS)	400 mg/L
Total Nitrogen	40 mg/L
Total Phosphorous	8 mg/L
Fats, oils, grease	150 mg/L
Faecal Coliform	1,000,000 to 10,000,000 units/100 mL
Wastewater Temperature	13^{o}C minimum

There are two grease traps installed in the camp kitchen; Tahera cleans these traps weekly and ships the grease off site for disposal. Information was not available regarding whether the grease traps were installed per the P.J. Hannah's specifications in section 1.2.3 of the Operation and Maintenance Instructions manual. P.J. Hannah was provided with the "Nishi-Khon/SNC Lavalin Specifications" that cites an influent O&G loading of 175 mg/L (refer to Worksheet #1 in Appendix B) and, therefore, was aware that the WWTP should be designed to handle such loadings. Notwithstanding the above, Tahera will monitor WWTP influent and effluent O&G; refer to section 4.3 below.

2.3 Effluent Requirements

Refer to section 3 of this present report for additional details regarding the wastewater treatment process; from the design review herein, we generally conclude that this WWTP is properly designed and adequately sized to handle the expected loadings from the sewage sources identified.

Given the expected loadings to this WWTP during normal operation (refer to Tables 1 and 2), we expect that the WWTP's design specifications (refer to Appendix B) will result in an effluent with a quality as summarized in Table 3 below.

Table 3: Average Wastewater Effluent Composition

Parameter	Concentration
BOD_5	<10 mg/L
Total Suspended Solids (TSS)	<10 mg/L
Total Nitrogen	20 mg/L
NH_3 – N	20 mg/L
Total Phosphorous (without precipitation)	6 mg/L
Oil and Grease	<15 mg/L
Faecal Coliform	<100 units/100 mL
Clarifier Sludge Production (1-2% solids m/m)	2.1 m^3/day

Calculating the anticipated WWTP effluent concentrations for O&G and coliforms with certainty is difficult; the values stated in Table 3 are reasonable estimates. Note that the environment in the PKCA is inhospitable for faecal coliform growth due to the low temperature, sun light during summer months, and lack of organics growth substrate. Consequently, and in addition to dilution, there will be further decay of the bacterial count prior to PKCA discharge to Stream C3.

The WWTP discharge is directed to the PKCA. Part G 6(a)i of the Jericho Diamond Mine Water Licence NWB1JER0410 requires that the main PKCA discharge to Stream C3 meets the effluent quality requirements summarized in Table 4 below.

Table 4: Effluent Quality Requirements, Stream C3 when WWTP in Operation

Parameter	Maximum Average Concentration	Maximum Concentration of any Grab Sample
BOD_5	15.0 mg/L	25.0 mg/L
Oil and Grease	3.0 mg/L	5.0 mg/L
Faecal Coliforms	10 CFU/100 ml	20 CFU/100 ml

The WWTP discharge is a relatively small component of the total flows to the PKCA; notwithstanding that the concentrations in the WWTP discharge exceed the values stipulated in Part G 6(a)(i) of the Licence, we think it unlikely that the Licence requirements will be exceeded for these values at the point of sampling (PKCA discharge to Stream C3). Monitoring shall confirm this; refer to section 4.3 below.

The Table 4 requirements are in addition to the requirements of Part G 6(a) of the water licence, which specifies effluent quality requirements for all PKCA discharges to Stream C3. Several of the parameters cited in Part G 6(a) may also be influenced by discharges from the WWTP; these are summarized in Table 5 below.

Table 5: Effluent Quality Requirements, Stream C3, General

Parameter	Maximum Average Concentration	Maximum Concentration of any Grab Sample
Total Ammonia - N	6 mg/L	12 mg/L
Nitrate - N	28 mg/L	56 mg/L
Nitrite - N	2.5 mg/L	5.0 mg/L
Phosphorous - P	0.2 mg/L	0.4 mg/L
TSS	15.0 mg/L	25.0 mg/L

Predicted phosphorous loadings from the WWTP effluent to the PKCA, when phosphorous removal is not used, could be sufficiently high that discharges from the PKCA to stream C3 may exceed the maximum concentrations specified in the water licence. This speculation is based upon the water balance data provided to Dillon by Tahera; additional monitoring is required in order to confirm this (refer to section 4.3 of this report).

Tahera will conduct monitoring of other discharges to the PKCA to ensure that the discharges from the WWTP (refer to Table 3), combined with other mine discharges (refer to worksheet #5 in Appendix B), will not result in any exceedences of the NWB Licence requirements (refer to Tables 4 and 5).

3.0 Treatment Process Description

Refer to the Jericho Diamond Mine Waste Water Treatment Plant Design Plan, (Tahera, April 2005) for a detailed description of the nature and mechanics of waste treatment within Rotating Biological Contactor technology and the associated appurtenances in this WWTP. Utilizing RBC and secondary clarifier technology for the biological and physical treatment of sewage is well understood and accepted within this industry sector. Similarly, dual media filtration and UV disinfection are also widely accepted methods for effluent polishing.

3.1 Pretreatment

Raw wastewater from the camp is collected in a sump and fed to the WWTP using a level activated submersible solids grinding pump. The raw wastewater is pumped into an aerated Equalization Tank.

Refer to the sewage loading and Equalization Tank design calculations within worksheets #1 and #2, respectively, in Appendix A. Calculations in these worksheets confirm that the Equalization Tank is designed to provide adequate volume storage to buffer the WWTP against hydraulic shocks. The Equalization Tank is also expected to buffer the treatment system against variations in influent quality.

3.2 Rotating Biological Contactor Secondary Treatment

A rotating biological contactor (RBC) provides secondary treatment for the wastewater generated at the Tahera camp; a PJ Hannah Model D10BFP RBC package plan was installed.

The RBC is equipped with three rotating discs arranged in two stages: a single disc first stage and a two disc second stage. The discs consist of rigid polypropylene media supported on galvanized steel frames and are rotated using a direct mechanical drive system (3/4 hp motor).

An underflow line from the Equalization Tank feeds wastewater into the first stage of the RBC. A bucket wheel pump assembly connected to the discharge side of the first disc is used to deliver a measured dose of wastewater to the second stage of treatment system.

Refer to the RBC design calculations within worksheet #3 in Appendix B. Note that, in preparing the design calculation and to err on the side of conservatism, Dillon assumed that negligible soluble BOD reduction occurs in the Equalization Tank.

Calculations in worksheet #3 confirm that the RBC units are designed to handle the expected hydraulic, organic, and solids loadings from the sewage. The calculations also confirm that the WWTP design effluent quality – at this stage of the treatment process and given the associated downstream appurtenances – is consistent with the overall treatment requirements in order to meet the relevant requirements of the Licence.

3.3 <u>Effluent Solids Separation and Disinfection</u>

Effluent from the RBCs overflows into a four-hopper clarifier for solids removal. A timer activated pump transfers settled sludge to the aerobic digestor every three hours, with the pump run time currently set to 3 minutes. Clarified effluent overflows to the Wescan filter feed tank.

The plant drawing includes a provision for optional phosphorous removal using alum injection into the RBC's discharge to the secondary clarifiers. This equipment is not present at the Tahera WWTP.

Calculations in worksheet #4 confirm that the clarifier are adequately sized to handle the expected hydraulic and solids loading from the RBCs.

Decant water from the clarifier overflows to a filter feed tank, and is then pumped through a Wescan dual media (sand/gravel) filter for final solids removal. Performance specifications for this unit were unavailable; however, under normal clarifier and filter operating conditions and due to dilution and residence time within the PKCA, we do not expect TSS loadings from the WWTP effluent to pose a problem to the quality of the PKCA discharge to Stream C3.

Effluent from the filter is discharged to the backwash feed tank where it undergoes UV disinfection prior to discharge to the PKCA. Manufacturer performance specifications for this UV unit provide for a minimum 4-log reduction in faecal coliforms.

Filter effluent is also used to backwash the filter, and the backwash effluent from the filter is directed into the Equalization Tank.

Filtered and UV disinfected water is gravity fed to the PKCA when the water level in the backwash tank reaches a pre-determined level.

Digestor aeration is periodically ceased, and decanted digestor water is manually recycled to the Equalization Tank using an airlift pump. The digestor can also overflow into the Equalization Tank during normal operation. Tahera is currently removing approximately 6,000 L per week of settled/digested sludge; this fits well with the calculated values in Table 3 given anticipated solids reduction in the digestor. This sludge is transported to the Waste Rock Dump for disposal via vacuum truck.

A decant line transfers liquid from the top of the aerobic digestor to the Equalization Tank as required to accommodate sludge transfers from the secondary clarifier. An overflow line connects the aerobic digestor with the Equalization Tank in the event that the aerobic digestor is overfilled.

Design calculations for the solids separation processes are summarized in Appendix B.

3.4 Plant Upset Conditions

In the event of a plant upset, untreated wastewater will be discharged via vacuum truck directly to the east end of the PKCA; Tahera will consider installing a WWTP bypass in spring 2006.

Tahera reports that the discharge to Stream C3 is located at the west end of the PKCA. Discharges of untreated wastewater will be diluted with natural lake water and process plant effluent, and flow through the intermediate filter dyke before reaching the discharge point at the west side of the PKCA. Potential impacts of untreated wastewater on Stream C3 water quality should be minor in the event of a WWTP upset, provided the plant is brought back into operation with minimum delay.

Wastewater temperatures lower than 13^{o}C reduce the treatment efficiency of RBCs. Current operating experience indicates that January wastewater temperatures are on the order of 20^{o}C, which are adequate for plant operation.

Additional discussion regarding plant upset conditions is contained within the Operating and Maintenance Instructions (P.J. Hannah), and Dillon will provide to Tahera an update and expansion to this document. Refer also to sections 4.3 and 4.5 below.

4.0 Wastewater Treatment Plant Design

4.1 Wastewater Treatment Plant and Building Layout

The WWTP is located at the south side of the camp, between the camp residential area and the diamond plant (refer to Figures 1 and 2). No WWTP building layout drawing is available. Refer to Figure 3 for the actual WWTP equipment layout.

The building is equipped with 3 dehumidifiers, which drain back into the Equalization Tank, clarifier, and aerobic digestor.

Measured January temperatures were 15°C air temperature in the WWTP building, and 20°C in the process water. Note that these are acceptable temperatures since RBC technology generally requires that process water temperatures remain above 13°C. Tahera will install a make-up air unit with a heater to increase the ambient air temperature in the building during the winter months.

4.2 Influent and Effluent Drainage

Wastewater is transferred from the first stage of the RBC to the second stage using a bucket pump. Flow through the remainder of the system is via gravity, until the clarified effluent is pumped through the tertiary filter. If the tertiary filter pump fails, clarified water overflows into the backwash water tank and to the WWTP effluent, bypassing the sand filter and the UV disinfection.

An overflow weir located several centimeters above the high level mark in the RBC first stage allows wastewater to overflow into the RBC second stage if the water level in the plant exceeds the design high-water level.

