



**FilterBoxx**<sup>™</sup>  
Packaged Water Treatment Solutions

## **DOWLAND**

# **WASTE WATER TREATMENT PLANT (WWTP) PACKAGE**

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## **FILTERBOXX WATER TREATMENT SYSTEMS**

### **CONTROL NARRATIVE**

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**Prepared For:**  
**DOWLAND**  
**NWT, Canada**

**Prepared By:**  
**FilterBoxx - *Packaged Water Treatment Solutions***  
**15-4511 Glenmore Trail SE**  
**Calgary, Alberta, Canada**  
**T2C 2R9**  
**403-203-4747 (bus)**  
**403-203-4774 (fax)**

Approved by: \_\_\_\_\_ Kevin Slough, Engineering Director

Approved by: \_\_\_\_\_ Glenn Cattani, Project Manager/Engineer

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## 1.0 CONTROL NARRATIVE

### 1.1 Overview

This water treatment facility is designed to treat the waste water from Dowland industrial camp/drill/construction work site. The facility consists of the following micro systems:

- Feed Flow Monitoring
- Sludge Collection
- Feed Flow Attenuation
- Submerged Fixed-Film Bioreactor
- Ultrafiltration Membrane Filtration
- Effluent Distribution
- Chemical Injection (i.e. maintenance and normal operations)
- Programmable Logic Controller (PLC), and
- Motor Control Panel (MCP).

The influent wastewater will be pumped from the collection lift station (by the Client) to the inlet of the sludge holding tank to remove coarse solids. From there, the wastewater will flow into the equalization tank. The equalization tank is used to attenuate peak flows into the treatment plant. The waste water is pumped from the equalization tank via submersible pumps into the SF<sup>2</sup> zone of the SF<sup>2</sup>-MBR process tank.

The majority of the waste water treatment will be performed in the SF<sup>2</sup> tank. The SF<sup>2</sup> tank will be filled to 60% capacity with FilterBoxx biological growth media which will be retained within the SF<sup>2</sup> tank by stainless steel retention screens. The SF<sup>2</sup> process is an attached growth biological treatment process. The process utilizes aerobic or oxygen using bacteria to remove organic contaminants through a process of biological oxidation. The air required to meet the oxygen demands of the system and to provide the mixing of the mixed liquor suspended solids is supplied via a central blower system and fine pore bubble diffusers.

The waste water flows from the SF<sup>2</sup> tank to the MBR tank where the final effluent is processed or filtered through the SpiraSep Ultrafiltration (UF) membranes. The UF membranes are physical barriers designed to filter out suspended solids in the waste water larger than 0.05 µm. The UF membranes are immersed in the waste water and are referred to as “outside in” filters; therefore the solids that are filtered out of the waste water are retained in the UF tank and recirculated back to the SF<sup>2</sup> tank. This waste stream from the UF membrane system is identified as concentrate or reject.

The final treated effluent drawn through the SpiraSep UF membranes by the UF Permeate pump is discharged into the UF Backwash or Clear Well tank. Permeate is used to periodically Backwash the UF membrane system by means of the Backwash pump. The UF membrane Backwash sequence is performed automatically by the system PLC. The process Aeration Blower is also used to provide air scour for the membranes.

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Dowland Waste Water Treatment Package  
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The SpiraSep UF Membranes will undergo a daily flux enhancement cleaning with Sodium Hypochlorite, Citric Acid or Caustic Soda which is dosed once per day into the Backwash stream. These chemicals are used to remove the build-up of organic and inorganic foulants on the surface of the UF membranes. This cleaning sequence is performed automatically by the system PLC.

A Clean In Place (CIP) is cleaning sequence that is performed only on the UF membrane system. A CIP is a pseudo-automatic sequence where the UF membranes are dosed with a high concentration of chemicals in order to remove large amounts of organic and inorganic foulants that have built up on the membrane's porous surface due to normal operations. CIP frequency is typically every three (3) months but depends greatly on the operation of the UF membrane system.

The UF Permeate or final effluent is pumped via the distribution pumps to the Ultraviolet (UV) disinfection system (Optional Equipment). As the final effluent passes around the quartz UV light tubes, the bacteria or viruses that were not filtered by the SpiraSep UF membrane system will be rendered "inactive" or dead.

Each tank is equipped with a foam knock-down or sprayer system to keep the tank foam levels under control. Tank foam is the result of dead bacteria which arise when the system undergoes a change in operation or upset, such as lack of aeration or variable feed water quality.

The entire WWTP is controlled by the PLC and incorporates a Human Machine Interface (HMI) or Motor Control Panel (MCP) to simplify the system controls and operations. Some automatic sequences require operator input (i.e. pseudo-automatic), such as the Clean in Place (CIP), due to the high concentration of chemicals in use in the system.

All actuated/motorized valves are either Ball (body and ball: stainless steel construction) and/or Butterfly style body with SS (Stainless Steel) disc.

The system is mounted on one (1) steel girder system skid with rough dimensions of 11 ft (W) x 65 ft (L) x 10 ft (H).

It is imperative that all system skids be leveled. Failure to do so could impede proper system operations.

## **1.2 Control System**

The WWTP equipment is controlled automatically by a Programmable Logic Controller, or PLC. The facility operator will interface with the system by means of a Motor Control Panel, or MCP. The operator will not have access to any of the operating parameters, such as Alert/Alarm set points, except for a few timers such as the UF Backwash frequency and duration. Alerts/Alarms are displayed at the MCP through a **RED** indication light and will require operator action before the system can resume its normal course.

The following information is provided on the WWTP MCP for PLC-controlled devices:

*Pumps/Blowers/  
Motors:* Device selector toggle switch: **HAND/OFF/AUTO**

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<b>Device Operation/ Indication:</b>	Device status indication lights: <b>GREEN</b> for ON or RUNNING
<b>Sequencing Timers:</b>	Manual timer relay blocks located inside the MCP
<b>System Alert/Alarm:</b>	System Alert/Alarm status indication light: <b>RED</b> is for Alert/Alarm
<b>System Alert/Alarm Reset Pushbutton:</b>	System Alert/Alarm Reset Pushbutton to acknowledge and clean any system Alerts/Alarms

The WWTP **does not have** a system wide operation mode control switch that would enable the system operator to **RUN** or turn **OFF** the entire system. The WWTP PLC requires that **ALL** device toggle switches be in **AUTO** as well as be clear of any Alerts/Alarms to run normally. If one or more devices are not in **AUTO**, the WWTP will fail to operate correctly and poor waste water treatment could result.

### **IMPORTANT NOTICE:**

**ONLY QUALIFIED PERSONNEL SHOULD ATTEMPT TO OVERRIDE EQUIPMENT (I.E. RUN DEVICES IN HAND) AND DOING SUCH INCORRECTLY COULD RESULT IN DAMAGE TO THE SYSTEM AND/OR INJURY.**

### **1.3 Emergency Stop Disconnect, ESD**

An **EMERGENCY STOP DISCONNECT, or ESD** push-button is located on the MCP. When this push-button is pushed in, all pumps, motors and blowers in the system are disabled and turned **OFF** regardless of their current settings and all valves will de-energize. The ESD push-button is hardwired to interrupt power to the PLC's digital outputs. When the ESD push-button is reset, (i.e. physically pulled out) all devices will return to their original operating state.