The plant is not currently equipped with a by-pass system.

4.3 Plant Operation and Maintenance

The Operating and Maintenance Instructions (P.J. Hannah) discusses the generic operation and control of the WWTP. Dillon will review this document and provide an updated version to Tahera.

We noted in Tahera’s correspondence that the Western Canada Waste and Wastewater Association provided a training course for the WWTP operators.

Dillon will recommend a WWTP influent and effluent monitoring regime within the Operation and Maintenance Manual update.

4.4 Instrumentation and Control

The Operating and Maintenance Instructions (P.J. Hannah) contains several drawings related to the configuration of the electrical control panels. Dillon received this manual with insufficient time to incorporate meaningful discussion within this present report; thus, additional discussion regarding the instrumentation and control of the WWTP will be incorporated into the Operation and Maintenance Manual update.

4.5 Plant Contingency Plan

Various contingency planning is discussed above, and in P.J. Hannah and Tahera documentation. As this issues is germane to the Operation and Maintenance Manual, this subject shall also be discussed more at length in Dillon's update to that document.

5.0 References

AMEC Earth and Environmental, 2004. *Wastewater Treatment Plant Operations Plan, Jericho Diamond Mine, Nunavut*, May 2004.

British Columbia Ministry of Health Services, 2005. *Sewerage System Standard Practice Manual*, June 7, 2005.

Metcalfe & Eddy, Inc., 1991. *Wastewater Engineering: Treatment, Disposal and Reuse*, McGraw-Hill Inc., Toronto.

Nishi-Khon/SNC Lavalin, 2000. *Engineering Specification, Sewage Treatment Plant,* 334244-1120-45ES-3701, Revision C, June 26, 2000.

Nunavut Water Board, 2005. *Letter Re: Tahera Diamond Corporation; Wastewater Treatment Plant Design Plan; NWB1JER0410*, July 28, 2005.

Nunavut Water Board, 2004. *Licence NWB1JER0410*. December 21, 2004.

P.J. Hannah Equipment Sales Corp., 2005. *Basic Design Criteria – Tahera WWTP*, April 4, 2005, 4 pages.

P.J. Hannah Equipment Sales Corp. *P.J. Hannah Rotating Biological Contractor (RBC) Operating and Maintenance Instructions for P.J. Hannah RBC Model DS10H BFP for 200 Man Camp Wastewater Treatment,* Serial Number K17550.

Tahera Diamond Corporation, 2005. *Jericho Diamond Mine Waste Water Treatment Plant Design Plan, Revision No. 2,* April 2005.

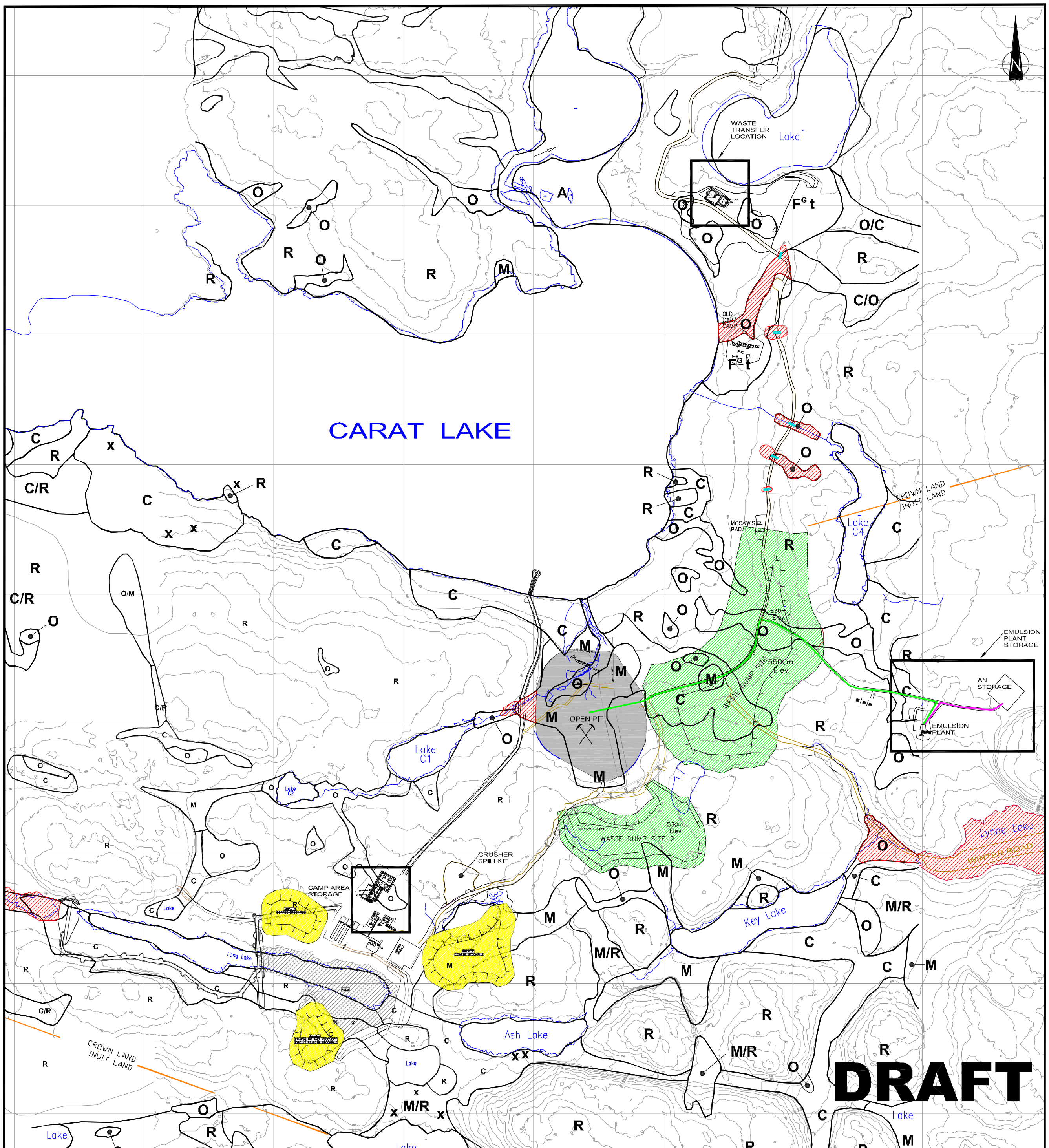
Tahera Diamond Corporation. *Jericho Project, Project Description,* D:\Project Description\Project Description (Final) Jan11.doc.

Tahera Corporation, 2003. *Jericho Project, Baseline Summary Report,* January 12, 2003.

Water Pollution Control Federation, 1977. *Wastewater Treatment Plant Design, A Manual of Practice, MOP/8,* Lancaster Press, Inc., Lancaster, Pa.

Appendix A: Figures

Figure 1:
Site Map (AMEC “Environmental Site Map” Figure No.1)



Legend

Quaternary Holocene Deposits
A River and creek deposits.
C Colluvium.
O Organic deposits.
F' Quaternary Pleistocene Deposits

Fluvioglacial sediment.
M Till. Silt, sand, gravel, cobbles and boulders.

Pre-Cambrian Bedrock
R Undifferentiated metamorphic and volcanic bedrock.

Spill Sensitive Area
Stockpile
AN truck route
Explosives truck route
Culvert
Waste Dump
PKCA
Open Pit

NOTE:
Base map provided by Tahera. Stockpiles and PKCA boundary provided by SRK Consulting.

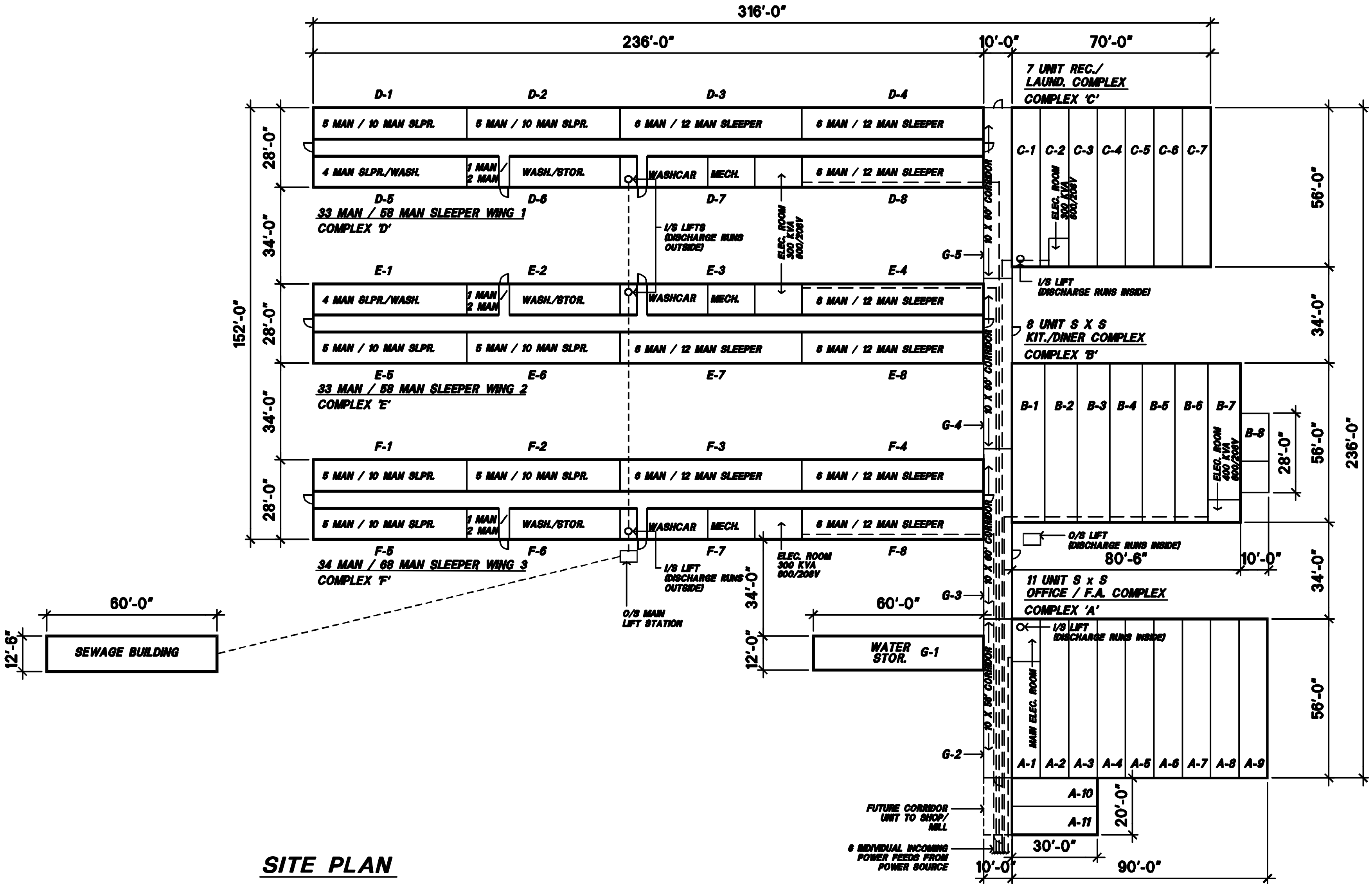
AMEC Earth & Environmental
amec
2227 Douglas Road, Burnaby, B.C. V5C 5A9
Tel. (604) 294-3811 Fax. (604) 294-4664

CLIENT

PROJECT: JERICHO DIAMOND PROJECT	DWN BY: BWS	DATUM: NAD27	DATE: JANUARY 2006
TITLE: ENVIRONMENTAL SITE MAP	CHK'D BY: BO	REV. NO.: A	PROJECT NO: VE51295
	PROJECTION: UTM Zone 12	SCALE: AS SHOWN	FIGURE No. FIGURE 1

C:\DOCUME~1\ADMINI~1\LOCALS~1\Temp\Jericho_EnvSiteMap.dwg - Environmental Site Map - Jan. 16, 2006 11:33am - Administrator

Figure 2:
Site Plan (Shanco Sheet No.F-440A)



SITE PLAN

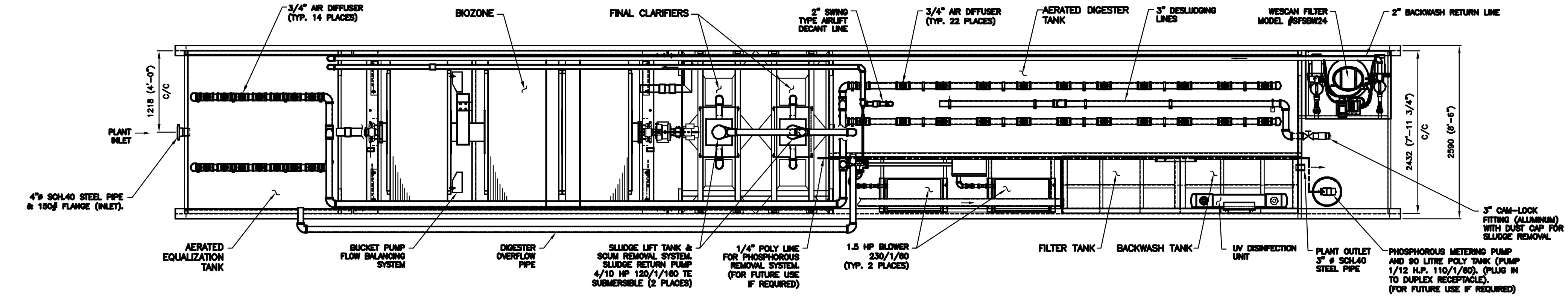
SCALE: 1"=50'-0"

SHANCO CAMP SERVICES LTD. "Simply the Best"	by: VIC scale: 1"=50'-0"	date: 03-12-2004 sheet number: F-440A

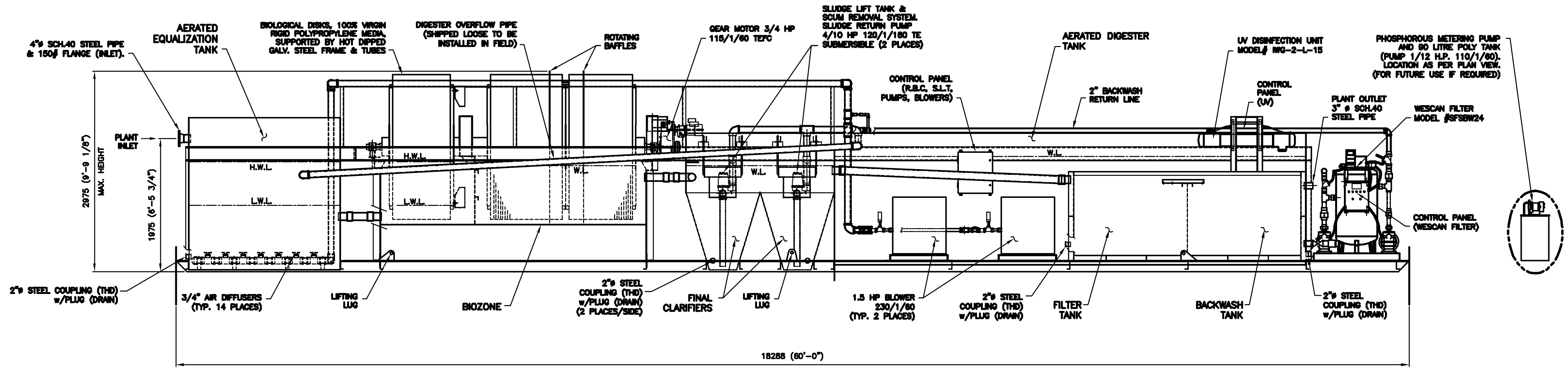
project: NUNA LOGISTICS - TAHERA CAMP

drawing: SITE PLAN

Figure 3:
WWTP Schematic (P.J. Hannah Drawing No.A1-K17550-10455)



PLAN VIEW



ELEVATION VIEW

CRITERIES DE CONCEPION	DESIGN CRITERIA		UNITS	
DEBIT JOURNALIER MOYEN	AVERAGE DAILY FLOW	45.5	M^3/[illegible]	
SOURCE: EGOUT DOMESTIQUE	SOURCE: DOMESTIC SEWAGE			
DEBIT DE POINTE	PEAK FLOW	5.7	M^3/H	
DÊETRE DEBIT BALANCER PAR	TO BE FLOW BALANCED TO	2.18	M^3/H	
AFFLUENT DBO TOTALE: ETE HIVER	INFLUENT BOD TOTAL: SUMMER WINTER	17.06	KG/[illegible]	
AFFLUENT DBO SEDIMENTE	INFLUENT BOD SETTLED	11.94	KG/[illegible]	
AFFLUENT SOLIDES EN SUSPENSION	INFLUENT SUSPENDED SOLIDS	20.48	KG/[illegible]	
EFFLUENT DBO	EFFLUENT BOD (AVERAGE)	10	mg/l	
EFFLUENT SOLIDES EN SUSPENSION	EFFLUENT SUSPENDED SOLIDS (AVERAGE)	20	mg/l	AFTER FILTER
PHOSPHORE	PHOSPHORUS	1.0	mg/l	AFTER FILTER
COLIFORME FÉCALE	FECAL COLIFORM	10	CFU	
TEMPÉRATURE	TEMPERATURE	11° 21°	°C MIN °C MAX	
INFORMATIONS TECHNIQUES	**TECHNICAL INFORMATION**			
DIAMETRE DU DISQUE BIOLOGIQUE	BIO SUPPORTED MEDIA DIAMETER	2.15	M	
SURFACE DU DISQUE BIOLOGIQUE	BIO SUPPORTED MEDIA AREA	1327	M^2	
CHARGE APPLIQUEE SUR LES DISQUES: ETE HIVER	DISC LOADING: SUMMER WINTER	9.0	GM/M^2	
GRANDEUR MINIMUM COMME REQUIS SUR DEBIT QUOTIDIEN MOYEN AU EAUX D'EGOUT BRUTES DE 375 mg/l.	MINIMUM SIZES AS REQUIRED BY AVERAGE DAILY FLOW AT RAW SEWAGE STRENGTHS OF 375 mg/l.			

DESCRIPTION	REV.	DATE
PHOSPHOROUS REMOVAL SYSTEM ADDED.	1	04/04/05

THIS REVISED DRAWING SUPERSEDES ALL PREVIOUS ISSUES

TOUS LES DIMENSIONS EN mm SINON SPÉCIFIER AUTREMONT / ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED

DRAWN	R.D.M
DATE	02/18/2005
SCALE	1:30
CHECKED	
APPROVED	
PLOT	1:30

P.J. HANNAH EQUIPMENT SALES CORP.
VANCOUVER, TORONTO
*NORTH AMERICAN LICENSEE OF KEE PROCESS (FORMERLY KLARGESTER)
*CANADIAN LICENSEE OF SLY INC.
Specialists in pollution control since 1973

CLIENT SHANCO CAMP SERVICES

CONSULTANT

PROJECT TAHERA DIAMOND CORP.

TITLE GENERAL ARRANGEMENT OF 200 MAN CAMP SEWAGE TREATMENT PLANT MODEL D10BFP

OUR REF. # 17550

YOUR REF. #

DRAWING NO. A1-K17550-10455

REV. 1

Appendix B:
Dillon Process Design Calculations

1.0 Design Parameters

1.1 Hydraulic Load

Design Maximum Camp Occupancy:	200 Persons
Wastewater Generation Rate:	227 L/day-person
Average Wastewater Flowrate:	45.4 m^3/day
Harmon Peaking Factor:	4.1
Peak Flow:	7.85 m^3/hr

1.2 Contaminant Load

Plant Wastewater:

BOD_5:	375 mg/L
TSS:	400 mg/L
NH_3:	30 mg/L
TKN:	40 mg/L
Total N:	40 mg/L
Total P:	8 mg/L
Oil and Grease:	50 mg/L

1.3 Effluent Quality

BOD_5:	10 mg/L
TSS:	10 mg/L
Total N:	20 mg/L
Total P:	6 mg/L

2.0 Treatment Process

2.1 Equalization Tank

Equalization Volume (includes RBC first Stage):	8.28 m^3
Average Hydraulic Retention Time:	4.38 hr
Aeration Rate:	0.4 m^3/min

2.2 Rotating Biological Contactor:

Media Area:	1327 m^2
Tank Volume/Media Area Ratio:	0.0071 m^3/m^2
Tank Volume:	9.48 m^3
Hydraulic Loading:	0.034 m^3/m^2-day
Hydraulic Retention Time:	5.01 hr

Organic Loading (total BOD_5): 0.013 kg/m^2-day

2.3 Clarifiers

Average Overflow Rate:	8.42 m^3/m^{2-}day
Surface Area:	5.39 m^2
Surface Solids Load @ Average Flow:	0.034 lb/ft^2-hr
Volume:	4.23 m^3
Hydraulic Retention Time:	2.24 hr
Underflow Rate:	1.02 m^3 once every three hours

2.4 Aerobic Digester

Volume:	21.47 m^3
Solids Loading Rate (@ 1% solids):	2.09 m^3/d
Aeration Rate:	0.62 m^3/min

2.5 Tertiary Filter

Media Type:	Sand/gravel
Filter Bed Area:	0.29 m^2
Backwash Trigger:	Pressure differential

2.6 Ultraviolet Disinfection

Lamp Type:	Low pressure, standard output
UV Dose (@ 2,000 L/hr, 90% UV transmission):	90 mJ/cm^2

Flowrate Estimation

Typical Camp Occupancy =	92	persons
Max Camp Occupancy =	**194**	**persons**
Design Value =	**200**	**persons**

Wastewater generation rates - estimates:

Facility	Unit	BC Sewerage System Standard Practice Manual, June 7, 05,	Metcalfe and Eddy, 1991 - typical values
Construction Camp cw flush toilets	L/day*person	189	
Work Camp	L/day*bed	227	
Motel - full housekeeping	L/day*person	180	
Resort Apartment	L/day*person		227
Special Care Home	L/day*resident	136	
Senior Citizen Home	L/day*resident	227	322
Boarding School	L/day*student	136	284

Work Camp figure = Design Generation Rate = 227 L/day-bed

Use work camp value:

Design Flowrate = # of beds * generation rate/bed
= 45400 L/day
= 45.4 m^3/day

Peak Flowrate:

Harmon Peaking Factor PF = 1 + 14/[4+sqrt(Population/1000)]
PF = 4.1

Peak Hourly Flow = PF * Design Flowrate
= 188 m^3/day
= 7.85 m^3/hour

Rate of discharge of pumper trucks (two holding tanks pumped out to STP as required) may be controlling factor in ***peak flow***:

Tank Volume:	16	m^3 weekly in one pumper truck load
Pumper Truck Discharge Duration	2	Time (hr) to discharge pumper truck to equalization basin (Assumed)
Pumping Rate:	8	m^3/hr Assumed; **UNACCEPTABLE**, thefore, not used in theoretical loading calculations.