### **IMPORTANT NOTICE:**

**THE OPERATOR MUST BE CAREFUL WHEN RESETTING THE MCP ESD PUSHBUTTON; DEVICES CAN START UP SUDDENLY AND COULD STARTLE THE OPERATOR AND CAUSE PERSONAL INJURY.**

### **1.4 System Power Failure/Interruption**



The WWTP will **NOT RESTART AUTOMATICALLY** after a power interruption. When power is restored after a power interruption, the entire unit will remain **OFF** until the operations staff resolves the issues causing the power interruption and presses the MCP System Alert/Alarm Reset Pushbutton.

The once the MCP System Alert/Alarm Reset Pushbutton is pressed the system will continue on with its “last state” operation.

## **2.0 Alert/Alarm Handling**

1. All Alerts/Alarms are displayed on the MCP with a **RED** light.
2. Once the operator has performed the necessary service to clear the Alert/Alarm condition(s) and prevent them from re-occurring, the MCP System Alert/Alarm Reset Pushbutton should be pressed to reset and clear the Alert/Alarm from the screen. If the Alert/Alarm condition(s) still physically exists after it has been reset, the system will indicate the issue with the **RED** indication light after the Alert/Alarm time delay has elapsed.

### **2.1 Alert versus Shutdown Alarms**

Alerts do not cause any device to stop or close, nor do they cause the WWTP system to shut down. The operator should take Alerts as a warning that the system needs attention. Rather than shutting down devices due to these alerts, continued operation is allowed with the intention that operator attention can provide uninterrupted system operation and production of good quality water from this equipment.

If the WWTP system experiences a *Shutdown Alarm*, the system will shut down and the appropriate devices will be automatically stopped/closed (i.e. AUTO-OFF or AUTO-CLOSE), according to the shutdown sequence in the Device Sequencing Chart (DSC).

When the Alarm has been reset via the MCP System Reset pushbutton, the unit will start up.

For example, if a pump is running in its auto condition and an Alarm occurs, the PLC will stop the pump and the system and the Alarm indication light will appear. Once the operator has reset the Alarm and restarted the system, as described above, the pump will restart in auto (provided that interlock conditions that permit the pump to run are satisfied). If the Alarm condition still exists, another Alarm will be generated and the pump will stop again.

An Alert and/or Alarm will cause the MCP Alert/Alarm indication light to turn on. If the Alert/Alarm condition is cleared before the operator has silenced the horn or acknowledged the Alert/Alarm, the indication light will automatically turn off.

## **IMPORTANT NOTICE:**

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**Please note that the following sections are simple overviews of how the WWTP is meant to operate. There are other pieces of documentation that need to be reviewed in conjunction with the System Control Narrative, such as the system Piping and Instrumentation Drawings (P&IDs), Process Flow Drawings, System Controls Chart (SCC), Device Sequencing Chart (DSC), and system Operation and Maintenance (O&M) manual. This documentation will describe the system in greater depth.**

### **3.0 System Mode of Operation Selection**

The entire WWTP is altogether considered one (1) area:

- 1) Ultrafiltration Membrane Bioreactor (UF MBR)

#### **3.1 MBR RUN Mode**

**MBR RUN** mode is considered the “normal operation” of the entire system and should be seen as the automatic operation and can be performed by the operator by selecting **AUTO** on ALL the system device Hand-Off-Auto toggle switches located on the Main Control Panel (MCP). During **MBR RUN** mode operator intervention is not required unless an Alert/Alarm is active.

When in **MBR RUN** mode, the system will perform the following control functions:

- Level control of all feed, storage and process tanks
- Chemical dosing
- Ultrafiltration membrane system water production

Please refer to the WWTP Device Sequencing Chart (DSC) for detailed information on the sequencing steps when the system is placed in **MBR RUN** mode.

In **MBR RUN** mode, the components of the system are generally running in automatic control under the PLC.

#### **3.2 MBR OFF Mode**

The entire systems can be shut off or placed in **MBR OFF** Mode by the system operator by turning all the system devices to **OFF** on the respective Hand-Off-Auto toggle switches at the (MCP).

Turning the system to **MBR OFF** mode will stop and close all devices in a safe and orderly manner to prevent damage to the operating staff and system equipment. Please refer to the WWTP Device

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Sequencing Chart (DSC) for detailed information on the sequencing steps when the system is placed in **MBR OFF** mode.

## **4.0 Membrane Control Sequences**

### **4.1 MBR PRODUCTION Sequence**

**MBR PRODUCTION** is where permeate is drawn from the UF membrane tank through the UF membrane elements and pumped to the system Clear Well Tank, TK-2200, using P-1000. The permeate water is then used for backwashing the UF membrane elements and feed to the Effluent Chamber, TK-4100, before going to the client's distribution system.

Once **MBR PRODUCTION** is initiated, the sequencing will proceed as described in the DSC.

### **4.2 MBR BACKWASH Sequence**

An **MBR BACKWASH** is a recurring reverse flow of water (i.e. UF membrane permeate) to clean debris from the outer surface of the membrane elements. The **MBR BACKWASH** frequency and duration timers are set by the operator by means of the MDC. The UF membrane system will return to **MBR PRODUCTION** once **MBR BACKWASH** sequence is complete automatically.

During a **UF BACKWASH**, water from the UF Permeate/Backwash storage tank is pumped using Pump P-2000 to the UF membranes.

Sodium Hypochlorite from chemical system P-5100 is added to the backwash system during a **UF BACKWASH** as an added measure to clean the UF membrane elements. P-5100 will run for no longer than the **MBR BACKWASH** Duration Time, TMR-2.

The UF membrane element support rack is equipped with an automated vent valve, SOV/FV-1050, that relieves the header piping of residual air or buildup during normal operation. The valve will automatically open during a portion of the **MBR Backwash** sequence.

Once **MBR BACKWASH** is initiated, the sequencing will proceed as described in the DSC.

### **4.3 MBR STANDBY Sequence**

In **MBR STANDBY** the UF membrane system stops producing permeate and the reject and backwash pumps stop. The aeration blower will continue running to aerate the UF membrane and raw storage tanks.

The MBR system will do the following automatically:

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**MBR STANDBY** is triggered by the following (i.e. from **MBR PRODUCTION**):

- UF membrane tank Level Control Low Low trigger, LCLL-2104, or
- Effluent Chamber tank Level Control High High triggers, LCHH-4101.

**MBR STANDBY** is cleared by the following (i.e. to **MBR PRODUCTION**):

- UF membrane tank Level Control High trigger, LCH-2102, and
- Clear Well tank Level Control Low Low trigger, LCLL-4104.

Once **MBR STANDBY** is initiated, the sequencing will proceed as described in the DSC.