Loading Rate Estimation

Parameter	Guide for Communal WWT System Selection, Dillon, circa 1995	Metcalfe and Eddy, 1991 - typical values	Metcalfe and Eddy, 1991 - typical values	Metcalfe and Eddy, 1991 - typical values	Nishi-Khon/SNC Lavalin Specifications	Nishi-Khon/SNC Lavalin Specifications	Nishi-Khon/SNC Lavalin Specifications	PJ Hannah Design Loadings: dwg K-17550-10455	PJ Hannah Basic Design Criteria - Tahera WWTP, 2005-04-04	**Theoretical Loading Values Utilized for Design**			
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	kg/m^3	kg/hr_{avg}	kg/day
		Weak	Medium	Strong	Min	Max	Avg						
BOD_5	220	110	220	400	237	379	247	375	375	**375**	0.375	1.42	17.03
SS	260	100	220	350	237	454	247	450	375	**400**	0.40	1.51	18.16
NH_3	25	12	25	50	ns	ns	ns	ns	ns	**30**	0.030	0.11	1.36
TKN	40	ns	ns	ns	ns	ns	ns	ns	ns	**40**	0.040	0.15	1.82
Total N	40	20	40	85	ns	ns	33	ns	ns	**40**	0.040	0.15	1.82
Total P	8	4	8	15	ns	ns	17	ns	ns	**8**	0.008	0.030	0.36
Oil and Grease		50	100	150	ns	ns	175	ns	50*	**50**	0.05	0.19	2.27

*: P.J. Hannah design max. loading that this WWTP can handle. Must be confirmed through influent monitoring.

Effluent Standard Confirmation:

	Influent (mg/L)	Effluent (mg/L)	
BOD_5	375	10	**OK - this level is achievable using RBCs with this plants hydraulic and organic loading rate.**
TSS	400	10	**OK - this level is achievable using RBCs with this plants hydraulic and organic loading rate.**
Total N	40	20	
Total P	8	6	

VSS Generated from $BOD_{5,sol}$ reduction: 110 mg/L
= 4971300 mg/day
= 4.97 kg/day

NItrogen Confirmation:

Typical nitrogen content in cell biomass = 0.14
Nitrogen removed in sludge = 0.70 kg/day
Nitrogen remaining in effluent = 1.12 kg/day
= 24.67 mg/L

Phosphorous Confirmation:

Typical phosphrous content in cell biomass = 0.03
Phosphorous removed in sludge = 0.15 kg/day
Phosphorous remaining in effluent = 0.21 kg/day
= 4.72 mg/L

Equlaization Tank Design

Time	Mean Flow	Cum Flow	Avg Flow	Cum Flow	X Marker
0:00		0	0		0
1:00	140	140	836	836	1
2:00	140	280	836	1671	2
3:00	400	680	836	2507	3
4:00	1400	2080	836	3343	4
5:00	1400	3480	836	4178	5
6:00	1400	4880	836	5014	6
7:00	1437	6317	836	5849	7
8:00	1591	7907	836	6685	8
9:00	1489	9396	836	7521	9
10:00	1210	10605	836	8356	10
11:00	1058	11663	836	9192	11
12:00	272	11935	836	10028	12
13:00	434	12369	836	10863	13
14:00	923	13291	836	11699	14
15:00	418	13709	836	12534	15
16:00	536	14245	836	13370	16
17:00	1103	15348	836	14206	17
18:00	506	15855	836	15041	18
19:00	1206	17061	836	15877	19
20:00	1018	18079	836	16713	20
21:00	876	18955	836	17548	21
22:00	500	19455	836	18384	22
23:00	300	19755	836	19219	23
0:00	300	20055	836	20055	24

Time	Mean Flow	Scaled Mean F	Cum Flow	Avg Flow	Cum Flow	X Marker
0:00			0	0		0
1:00	140	280	280	1671	1671	1
2:00	140	280	560	1671	3343	2
3:00	400	800	1360	1671	5014	3
4:00	1400	2800	4160	1671	6685	4
5:00	1400	2800	6960	1671	8356	5
6:00	1400	2800	9760	1671	10028	6
7:00	1437	2873	12633	1671	11699	7
8:00	1591	3181	15814	1671	13370	8
9:00	1489	2977	18791	1671	15041	9
10:00	1210	2419	21210	1671	16713	10
11:00	1058	2116	23326	1671	18384	11
12:00	272	543	23869	1671	20055	12
13:00	434	868	24737	1671	21726	13
14:00	923	1845	26583	1671	23398	14
15:00	418	835	27418	1671	25069	15
16:00	536	1072	28490	1671	26740	16
17:00	1103	2207	30697	1671	28411	17
18:00	506	1013	31709	1671	30083	18
19:00	1206	2413	34122	1671	31754	19
20:00	1018	2036	36158	1671	33425	20
21:00	876	1753	37911	1671	35096	21
22:00	500	1000	38911	1671	36768	22
23:00	300	600	39511	1671	38439	23
0:00	300	600	40111	1671	40110	24

At observed flowrate - equilization tank to be: 5.4 m3

At scaled flowrate - equilization tank to be: **8.7** m3

Assumes plant operating at upper limit of hydraulic capacity. Not the case with this WWTP; refer to RBC worksheet.

Equlization Tank Residence Time:

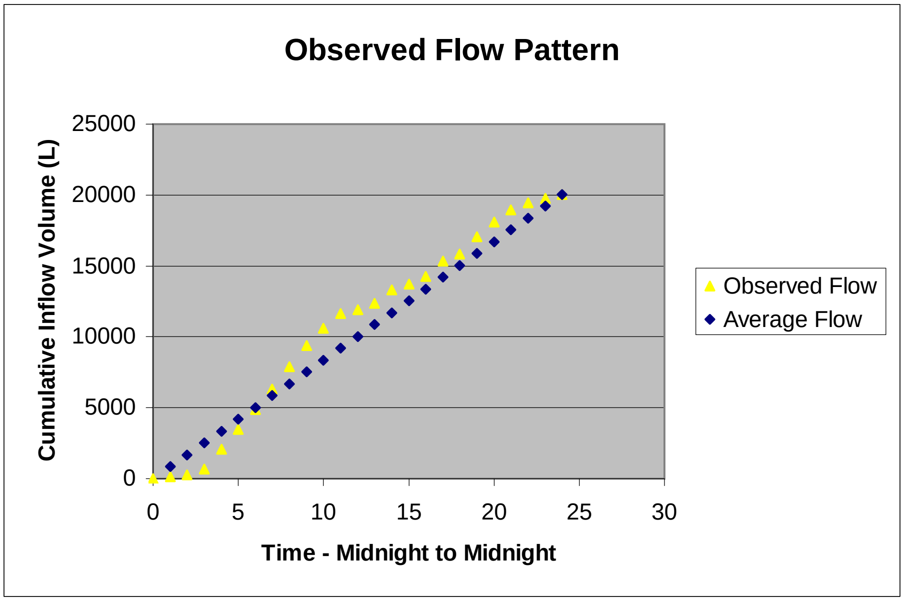
Residence time in Equalization Tank = Tank volume / flowrate
= 0.182 days
= 4.38 hrs

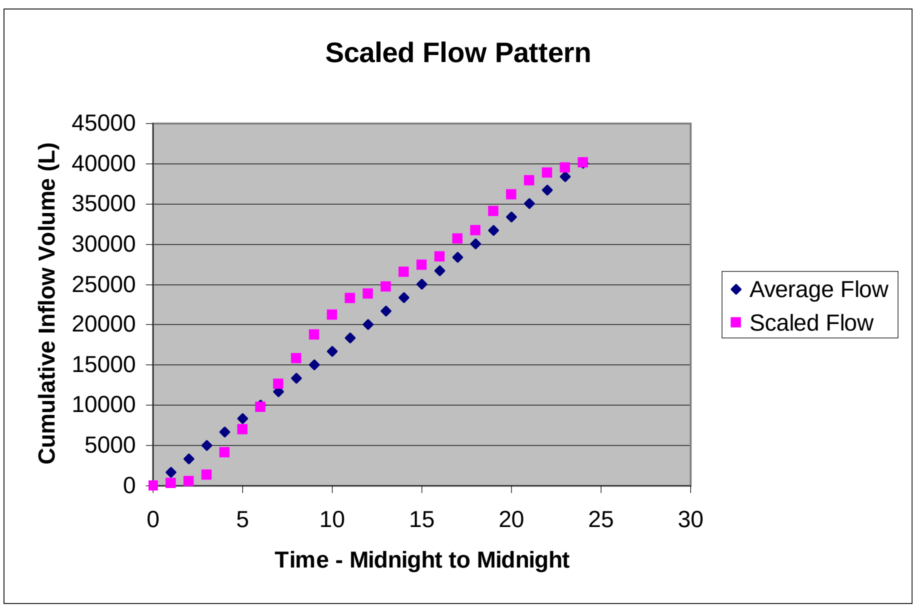
Asssume Tank is full; Q = 2m^3/hr; neglects RBC1 Vessel.