Please note that **MBR STANDBY** is not a condition where the system is *OFF*, it is a normal operating condition.

## **5.0 COMMON System Components, Controls and Devices**

### **5.1 Raw Water Feed**

The raw water feed equipment is composed of a pump located in the Client's feed well. The raw water is feed directly into the Solids tank where solids are collected and drained out on a regular basis.

### **5.2 Raw Water Feed Flow Measurement**

A Flow Indicating Meter, FE/FI-9090, measures the flow rate of the incoming raw water. The instantaneous and totalized values are displayed on the flow device.

### **5.3 EQ Tank and Controls**

The raw water pump is controlled by the level control devices in the EQ tank, TK-2000-B. The contents of the Solids tank, TK-2000-A, overflows into the EQ tank, which is designed with sufficient retention time and size to attenuate variable influent flow into the WWTP.

The water flow throughput in and out of the EQ tank is controlled by the EQ pump, P-1000, and level controls (i.e. level switches).

P-1000 is equipped with a Variable Frequency Drive (VFD).

A Flow Indicating Meter, FE/FI-2090, measures the flow rate of the outgoing water to the SFF tank. The instantaneous and totalized values are displayed on the flow device.

The EQ tank is aerated with the system aeration blower, B-9500, to keep its contents thoroughly mixed and homogeneous.

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The EQ tank is equipped with a high level float switch, LSHH-2000B, to indicate tank overflow.

#### **5.4 Submerged Fixed Film Tank and Controls**

P-1000 pumps the waste water directly into the Submerged Fixed Film (SFF) tank, TK-2000-C, where it will overflow into the Ultrafiltration (UF) membrane tank, TK-2001.

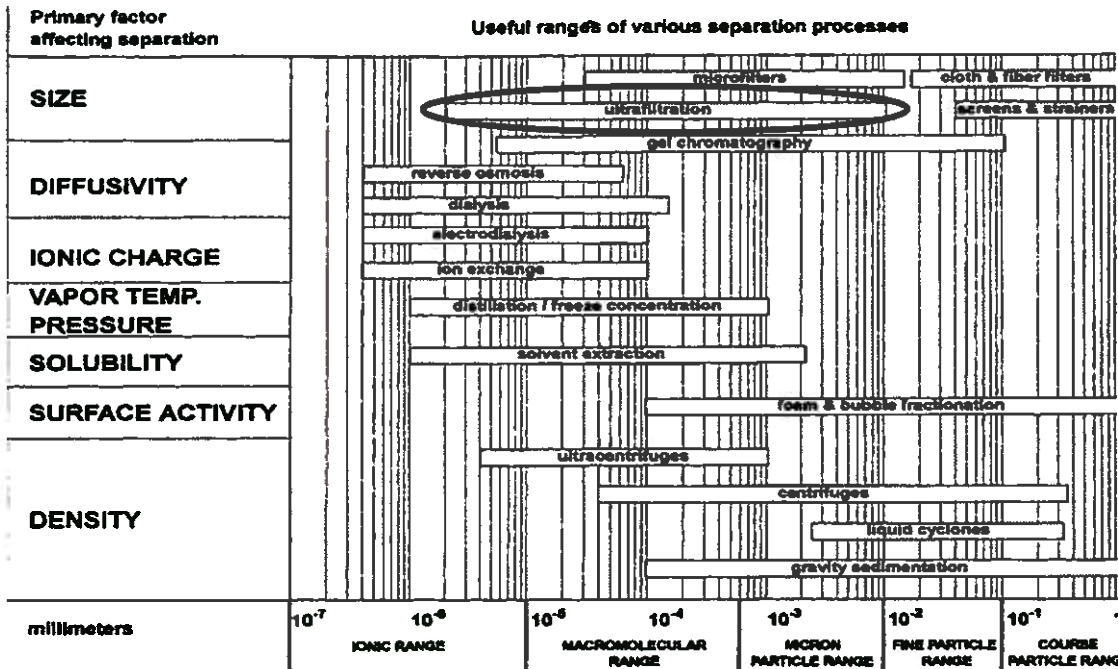
The SFF tank is aerated with the system aeration blower, B-9500, to keep its contents thoroughly mixed and homogeneous, and to maintain a proper aerobic environment for aerobic digestion and processing of the waste water. The SFF tank contains FilterBoxx bio-media that acts as sites for aerobic digestion. Moreover, the media helps to reduce the size of the tank and thus the footprint of the entire waste water treatment plant.

The SFF tank is equipped with a high level float switch, LSHH-2000C, to indicate tank overflow.



## 6.0 Ultrafiltration (UF) Membranes

The following figure describes the spectrum of filtrations.



The WWTP is equipped with Ultrafiltration (UF) membranes. The UF membranes have a pore size of 0.05 micron (see figure above for range of applications), and have hydrophilic membrane chemistry that allow for high flow, low pressure backwashing. They are designed mainly for high flow, high solids applications. The membranes have superior structural integrity that enables them to be used in a variety of environments.

Only fluid can pass through the UF membrane, and all particles greater than 0.05 micron that cannot fit through the pores of the membrane are blocked. The UF membranes provide the final removal of suspended solids in the Dowland WWTP.

Each UF membrane/element is arranged in a FilterBoxx UF membrane support rack. The WWTP has one (1) membrane support rack with an availability of four (4) UF elements per support rack.

### 6.1 Ultrafiltration (UF) Membrane Operation



When the UF elements are submerged a slight suction is applied using the Permeate Pump, P-1000, to draw permeate from the UF membrane tank to the Clear Well tank. Permeate in the Clear Well tank is used to backwash the UF membrane elements with the Backwash Pump, P-2000. The Clear Well tank is also a feed tank for the Effluent Chamber tank and the Client's distribution system described in the following sections.

Backwashing the UF membrane elements is an automatic function controlled by the System Controller (SC). Operator set points, TMR-1 and TMR-2 control the **UF PRODUCTION** and **UF BACKWASH** sequence durations, respectively. These sequences are described in more detail in the following sections.

During the UF PRODUCTION and UF BACKWASH sequences, the Reject Pump, P-3000, is running at a constant speed to prevent the build up of solids in the UF membrane process tank.

## **6.2. Ultrafiltration (UF) Membrane Process Tank**

The water that overflows from the SFF tank is fed directly into the UF membrane process tank, TK-2100. The process tank feed water will submerge the UF membranes at all times during normal operation.

The level of the UF membrane process tank will be controlled by the System Controller by means of level switches, LSSL-2104, LSL-2103, LSH-2102, and LSHH-2101, located in the side wall of the tank. Using the aforementioned instrumentation the System Controller will control the process water level in the UF tank and ensure that the UF membranes are never exposed to air

### **IMPORTANT NOTICE:**

**Please note that the UF membranes must be kept wet at all times. Letting them dry could have irreversible effects on the membranes resulting in membrane damage and poor water quality.**

As a safety precaution, there is a level switch high, LSHH, float located near the top of the UF membrane process tank. When tripped this switch will sound off an alarm and shut the entire system down indicating possible tank overflow.