Aeration Rate:

Typical design factors:

Air supply rate =	0.01 to 0.015	m^3/m^3-min	
Assume minimum air supply =	0.015	m^3/m^3-min.	
Actual Aeration Rate =	14.0	cfm	
=	0.4	m^3/min	
Equalization Tank volume =	8.28	m^3	**Excluding RBC1 Vessel**
Actual air supply/volume =	0.048	m^3/m^3-min	**CHECK OK**


Observed Flow Pattern
Cumulative Inflow Volume (L)
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
Time - Midnight to Midnight
Observed Flow
Average Flow


Scaled Flow Pattern
Cumulative Inflow Volume (L)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
30
Time - Midnight to Midnight
Average Flow
Scaled Flow

<u>RBC Design</u>

Typical loading factors:

Hydraulic Loading =	3	gal/ft^2-day	
HRT =	1.1	hr	
Organic Loading			
SBOD =	1.4	lb/10^{3}ft^2-d	
TBOD =	2.75	lb/10^{3}ft^2-d	
Max. First Stage Loading			
SBOD =	5	lb/10^{3}ft^2-d	
TBOD =	10	lb/10^{3}ft^2-d	

Typical Design Factors:

Tank/media area ratio =	0.0049	m^3/m^2	
Optimum peripheral velocity =	0.3	m/s	

Design factors for Tahera RBC WWTP:

Average Daily Flowrate =	45.4	m^3/day	
=	11994.72	USG/day	
Media surface area =	1327.00	m^2	
=	14276.40	ft^2	
Hydraulic Loading =	0.84	gal/ft^2-day	**CHECK OK**
RBC1 and RBC2 vessel volume =	9.48	m^3	**Assumes RBC disks occupy negligible volume and excludes Equalization Tank volume**
HRT =	5.01	hr	**CHECK OK**
Tank Volume/Media Area Ratio =	0.0071	m^3/m^2	**CHECK OK**

Organic Loading:

SBOD =	1.31	lb/10^{3}ft^2-d	**CHECK OK**
TBOD =	2.62	lb/10^{3}ft^2-d	**CHECK OK**
Max. First Stage Loading:			
First Stage Media surface area =	442.33	m^2	**Assumes 1/3 of total RBC media area**
=	4758.80	ft^2	
SBOD =	4.08	lb/10^{3}ft^2-d	**CHECK OK, Using 700mg/L peak organic loads forecast by Tahera**
TBOD =	8.15	lb/10^{3}ft^2-d	**CHECK OK**

Solids Outflow from RBC:

Total:Soluble BOD Ratio	0.5		
RBC Influent $BOD_{5,\,sol}$ =	188	mg/L	
=	0.19	kg/m^3	
=	8.51	kg/day	
=	18.73	lb/day	
Peak RBC Influent $BOD_{5,\,sol}$ =	350	mg/L	**Using 700mg/L peak organic loads forecast by Tahera occur for 1 hr**
=	\$0.35	kg/m^3	
=	\$0.66	kg/hr	
=	\$8.82	kg/day	
=	\$19.40	lb/day	
Effluent BOD_5 = 10 mg/L	10	Assumed	
Effluent $BOD_{5,sol}$ = 10 mg/L	5		
Soluble BOD Removed	183	mg/L	**Assuming negligible BOD removal in Equalization Tank**
BOD:TSS Conversion ration	0.6		
VSS Generated from $BOD_{5,sol}$ reduction:	110	mg/L	
TSS Influent	400	mg/L	
TSS from Clarifier o/f	40		
Total Clarifier Solids Loading	470	mg/L	

Clarifier Design

Typical Clarifier design values:

Hydraulic Loading Rate =	400 to 600	gal/ft^2-day
=	16.28 to 24.42	m^3/m^2-d
Solids Loading Rate =	1	lb/ft2-h
=	4.88	kg/m^2-h

Clarifier hydraulic loading rate:

Design settling area =	5.39	m^2	
Design Hydraulic Loading Rate =	8.42	m^3/m^2-day	**CHECK OK**
Clarifier Volume:	4.23	m^3	
TSS from RBC =	470	mg/L	
Flow through RBC =	1.89	m^3/hr	
=	1891.67	L/hr	
HRT =	2.24	hr	

Clarifier solids loading rate:

Sludge to Clarifier (solids) = TSS * Flowrate

=	888137.50	mg/hr
=	0.89	kg/hr
=	1.95	lb/hr
=	46.89	lb/day dry basis
=	21.29	kg/day dry basis

Design loading rate of Tahera RBC clarifiers = 0.034 lb/ft^2-hr **CHECK OK**

Verification of clarifier volume occupied by sludge blanket:

Assume 1% solids

sludge volume = weight of dry solids/(density of water * specific gravity of sludge* decimal percent solids)

after 1.5 hours:

sludge volume =	4.60	ft^3
=	0.13	m^3
=	130.32	L

After 3 hours:

sludge volume =	0.26	m^3
=	260.63	L

Daily sludge generation:

sludge volume =	2.09	m^3	**Note, this value corroborates PJ Hannah estimate**
Clarifier sludge pump capacity =	90	USGPM	
=	340.65	L/min	
Pump cycle =	3	min "ON" every 3 hrs	
Volume removed every 3hrs =	1021.95	L	**Conclusion: Useable volume of clarifiers is not compromised by sludge blanket build-up**
=	1.02	m^3	

PKCA Partial Water Balance

		Concentration (mg/L)								Mass Loading (kg/yr)						
Source	Annual Flowrate (m^3/yr)	BOD5	Total P	Total N	NH3 - N	TSS	NO2 - N	NO3 - N	O&G	BOD5	Total P	Total N	NH3 - N	TSS	NO2 - N	NO3 - N
Precipiation + Runoff - Evaporation	94340	un	un	un	un	un	un	un	un	nc	nc	nc	nc	nc	nc	nc
Slurry + Grey Water from Plant Area	271429	un	un	un	un	un	un	un	un	nc	nc	nc	nc	nc	nc	nc
Pump from Mine Pit to East Sump	61000	un	0.14	un	4.2	24	0.85	18.1	un	nc	8.54	nc	256.2	1464	51.85	1104.1
WWTP Effluent @ 45.4 m^3/day	16571	10	6	20	un	10	un	20	un	165.71	99.426	331.42	nc	165.71	nc	331.42
Permit Requirements for Release to C3 (mg/L)		15	0.2		6	15	2.5	28	3							
Average concentration of Parameters in C3 Discharge (mg/L)		0.37	0.24	0.75	0.58	3.68	0.12	3.24	nc							

Notes:
- un = unavailable
- nc = not calculated

APPENDIX B

APPENDIX B WESTCAN FILTRATION SYSTEM

DUPLEX 30” SAND FILTRATION SYSTEM

2378 Holly Lane
Ottawa, ON Canada,
K1V 7P1

Phone: (613) 523-1641
Fax: (613) 731-0851
E-mail: contact@seprotech.com

INDEX

1. EQUIPMENT LIST

- **FILTER FEED PUMP**

MANUFACTURER	**PENTAIR**
MODEL	**WHISPER FLO**
	WFE-2
PUMP RATING & POWER SUPPLY	**1/2 HP, 230/120/1/60**

- **BACKWASH PUMP**

MANUFACTURER	**PENTAIR**
MODEL	**WHISPER FLO**
	WFE-8
PUMP RATING & POWER SUPPLY	**2 HP, 230/120/1/60**

- **AIR COMPRESSOR**

MANUFACTURER	**MAKITA**
MODEL	**MAC700**
PUMP (AIR COMPRESSOR)	
SERIAL NO.	**2 HP, 120/1/60**
POWER SUPPLY	

- **SOLENOID VALVE**

MANUFACTURER	**ASCO**	
MODEL	**8320G184, 8262, G261 (n/o)**	
POWER SUPPLY	**120/1/60**	**G20 (nc)**

- **CONTROL PANEL**

MANUFACTURER	**NORTHWEST TECH-CON**
LINE INPUT	**120/240/1/60**

- **DIFFERENTIAL PRESSURE SWITCH**

MANUFACTURER	**ASCO**
MODEL	**120/1/60**
POWER SUPPLY	

- **HYDRAULIC VALVE “NORMALLY CLOSED”**

MANUFACTURER	**AQUAMATIC**
MODEL	**K1136-SAC**
	524-A, 125 08071

- **HYDRAULIC VALVE “NORMALLY OPEN”**

MANUFACTURER	**AQUAMATIC**
MODEL	**K1037-SAO**
	1070169, 125, 08059 n/c

2. FILTER SYSTEM OPERATIONAL SEQUENCE

The filter feed pump (dosing pump) draws water, which has to be filtered from the feed tank. It passes this water through the automatic backwash filter and out of the discharge in to the backwash pump feed tank.

This filter feed pump is turned on and off by a differential float switch. There is a delay timer in the control panel, which delays the starting of the filter feed pump by 30 seconds. This is to let the filter media re-settle after backwashing.

In the filter feed tank is a float switch, which operates a high water alarm in the control panel if the filter feed pump fails. This high water alarm is auto reset and only indicates an alarm condition.

If the filter feed pump fails, the water will bypass the filter and flow by gravity in to the discharge tank (backwash pump feed tank) if it is piped and plumbed per our drawings.

On the filter tank is a pressure differential switch. The “main” pressure on the switch should be set at 22 psi. The “differential” pressure should be set at 12 psi. When the filter tank reaches a predetermined level (approximately 22 psi) the switch makes an electrical contact, which does the following:

- Turns on the compressor.
- Energizes the solenoid valve.
- Turns on the backwash pump (note the pump is interlocked so the filter feed pump cannot run when the backwash pump is running).

In the control panel is a timer for the backwash pump. It is normally set to operate the backwash pump for approximately two minutes.

If the backwash pump empties the backwash pump feed tank before the two minutes on the timer expires then a safety float switch will turn off the backwash pump to prevent it running dry. This float switch is auto reset and does not indicate an alarm condition.

When the air compressor starts to operate it pressurizes the two hydraulic flow control valves which switch the filter feed pump valve from normally closed to normally open. It also switches the backwash pump valve from normally open to normally closed.

The air compressor runs for the same time period as the backwash pump as it is connected to the same timer.

When the air compressor and backwash pump stop running the hydraulic automatic valves return to their original position and the filter is now ready to continue its normal filtering cycle.

3. INSTALLING THE FILTER UNIT

The water to be filtered should come from the normal final outfall point of the treatment plant as designed by the manufacturer. In order to help with peak loading periods and to control surges, it is recommended that a separate 1000 gallons tank be provided from which to dose the filter. The **drawing #60077-l00 (enclosed, see back of manual)** illustrates a typical filter installation using a filter feed tank (dosing tank) arrangement.

4. INSTALLING THE FILTER MEDIA – SAND & GRAVEL

This model is a dual media pressure filter. The media used, has been very carefully selected and all the hydraulics of the filter have been designed around its properties. Before you load the filter unit, be sure that the media you have is the correct media.

To install the media, open the hatch on top of the tank.

FIRST THE GRAVEL - 1150 lbs

The first course in loading the filter is the gravel underbed. In loading the gravel, add it to the tank slowly to avoid damaging the underdrain assembly. After loading the gravel, level it off before you add the sand.

SECOND THE SAND – 1000 lbs

The second course to be added to the filter is the sand. Use only silica sand, grade 20-30 blasting sand. If 20-30 silica blasting sand is unavailable, then number 16 silica sand may be substituted with equal results. After loading the sand into the filter, level it off.

5. INSTALLING THE FEED LINE

Connect the filter feed pump to the filter feed tank (dosing tank).