## **6.3 Ultrafiltration (UF) Membrane Permeate Pump, P-1000**

Permeate Pump, P-1000, is designed to pull water through the UF membrane elements with a very low suction of less than 10 psig, and will run as described in the *WWTP Device Sequencing Chart (DSC)*. During normal operation the suction pressure on the membrane elements is going to be negative (-ve psig). The pump will run at a constant speed and its flow can be throttled with the hand valve located on the discharge side of the pump.

The flow throughput of the Permeate Pump can be viewed by means of a flow indicating meter, FE/FI-1090, in US gallons per min (USGPM).

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#### **6.4 Ultrafiltration (UF) Membrane Backwash Pump, P-2000**

A Backwash is a reverse flow of clean water (i.e. UF membrane permeate) through the UF membrane elements to clean off any debris on the outer surface of the membranes. The UF membrane elements will run through a UF BACKWASH sequence at the end of each UF PRODUCTION sequence automatically.

Once a UF BACKWASH sequence is complete and all the necessary system conditions are met, the System Controller will place the UF membrane system back into the UF PRODUCTION sequence.

#### **6.5 Ultrafiltration (UF) Membrane Reject Pump, P-3000**

Reject Pump, P-3000, draws water from the bottom of the UF membrane tank and pumps sludge or reject from the UF membrane tank back to the front end of the plant.

The Reject Pump will operate during UF PRODUCTION, and BACKWASH sequences.

#### **6.6 Ultrafiltration (UF) Membrane Aeration Blower, B-8500**

The WWTP membrane tank has only one (1) aeration blower, B-8500, which is used to:

- Air Scour the Membrane Surface
- Supply the Membranes with a constant Flow of Feed Water
- Supply Preventative Maintenance

Air to the tank must be throttled with manual hand valves, HV-8521, to maintain the proper design flow rates. Keeping the air flow rate to the UF membrane tank constant is essential to the correct operation of the UF membrane system (i.e. proper air scouring). Once the throttling hand valves are set, they can be left and monitored on a weekly basis.

#### **6.7 Ultrafiltration (UF) Membrane Permeate/Backwash Pressure Switch**

The pressure switch located on the permeate/backwash pipe spool, PSL-1060, monitors the suction and discharge pressures of the Permeate and Backwash pumps, respectively.

As a failsafe measure, the System Controller will monitor these pressures to ensure that the UF membrane elements are not placed under excessive stress.

**IMPORTANT NOTICE:**

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**Please note that the UF membranes must not be placed under to high of a back or suction pressure. Exceeding design pressures could delaminate and damage the UF membranes. Contact your FilterBoxx representative before attempting to alter the operating pressured of the UF membrane system.**

## **7.0 UF Permeate/Backwash Clear Well Storage Tank and Level Controls**

The UF Permeate/Backwash Clear Well storage tank is used to feed the UF Backwash, and Effluent Chamber and Distribution systems. The Clear Well houses two (2) level switches, LSSL-4101 and LSHH-4104, which are used to place the UF membrane system in and out of Standby. Refer to the WWTP DSC for more detailed information.

As a safety precaution, there is an overflow weir in the Clear Well that allows the treated effluent to flow over into the Effluent Chamber where it will be pumped through to the Client's distribution system by means of a distribution pump, P-4100.

## **8.0 Chemical Injection Systems**

The WWTP utilizes a couple chemical injection systems. They are located in the following areas:

- Ultrafiltration Membrane System
  - o Sodium Hypochlorite, P-5100
  - o Sodium Metabisulfite, P-5000

Refer to the rest of this manual and the WWTP for details on how these systems are operated and controlled.

## **9.0 Ultraviolet Sterilization System**

Due to the treated water effluent design criteria, the WWTP is equipped with an Ultraviolet (UV) light sterilization system.

UV sterilization is actually a very simple process for removing unwanted *free floating* microscopic water borne bacteria, parasitic, fungal, viral, algae, and other unfriendly pathogens out of the treated water effluent by exposing it to high intensity ultra-violet (UV) light. UV light has the ability to affect the function of living cells by altering the structure of the cells nuclear material, or DNA. The end result is the organisms die off.



## 10.0 Ultrafiltration Membrane Clean in Place (CIP) System

The CIP system is in place as a heavy cleaning cycle for UF membrane system. This cleaning process should only be done periodically to preserve the life of the membranes.

It is to be done on either membrane system if:

- a) The membranes are badly fouled and design flows cannot be achieved under normal operating conditions.
- b) The membrane system is going to be shut down for an extended period of time and foulants that have accumulated (i.e. due to normal operation) need to be removed for normal operation, or
- c) The membrane system has been offline for an extended period of time and foulants that have accumulated (i.e. due to bio growth and normal operation) need to be removed for normal operation.

When the UF membrane system needs a CIP, the operator needs to shut down the UF membrane system (i.e. **OFF** mode). The operator must also ensure that the WWTP becomes a “closed system” by closing all discharge hand valves to prevent any chemicals from contaminating any clean water storage tanks.

### **IMPORTANT NOTICE:**

**Please contact your FilterBoxx representative before conducting any type of CIP.**

### 10.1 CIP for Immersed UF Membranes

- A) Hypochlorite/Caustic Soda Cleans
  - a. Target pH of 10.5 to 11.5
  - b. 40 Degrees Celsius
  - c. Use 1000 ppm of Hypochlorite
  - d. 2-hour soak with periodic aeration
- B) Citric Acid Cleans
  - a. Target pH of 2 to 3
  - b. 2-hour static soak
  - c. 20 Degrees Celsius

Due to the nature of the feed water, inorganic fouling is not anticipated.

The cleaning procedure is near identical for both methods of cleaning the UF membrane system.

- a) Fill the CIP tank with UF permeate
- b) Turn on the immersion heater and set the appropriate temperature
- c) Turn on the tank mixer and add the appropriate amount of chemicals



- d) Ensure that all hand valves around the permeate and backwash pump are closed off to prevent contamination with other systems
- e) Verify that the hose connections are tight
- f) Drain the UF membrane tank approximately 30% of the tank level (i.e. use system HMI).
- g) Once fully mixed, pump the solution directly into the membrane tank via the Camlock connection on the permeate piping.
- h) Once the UF membrane tank is full start the aeration blower manually and mix the contents of the tank for 10 minutes.
- i) Ensure that there is quite a bit of ventilation in the building to prevent the build up of chemical fumes/vapors.
- j) Mix the contents of the tank for 5 minutes every hour.
- k) After the soak duration has elapsed drain the tank by means of the UF Reject pump, and send the UF tank contents to the site's waste water storage tanks (provided by Client).

**IMPORTANT: MONITOR THE UF TANK LEVEL TO ENSURE THAT THERE IS NO CHANCE OF OVERFLOW.**

## **10.2 Clean in Place (CIP) System**

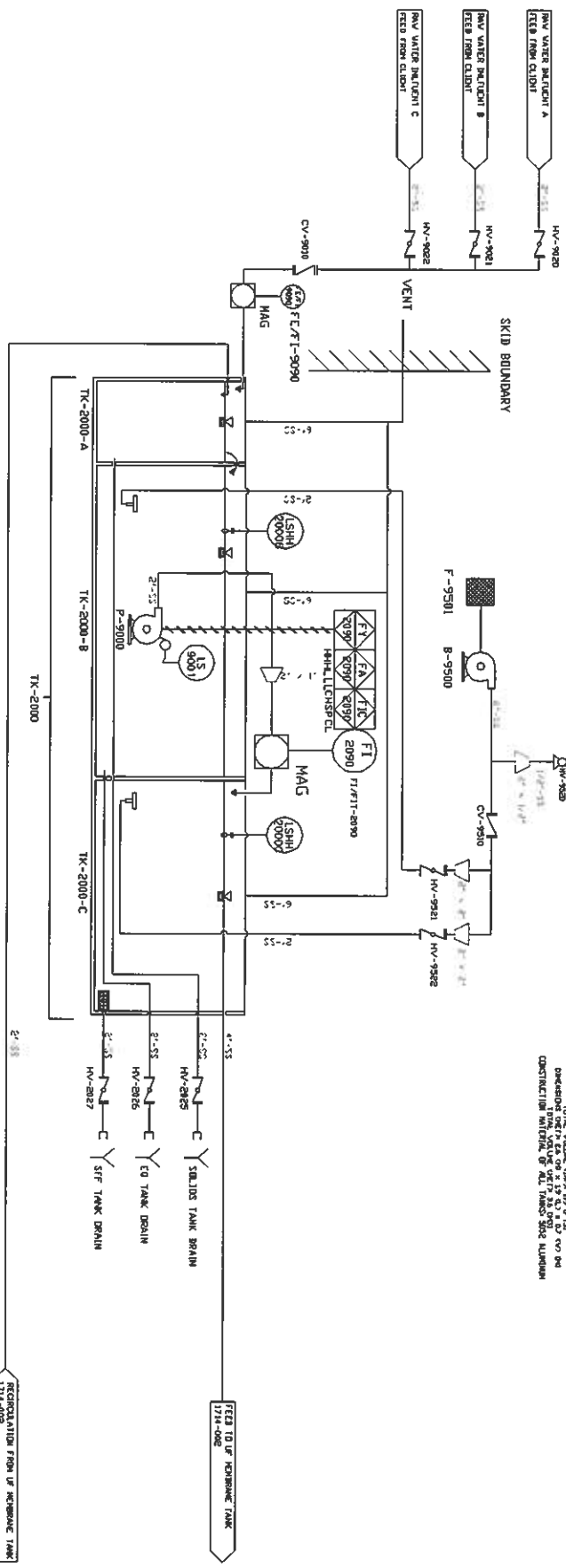
The CIP tank is equipped with a feed pump. The CIP pump, P-6000, is used to feed Ultrafiltration membrane system.







# ISSUED FOR CONSTRUCTION



COLLECTOR: [Name], [Address]  
 DRAWING NO: [Number]  
 PROJECT: [Name]  
 DATE: [Date]

**NOTES:**  
 1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.  
 2. MATERIALS TO BE USED SHALL BE AS SPECIFIED IN THE BILL OF MATERIALS.  
 3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS.  
 4. THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL ADJACENT PROPERTIES AT ALL TIMES.  
 5. ALL WORK SHALL BE COMPLETED WITHIN THE SPECIFIED TIME FRAME.  
 6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING UTILITIES.  
 7. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER.  
 8. THE CONTRACTOR SHALL MAINTAIN A LOG OF ALL WORK DONE AND MATERIALS USED.  
 9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DISPOSAL OF ALL WASTE MATERIALS.  
 10. THE CONTRACTOR SHALL MAINTAIN A SAFE WORKING ENVIRONMENT AT ALL TIMES.

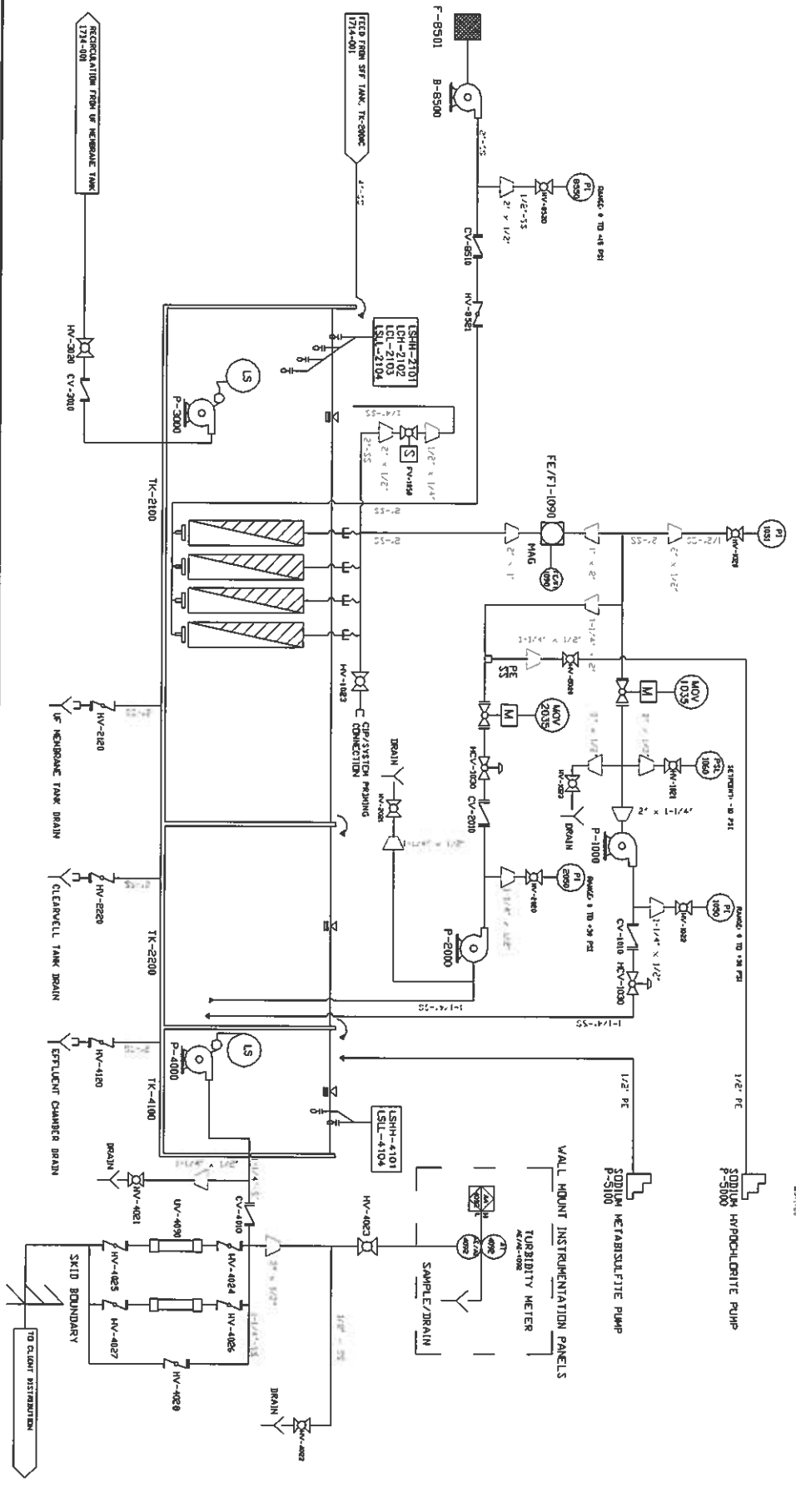
NO.	DATE	REVISION	BY	CHKD.	APPROVED BY	SCALE	DATE
1	15/01/2023	ISSUED FOR CONSTRUCTION	[Signature]	[Signature]	[Signature]	1:1	15/01/2023
2	20/01/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	20/01/2023
3	25/01/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	25/01/2023
4	30/01/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	30/01/2023
5	05/02/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	05/02/2023