6. FILTERED WATER – OUTFALL HOLDING TANK

After filtration, the effluent should be routed to an outfall holding tank. This tank also serves as the backwash pump feed tank. It should have a capacity of 1000 gallons.

The outfall-holding tank becomes the terminal point of the treatment process. An emergency overflow to this tank should be provided from the filter feed (dosing) tank, as shown on **drawing #60077-l00** (enclosed, see back of manual).

7. BACKWASH PIPING INSTALLATION

As filtered water will be used for purposes of backwashing the filter, a line should be piped in from the outfall holding tank to the pump labeled backwash pump. An illustration of this piping arrangement may be seen on **drawing #60077- l00.**

IMPORTANT NOTE: INSTALL THE FOOT VALVE AND CHECK VALVE AS SHOWN.

Please note on the drawing that the backwash water is returned to the primary clarifier of the treatment plant. This is the normal method for disposal of backwash water.

However the backwash water, which contains all of the material removed from the effluent during filtration, may be disposed of in a number of other ways if desired.

For instance, the backwash water may be routed to a wet well and fed back into the plant gradually by a sump pump, or it may be routed to a holding tank and collected later for other treatment. Disposal of the backwash water is best handled according to the requirements of the sewage treatment plant manufacturer, engineer or installer.

8. CHLORINATION

It is normally best to filter the effluent from the plant before chlorination. This helps prevent undue corrosion in the filter tank by chlorine. The outfall-holding tank is a possible location for chlorination as the chlorine demand in the filter during the backwash cycle is high, and the tank is exposed to corrosion only at widely spaced intervals during the day.

9. FACTORY INSTALLED SOLENOID VALVE & AIR COMPRESSOR

The arrangement of hydraulic valves on the filter is operated by a three (3)-way solenoid valve, which is found connected to the air compressor. Water pressure is required to maintain the hydraulic valves in their normal operating position.

Air pressure is required to reverse the position of these hydraulic valves.

Air is supplied to the solenoid valve by an air compressor on the skid. The air compressor and solenoid valve are energized when the backwash pump is energized. The “on” time is controlled by a timer in the control panel. It is normally set at 2 minutes.

The air compressor has a pressure switch, which is factory set at 70 psi. It should remain at this setting.

10. STARTING THE FILTER

Once the filter has been installed, the media loaded and the electrical power connected, the filter is ready to become operational. Follow these simple steps:

(1) Fill the filter tank with water
Using an outside water source, fill the filter tank with water. Allow the filter to stand for a period. This will permit trapped air pockets in the media to rise to the surface and prevent a water hammer effect in the tank, which could result in the media becoming mixed.

(2) Seal the manhole cover tightly

(3) Set the pumps to the auto position on the h.o.a switch.

(4) Supply power to the filter unit, and allow it to run in the forward filter position until sufficient water has been collected in the outfall holding tank to permit backwash.

(5) When there is enough water in the outfall-holding tank, backwash the filter, using the h.o.a. switch.

(6) Repeat this cycle several times to clean the media of dust or other debris.

Check the connections of the filter carefully for leaks, and tighten any that may appear. The filter is now completely operational.

****IMPORTANT NOTE****

**DO NOT RUN THE FILTER FEED (DOSING) PUMP DRY.
BE SURE THAT THERE IS ALWAYS WATER IN THE FILTER FEED TANK WHEN THE FILTER FEED PUMP IS RUNNING.**

11. THE HAIR AND LINT TRAP

Every effort has been made to keep maintenance procedures minimal. Actual required maintenance consists chiefly of making sure that the hair and lint strainer baskets for the pumps are kept clean on a regular basis.

To service the hair and lint strainers:

(1) Turn both switches in the control panel to off.

(2) Remove the strainer baskets from their housings, and hose them clean.

(3) With your finger, reach into the strainer housing on the pump and check the eye of the impeller for trash. Make sure that the power supply to the pump is "off" before you do this.

(4) Refill the strainer housings with water to maintain the prime.

(5) Be sure that the covers for the strainer housings are replaced tightly before putting the unit back into service.

12. FILTER MEDIA INSPECTION

In time, according to loading conditions over a long period of operation, it may become necessary to replace the sand media in the filter. To check the media, immediately after backwashing, use a length of one inch diameter glass or plastic tubing to obtain a core sample of the bed by pushing the tubing down as far as the gravel underbed. If significant amount of debris is found deep within the sand media, backwash and sample once more. If, in the second sampling, there are still significant amounts of debris to be found. The media may be completely impregnated with foreign material and require replacement. It should not be necessary to replace the sand media sooner than one year after installation of the unit, and in most instances, much longer.

13. TROUBLESHOOTING FOR FILTER

PROBLEM	POSSIBLE CAUSE
Red flashing light on control panel	High water alarm (HWA) activated because filter feed pump is not working.
Filter feed pump not pumping	Motor failure. Power supply interrupted. Pipes plugged. Hair & lint trap plugged. Filter needs backwashing. Float switch failure. Pump has lost its prime. Backwash pump is “on”. Low water in filter feed tank.
Backwash pump not pumping	Motor failure. Power supply interrupted. Pipes plugged. Hair & lint trap plugged. Low water in backwash tank. Float switch failure. Pump has lost its prime. Differential pressure (HONEYWELL) switch not working.
Backwashing ineffective	Backwash pump not pumping. Air compressor not working. Solenoid valve not working. Fault with differential pressure switch. Fault with hydraulic valves. Leak in airlines to hydraulic valves.
Frequent backwashing cycles	Backwashing ineffective. Filter media plugged. Backwash pump run time too short.

For any other troubleshooting issues, contact us at:

toll free: (613) 523-1641
fax: (613) 731-0851
email: **contact@seprotech.com**

14. TECHNICAL INFORMATION: TROUBLE SHOOTING GUIDE – JET PUMPS

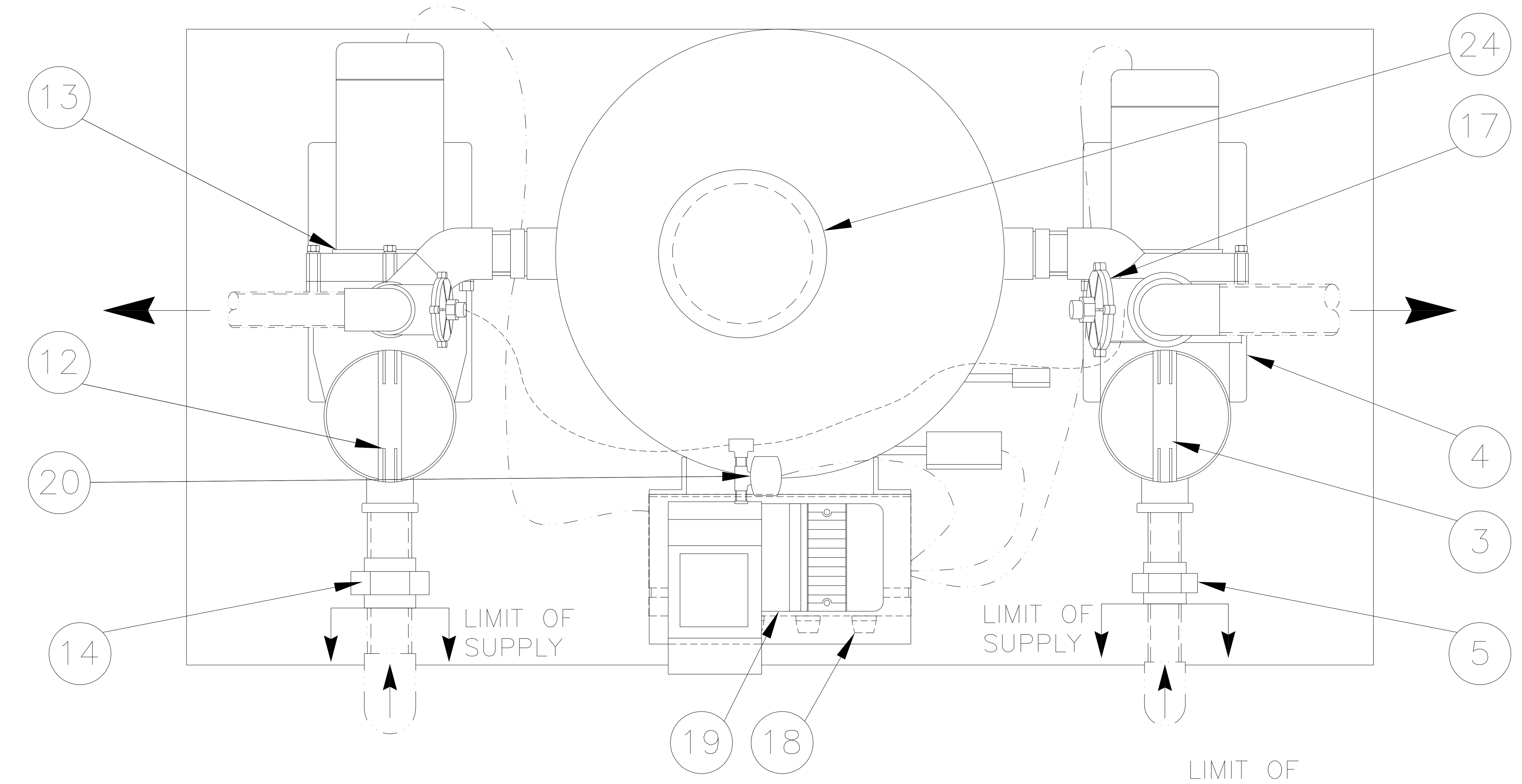
PUMP OPERATES BUT DELIVERS LITTLE OR NO WATER		
CAUSE OF TROUBLE	**HOW TO CHECK**	**HOW TO CORRECT**
1. Low line voltage.	Use voltmeter to check at pressure switch or terminals nearest pump.	If voltage under recommended minimum, check size of wiring from main switch on property. If OK, contact power company.
2. System incompletely primed.	When no water is delivered, check prime of pump and well piping.	Reprime if necessary.
3. Air lock in suction line.	Check horizontal piping between well and pump. If it does not pitch upward from well to pump, an air lock may form.	Rearrange piping to eliminate air lock.
4. Undersized piping.	If system delivery is low, the discharge piping and/or plumbing lines may be undersized. Refigure friction loss.	Replace undersized piping or install pump with higher capacity.
5. Leak in air volume control or tubing.	Disconnect air volume control tubing at pump and plug hole. If capacity increases, a leak exists in the tubing of control.	Tighten all fittings and replace control if necessary.
6. Pressure regulating valve stuck or incorrectly set. (Deep well only)	Check valve setting. Inspect valve for defects.	Reset, clean, or replace valve as needed.
7. Leak on suction side of system.	On shallow well units, install pressure gauge on suction side. On deep well systems, attach a pressure gauge to the pump. Close the discharge line valve. Then, using a bicycle pump or air compressor, apply about 30 psi pressure to the system. If the system will not hold this pressure when the compressor is shut off, there is a leak on the suction side.	Make sure above ground connections are tight. Then repeat test. If necessary, pull piping and repair leak.
8. Low well level	Check well depth against pump performance table to make sure pump and ejector are properly sized.	If undersized, replace pump or ejector.
9. Wrong pump-ejector combination.	Check pump and ejector models against manufacturer's performance tables.	Replace ejector if wrong model is being used.
10. Low well capacity.	Shut off pump and allow well to recover. Re-start pump and note whether delivery drops after continuous operation.	If well is "weak", lower ejector (deep well pumps), use a tail pipe (deep well pumps), or switch from shallow well to deep well equipment.
11. Plugged ejector.	Remove ejector and inspect.	Clean and re-install if dirty.
12. Defective or plugged foot valve and/or strainer.	Pull foot valve and inspect. Partial clogging will reduce delivery. Complete clogging will result in no water flow. A defective foot valve may cause pump to lose prime, resulting in no delivery.	Clean, repair or replace as needed.
13. Worn or defective pump parts or plugged impeller.	Low delivery may result from wear on impeller or other pump parts. Disassemble and inspect.	Replace worn parts or entire pump. Clean parts if require.
PUMP WON'T START OR RUN		