CLIENT: DOWNLAND CONTRACTING LTD.  
 TITLE: DOWNLAND CONTRACTING LTD. MBR WWTTP SYSTEM PAID RAW WATER TREATMENT

NO.	DATE	REVISION	BY	CHKD.	APPROVED BY	SCALE	DATE
1	15/01/2023	ISSUED FOR CONSTRUCTION	[Signature]	[Signature]	[Signature]	1:1	15/01/2023
2	20/01/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	20/01/2023
3	25/01/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	25/01/2023
4	30/01/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	30/01/2023
5	05/02/2023	REVISED PER COMMENTS	[Signature]	[Signature]	[Signature]	1:1	05/02/2023

MATERIALS: METAL PIPE, FLANGES, VALVES, FITTINGS, PUMPS, MOTORS, ELECTRICAL SUPPLIES, INSTRUMENTATION, AND OTHERS AS SHOWN ON THIS DRAWING.  
 DIMENSIONS: ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS OTHERWISE SPECIFIED.  
 TOLERANCES: UNLESS OTHERWISE SPECIFIED, TOLERANCES SHALL BE AS FOLLOWS: GRADES AND FINISHES: UNLESS OTHERWISE SPECIFIED, GRADES AND FINISHES SHALL BE AS FOLLOWS:  
 CONSTRUCTION: UNLESS OTHERWISE SPECIFIED, CONSTRUCTION SHALL BE AS FOLLOWS:  
 NOTES: SEE NOTES ON SHEETS 1-1/2, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, 1-11, 1-12, 1-13, 1-14, 1-15, 1-16, 1-17, 1-18, 1-19, 1-20, 1-21, 1-22, 1-23, 1-24, 1-25, 1-26, 1-27, 1-28, 1-29, 1-30, 1-31, 1-32, 1-33, 1-34, 1-35, 1-36, 1-37, 1-38, 1-39, 1-40, 1-41, 1-42, 1-43, 1-44, 1-45, 1-46, 1-47, 1-48, 1-49, 1-50, 1-51, 1-52, 1-53, 1-54, 1-55, 1-56, 1-57, 1-58, 1-59, 1-60, 1-61, 1-62, 1-63, 1-64, 1-65, 1-66, 1-67, 1-68, 1-69, 1-70, 1-71, 1-72, 1-73, 1-74, 1-75, 1-76, 1-77, 1-78, 1-79, 1-80, 1-81, 1-82, 1-83, 1-84, 1-85, 1-86, 1-87, 1-88, 1-89, 1-90, 1-91, 1-92, 1-93, 1-94, 1-95, 1-96, 1-97, 1-98, 1-99, 1-100.



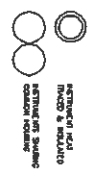
# ISSUED FOR CONSTRUCTION

<p> <b>FilterBox</b>            ALL INSTRUMENTATION AND ELECTRICAL SUPPLIES TO BE PROVIDED BY THE CLIENT.  <b>FilterBox</b>            DOWN AND CONTRACTING LTD.            WATER WASTE SYSTEMS DIVISION            1 F AND TREATED WATER SYSTEMS         </p>	<p>           CLIENT: DOWN AND CONTRACTING LTD.            PROJECT: WATER WASTE SYSTEMS DIVISION            SHEET NO: 1-1/2 OF 5         </p>	<p>           DATE: 10/1/2003            DRAWN BY: J. SMITH            CHECKED BY: M. JONES            APPROVED BY: K. BROWN            SCALE: AS SHOWN            PROJECT NO: 001 3 OF 5         </p>
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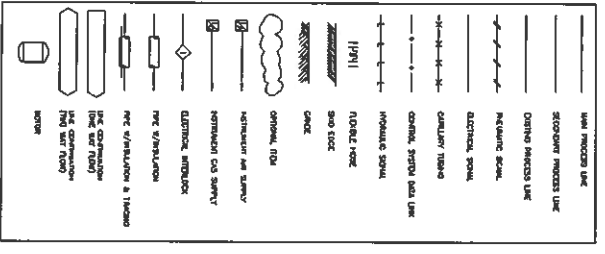


INSTRUMENTATION IDENTIFICATION

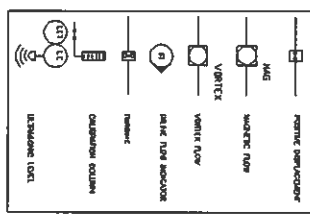
IDENTITY	INDICATE FIELD CONTROL	FIELD CONTROL	INDICATE REMOTE CONTROL
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ISOLATED	ISOLATED	ISOLATED	ISOLATED
ISOLATED	ISOLATED	ISOLATED	ISOLATED
ISOLATED	ISOLATED	ISOLATED	ISOLATED
ISOLATED	ISOLATED	ISOLATED	ISOLATED



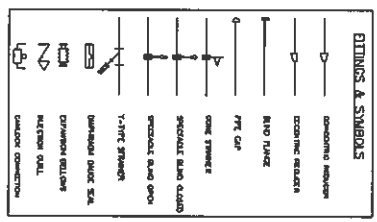
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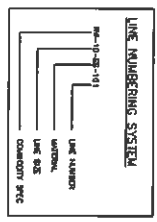
METERS