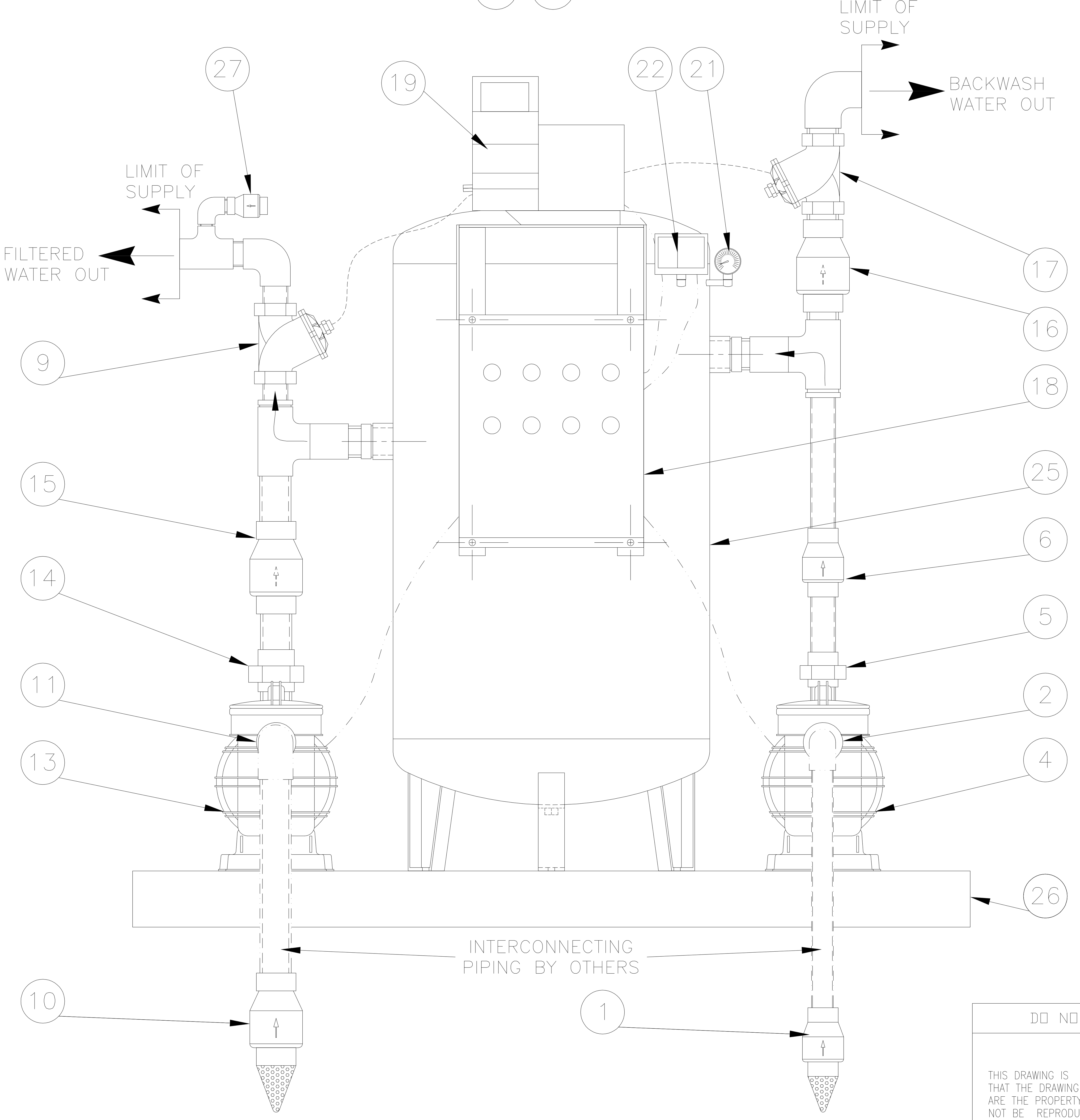
CAUSE OF TROUBLE	HOW TO CHECK	HOW TO CORRECT
1. Blown fuse.	Check to see if fuse is OK.	If blown, replace with fuse of proper size.
2. Low line voltage.	Use voltmeter to check pressure switch or terminals nearest pump.	If voltage under recommended minimum, check size of wiring from main switch on property. If OK, contact power company.
3. Loose, broken or incorrect wiring.	Check wiring circuit against diagram. See that all connections are tight and that no short circuits exist because of worn insulation, crossed wire, etc.	Rewire any incorrect circuits. Tighten connections, replace defective wires.
4. Defective motor.	Check to see that switch is closed.	Repair or take to motor service station.
5. Defective pressure switch.	Check switch setting. Examine switch contacts for dirt or excessive wear.	Adjust switch settings. Clean contacts with emory cloth if dirty.
6. Tubing to pressure switch plugged.	Remove tubing and blow through it.	Clean or replace if plugged.
7. Impeller or seal.	Turn off power, then use screwdriver to try to turn impeller on motor.	If impeller won't turn remove housing and located source of binding.
8. Defective start capacitor.	Use an ohmmeter to check resistance across capacitor. Needle should jump when contact is made. No movement means an open capacitor; no resistance means capacitor is shorted.	Replace capacitor or take motor to service station.
9. Motor shorted out.	If fuse blows when pump is started (and external wiring is OK) motor is shorted.	Replace motor.

MOTOR OVERHEATS AND OVERLOAD TRIPS OUT

CAUSE OF TROUBLE	HOW TO CHECK	HOW TO CORRECT
1. Incorrect line voltage.	Use voltmeter to check at pressure switch or terminals nearest pump.	If voltage under recommended minimum, check size of wiring from main switch on property. If OK, contact power company.
2. Motor wired incorrectly.	Check motor wiring diagram.	Reconnect for proper voltage as per wiring diagram.
3. Inadequate ventilation.	Check air temperature where pump is located. If over 100 F., overload may be tripping on external heat.	Provide adequate ventilation or move pump.
4. Prolonged low pressure delivery.	Continuous operation at very low pressure places heavy overload on pump. This can cause overload protection to trip.	Install globe valve on discharge line and throttle to increase pressure.

THE **DRAWING #60077-L00 (ENCLOSED, see back of manual**) IS LABELED TO SHOW ALL FEATURES OF THE FILTER WHICH IS IMPORTANT TO ITS INSTALLATION AND MAINTENANCE.



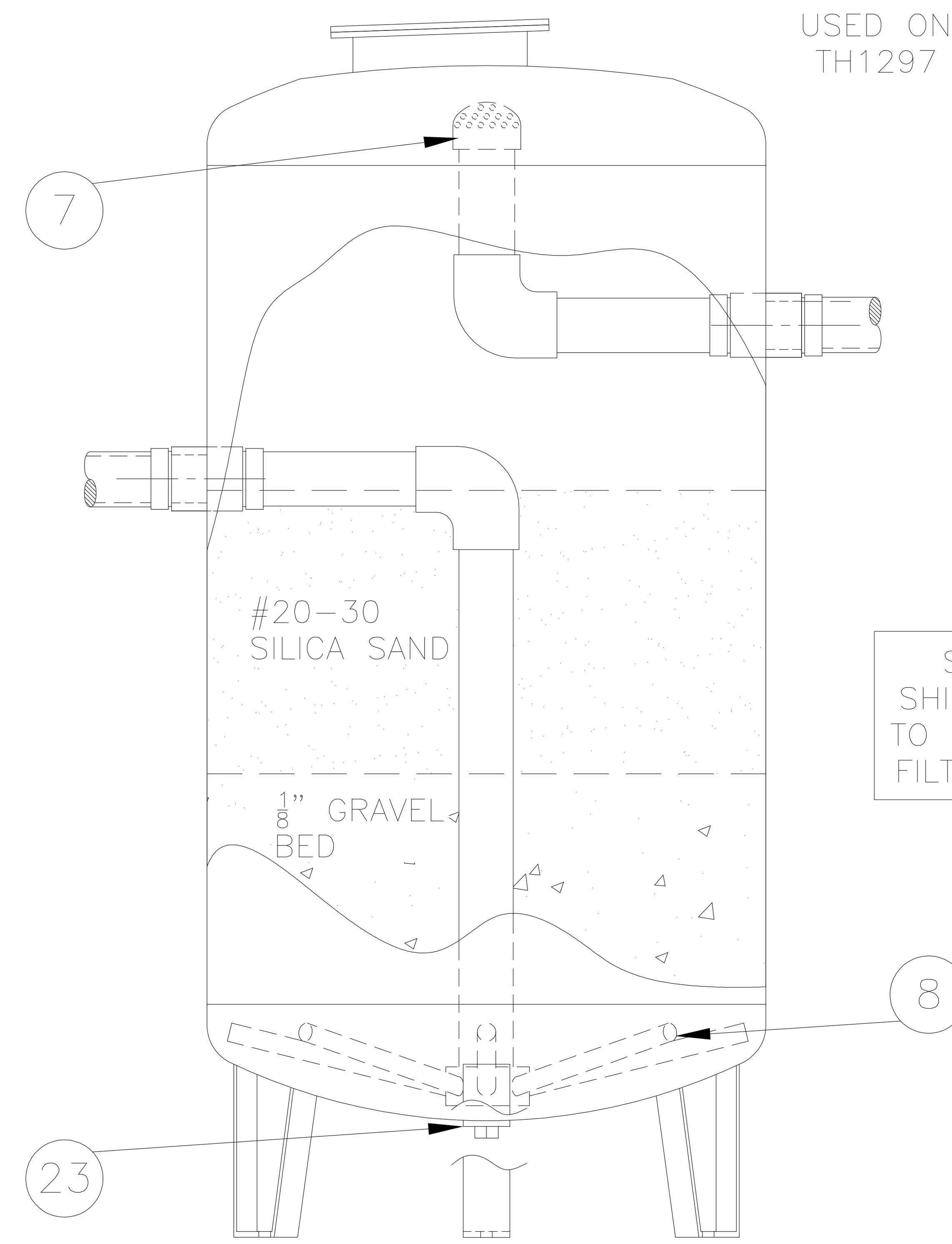


1	DOSING PUMP FOOT VALVE
2	DOSING PUMP INLET
3	DOSING PUMP HAIR & LINT TRAP
4	DOSING PUMP
5	DOSING PUMP UNION
6	DOSING LINE CHECK VALVE
7	DISTRIBUTION HEAD
8	LATERALS
9	HYDRAULIC AUTOMATIC VALVE (N.O.)
10	BACKWASH PUMP FOOT VALVE
11	BACKWASH PUMP INLET
12	BACKWASH PUMP HAIR & LINT TRAP
13	BACKWASH PUMP
14	BACKWASH PUMP UNION
15	BACKWASH LINE CHECK VALVE
16	CHECK VALVE
17	HYDRAULIC AUTOMATIC VALVE (N.C.)
18	CONTROL PANEL WITH ALARM LIGHT
19	AIR COMPRESSOR
20	SOLENOID VALVE
21	PRESSURE GAUGE
22	PRESSURE RELAY/SWITCH
23	DRAIN PLUG
24	ACCESS PORT
25	FILTER TANK
26	STEEL BASE
27	ANTI-SYPHON VALVE (DO NOT CAP)