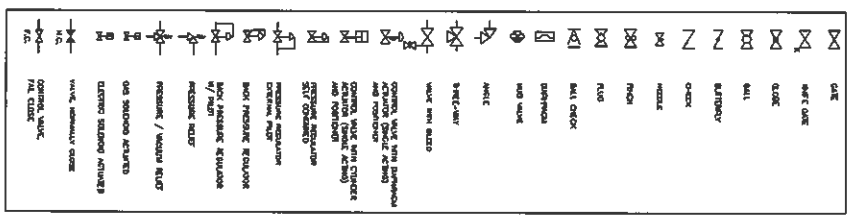
LETTERS & SYMBOLS



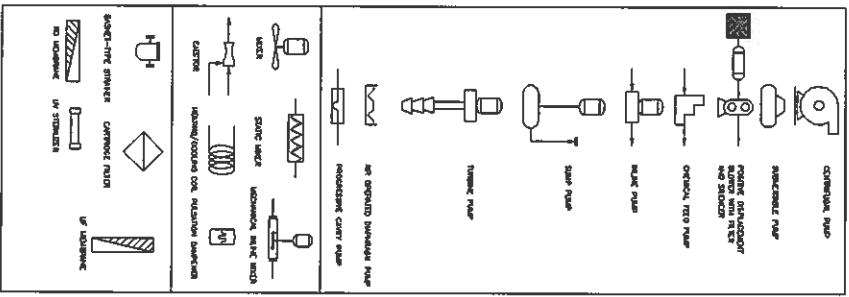
LINE NUMBERING SYSTEM



VALVES



PUMPS & EQUIPMENT



ISSUED FOR CONSTRUCTION

ALL INSTRUMENTATION ON THIS DRAWING IS THE PROPERTY OF THE COMPANY AND IS NOT TO BE REPRODUCED OR USED IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF THE COMPANY.



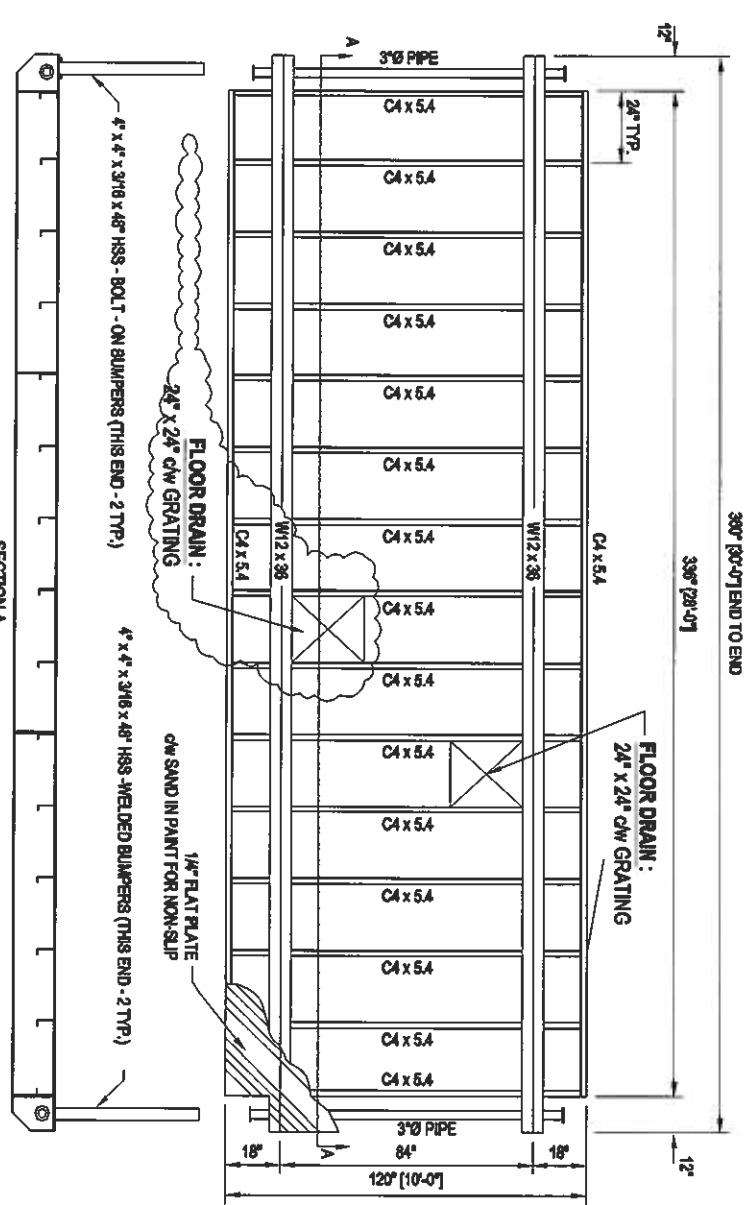
OWNER: DOWNLAND CONTRACTING LTD.  
DRAWN BY: DOWNLAND CONTRACTING LTD.  
CHECKED BY: DOWNLAND CONTRACTING LTD.  
APPROVED BY: DOWNLAND CONTRACTING LTD.  
DATE: 10/10/2010

NO.	DATE	DESCRIPTION	BY	CHKD	DATE	ISSUED BY	FOR	SCALE
1	10/10/2010	ISSUED FOR CONSTRUCTION	JM	AB	10/10/2010	JM	FOR CONSTRUCTION	N/A

DEVICE AND INSTRUMENT IDENTIFICATION TABLE

NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION	NO.	DESCRIPTION
1	TEMPERATURE TRANSDUCER	101	TEMPERATURE TRANSDUCER	201	TEMPERATURE TRANSDUCER	301	TEMPERATURE TRANSDUCER
2	TEMPERATURE TRANSDUCER	102	TEMPERATURE TRANSDUCER	202	TEMPERATURE TRANSDUCER	302	TEMPERATURE TRANSDUCER
3	TEMPERATURE TRANSDUCER	103	TEMPERATURE TRANSDUCER	203	TEMPERATURE TRANSDUCER	303	TEMPERATURE TRANSDUCER
4	TEMPERATURE TRANSDUCER	104	TEMPERATURE TRANSDUCER	204	TEMPERATURE TRANSDUCER	304	TEMPERATURE TRANSDUCER
5	TEMPERATURE TRANSDUCER	105	TEMPERATURE TRANSDUCER	205	TEMPERATURE TRANSDUCER	305	TEMPERATURE TRANSDUCER

- SKID NOTES :**
- SAND BLAST CLEAN (SP-6)
  - ZINC CHROMATE PRIMER
  - MARINE ENAMEL FINISH
  - 2" SPRAY FOAM INSULATION
  - W/TOWERTHON II FIRE RETARDANT COATING ON THE UNDERSIDE
  - DECKING IS STICH WELDED TO BEAMS
  - FINISH COLOR IS TO BE SLATE BLUE (QC260)
  - SUPPLY ONE 24" x 24" SUMP
  - SUPPLY ONE 12" X 12" SUMP



**SECTION A**

360" [30'-0"] END TO END

336" [28'-0"]

24" TYP.

3"Ø PIPE

C4 x 5.4

W12 x 36

FLOOR DRAIN : 24" x 24" CW GRATING

1/4" FLAT PLATE  
CW SAND IN PAINT FOR NON-SLIP

4' x 4' x 3/16 x 48" HSS - BOLT - ON BUMPERS (THIS END - 2 TP.)

4' x 4' x 3/16 x 48" HSS - WELDED BUMPERS (THIS END - 2 TP.)