MODEL No.	20SFSBW	24SFSBW	30SFSBW	36SFSBW	42SFSBW	48SFSBW	54SFSBW	60SFSBW	72SFSBW
RECOMMENDED FOR PLANT SIZE	7000 GPD	11,000 GPD	17,000 GPD	25,000 GPD	35,000 GPD	45,000 GPD	55,000 GPD	70,000 GPD	100,000 GPD
MAXIMUM FILTER CAPACITY	15,696 GPD	22,608 GPD	35,280 GPD	50,832 GPD	69,264 GPD	90,000 GPD	114,480 GPD	141,120 GPD	203,760 GPD
FILTER TANK DIAMETER	20"	24"	30"	36"	42"	48"	54"	60"	72"
FILTER BED AREA	2.18ft²	3.14ft²	4.90ft²	7.07ft²	9.62ft²	12.50ft²	15.90ft²	19.60ft²	28.30ft²
DOSING PUMP SIZE	½ h.p.	½ h.p.	½ h.p.	¾ h.p.	1 h.p.	1½ h.p.	2 h.p.	2 h.p.	3 h.p.
FORWARD FILTER RATE	10.9 GPM	15.7 GPM	24.5 GPM	35.3 GPM	48.1 GPM	62.5 GPM	75.5 GPM	98.0 GPM	141.5 GPM
DOSING TANK SIZE (US GAL.)	300gal.	300gal.	750gal.	750gal.	750gal.	750gal.	1000gal.	1000gal.	1000gal.
FILTER PIPE SIZE (NPT)	1"	1"	1"	1½"	1¼"	1½"	2"	2"	2½"
BACKWASH RATE	33 GPM	48 GPM	74 GPM	106 GPM	144 GPM	188 GPM	240 GPM	294 GPM	425 GPM
BACKWASH PUMP SIZE	¾ h.p.	1 h.p.	2 h.p.	2 h.p.	3 h.p.	5 h.p.	5 h.p.	7½ h.p.	7½ h.p.
BACKWASH PIPE SIZE (NPT)	1¼"	1½"	2"	2"	2½"	3"	3"	4"	4"
OUTFALL HOLDING TANK SIZE (US GAL.)	300gal.	300gal.	750gal.	750gal.	750gal.	750gal.	1000gal.	1000gal.	1000gal.
⅛" GRAVEL	250lbs	310lbs	500lbs	810lbs	1150lbs	1500lbs	1870lbs	2310lbs	3330lbs
#20-30 SILICA SAND	200lbs	300lbs	500lbs	700lbs	1000lbs	1300lbs	1600lbs	2000lbs	2900lbs
OVERALL HEIGHT OF UNIT	54"	61"	65"	82" *	64"	65"	67"	69"	74"
OVERALL WIDTH & LENGTH OF UNIT	34"x48"	38"x48"	44"x54"	54"x70"	58"x66"	64"x72"	70"x78"	76"x84"	92"x118"
APPROXIMATE SHIPPING WEIGHT	580lbs	605lbs	800lbs	970lbs	1920lbs	2035lbs	2280lbs	2510lbs	4000lbs

* NON-STANDARD HEIGHT

THIS MODEL USED ON TH1297



SAND & GRAVEL SHIPPED SEPARATELY. TO BE PLACED IN THE FILTER TANK ON SITE.

DESCRIPTION	REV.	DATE
DRAWING MODIFIED TO SUIT PROJECT# TH1297	3	05/12/05
PIPING UPDATED	2	12/10/01

DO NOT SCALE THIS DRAWING

ALL DIMENSIONS IN FEET & INCHES UNLESS OTHERWISE NOTED

PROPRIETARY DATA

CLIENT AMES INC. REF #

CONSULTANT REF #

PROJECT SUMMER HILL TRAILER PARK

GENERAL ARRANGEMENT
SFSBW AUTOMATIC BACKWASH FILTER (USGPD)

DRAWN R.V.
DATE 01/19/01
SCALE 2"=1'-0"
CHECKED
APPROVED
PLOT 1:6

WESCAN MECHANICAL

FILE NO. OUR REF. TH1297
DRAWING NO. A1-TH1297-29066 REV. 3

NO BACK CHARGES TO US WILL BE ALLOWED WITH OUT OUR PRE-AUTHORIZED WRITTEN PERMISSION
THIS REVISED DRAWING SUPERSEDES ALL PREVIOUS ISSUES

APPENDIX C

APPENDIX C LABORATORY ANALYTICAL PARAMETERS

Analyzed Water Parameters and Detection Limits

Analytical Package	Parameters	Detection Limits	Unit
Total and Dissolved Metals (ICP-T, ICP-D)	Aluminum (Al)	0.0002	mg/L
	Antimony (Sb)	0.000005	mg/L
	Arsenic (As)	0.00002	mg/L
	Barium (Ba)	0.00002	mg/L
	Beryllium (Be)	0.000002	mg/L
	Bismuth (Bi)	0.000005	mg/L
	Boron (B)	0.005	mg/L
	Cadium (Cd)	0.000005	mg/L
	Calcium (Ca)	0.05	mg/L
	Chromium (Cr)	0.00005	mg/L
	Cobalt (Co)	0.00005	mg/L
	Copper (Cu)	0.00005	mg/L
	Iron (Fe)	0.01	mg/L
	Lead (Pb)	0.000005	mg/L
	Lithium (Li)	0.0002	mg/L
	Magnesium (Mg)	0.05	mg/L
	Manganese (Mn)	0.000005	mg/L
	Mercury (Hg)	0.00005	mg/L
	Molybdenum (Mo)	0.00005	mg/L
	Nickel (Ni)	0.00005	mg/L
	Phosphorus (P)	0.05	mg/L
	Potassium (K)	0.2	mg/L
	Selenium (Se)	0.00004	mg/L
	Silicon (Si)	0.05	mg/L
	Silver (Ag)	0.000005	mg/L
	Sodium (Na)	0.2	mg/L
	Strontium (Sr)	0.00001	mg/L
	Thallium (Tl)	0.000002	mg/L
	Tin (Sn)	0.00002	mg/L
	Titanium (Ti)	0.00005	mg/L
	Uranium (U)	0.000002	mg/L
	Vanadium (Va)	0.00001	mg/L
	Zinc (Zn)	0.0001	mg/L

Analytical Package	Parameters	Detection Limits	Unit
Routine Parameters (R)	Alkalinity ($CaCO_3$)	5	mg/L
	Acidity ($CaCO_3$)	5	mg/L
	Chloride	0.5	mg/L
	Carbonate (Co_3)	5	mg/L
	Bicarbonate (HCO_3)	5	mg/L
	Total Hardness ($CaC0_3$)	1	mg/L
	Hydroxide (OH)	5	mg/L
	Sulphate (SO_4)	0.05	mg/L
	Total Suspended Solids (TSS	3	mg/L
	Total Dissolved Solids (TDS)	5	mg/L
	Total Organic Carbon (TOC)	1	mg/L
	Total Inorganic (TIC)	1	mg/L
	pH	0.1	-
	Conductivity (uS/cm)	0.2	uS/cm
	Turbidity	0.1	NTU
Nutrients (N)	Nitrate (NO_3)	0.006	mg/L
	Nitrite (NO_2)	0.002	mg/L
	Ammonia (NH3)	0.005	mg/L
	Orthophosphate	0.001	mg/L
	Total Phosphorus	0.001	mg/L
Biological (B)	Biochem Oxygen Demand	5	mg/L
	Fecal Coliforms	1	CFU/100 mL
	Oil & Grease	1	mg/L
Petroleum Hydrocarbons (PHCs)	Benzene	0.0005	mg/L
	Ethylbenzene	0.0005	mg/L
	Toluene	0.0005	mg/L
	o-Xylene	0.0005	mg/L
	m+p-Xylene	0.0005	mg/L
	Xylenes	0.0005	mg/L
	F1(C6-C10)	0.1	mg/L
	F1-BTEX	0.1	mg/L
	F2 (>C10-C16)	0.25	mg/L
	F3 (C16-C34)	0.25	mg/L
	F4 (C34-C50)	0.25	mg/L

Note:
1. The detection limits are provided by ALS Laboratory Group.

APPENDIX D

APPENDIX D DAILY MONITORING RECORD FORM

WWTP Routine Maintenance Record Form

Daily Maintenance	Completed	Comments
Read and Record flow meter		
Perform settling test		
Turn off Air Pumps		
High Pressure Wash		
Squeegee tanks		
Collect grease		
Return sludge to equalization tank		
Add Bio-soil additive (58 g to aeration tank)		
Measure DO and pH and Temp		
Measure Settleable Solids on Plant Influent and Clarifier Influent and Effluent		
Backwash pump operation		
Filter feed pump operation		
Aeration Pump 1		
Aeration Pump 2		
D wing Lift Station		
E wing Lift Station		
F wing Lift Station		
Laundry Lift Station		
Kitchen Lift Station		
Main Lift Station		
Weekly Maintenance		
Grease wheels on RBC		
Collect water Sample STP effluent		
Settleable Solids Test on Aerobic Digestor Sludge		
Remove grease kitchen lift station		
Remove 2 feet of volume from sludge tank		
Bi-weekly Maintenance		
Collect Water Sample STP influent		
Monthly Maintenance		
Remove grease D wing Lift Station		
Remove grease E wing Lift Station		
Remove grease F wing Lift Station		
Remove grease Laundry Lift Station		
Remove grease Kitchen Lift Station		
Remove grease Main Lift Station		