12"

12"

18"

84"

120" [10'-0"]

**PRELIMINARY**

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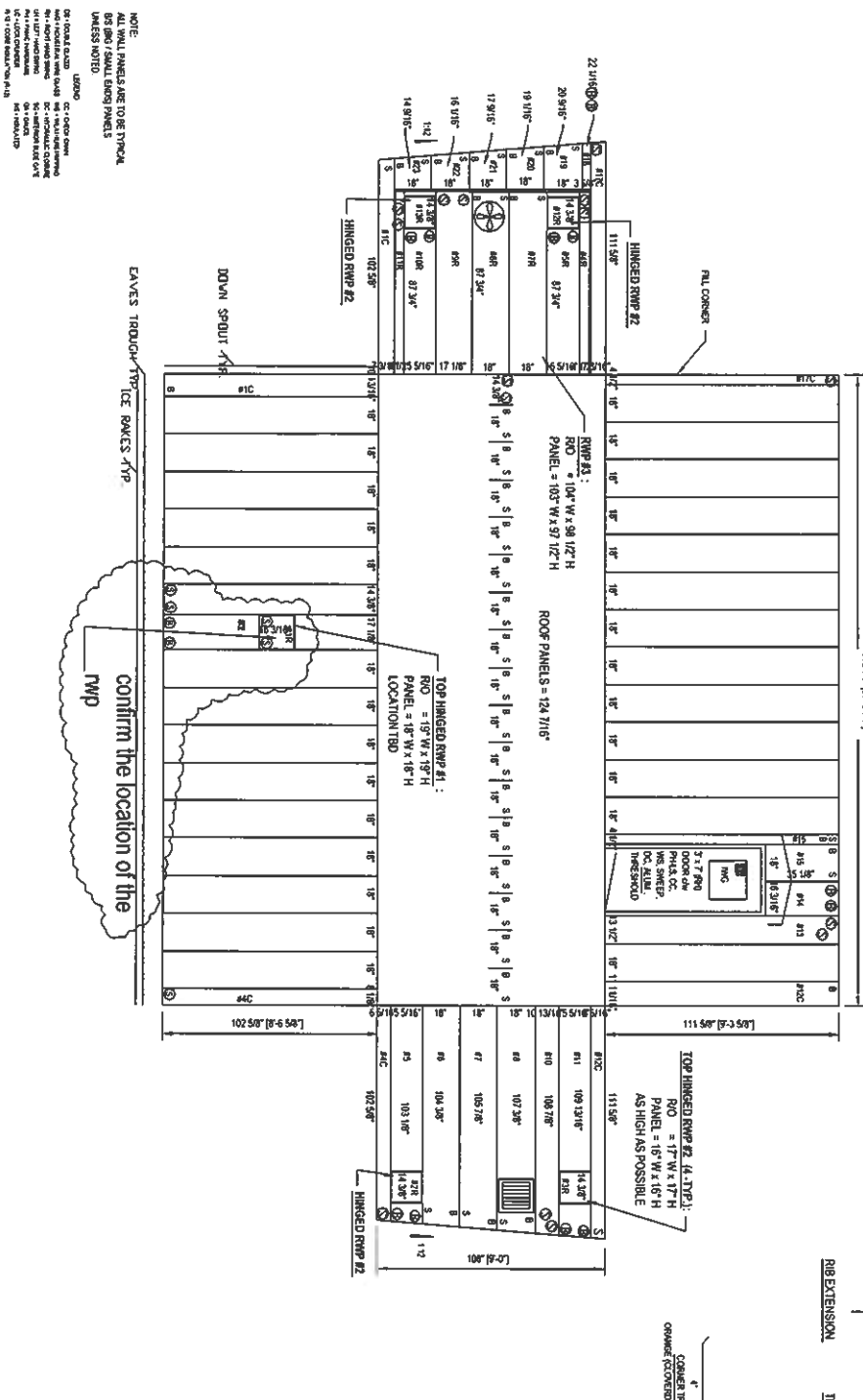
**FilterBox**

CLIENT	DOWNLAND CONTRACTING LTD.
TITLE	DOWNLAND CONTRACTING LTD. WASTE WATER TREATMENT PLANT SKID DESIGN

NO.	DATE	DESCRIPTION	BY	CHKD.
1		ISSUE FOR PERMITTING		
2		ISSUE FOR CONSTRUCTION		
3		ISSUE FOR OPERATION		
4		ISSUE FOR MAINTENANCE		
5		ISSUE FOR MODIFICATION		
6		ISSUE FOR DECOMMISSIONING		
7		ISSUE FOR RECONSTRUCTION		
8		ISSUE FOR REPAIR		
9		ISSUE FOR REPLACEMENT		
10		ISSUE FOR MODIFICATION		
11		ISSUE FOR DECOMMISSIONING		
12		ISSUE FOR RECONSTRUCTION		
13		ISSUE FOR REPAIR		
14		ISSUE FOR REPLACEMENT		
15		ISSUE FOR MODIFICATION		
16		ISSUE FOR DECOMMISSIONING		
17		ISSUE FOR RECONSTRUCTION		
18		ISSUE FOR REPAIR		
19		ISSUE FOR REPLACEMENT		
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45		ISSUE FOR MODIFICATION		
46		ISSUE FOR DECOMMISSIONING		
47		ISSUE FOR RECONSTRUCTION		
48		ISSUE FOR REPAIR		
49		ISSUE FOR REPLACEMENT		
50		ISSUE FOR MODIFICATION		

NO.	DATE	DESCRIPTION	BY	CHKD.
1		ISSUE FOR PERMITTING		
2		ISSUE FOR CONSTRUCTION		
3		ISSUE FOR OPERATION		
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7		ISSUE FOR RECONSTRUCTION		
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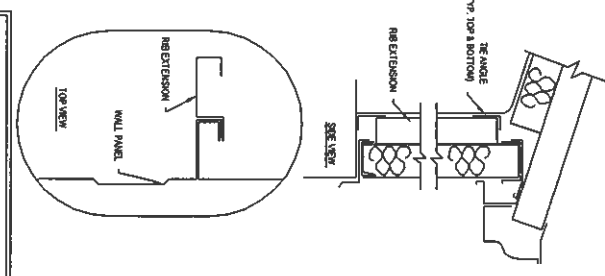
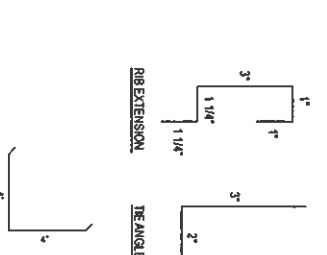
- NOTES:**
- EXTERIOR WALLS TO BE 24 GA. GALV. BLK. (G260)
  - EXTERIOR ROOF TO BE 24 GA. GALV. BLK. (G260)
  - ROOF TO BE 24 GA. GALV. BLK. (G260)
  - ROOF TO BE 24 GA. GALV. BLK. (G260)
  - INTERIOR LINEN TO BE 24 GA. WHITE ALUMINUM
  - BUILD ATION IN ROOF: 2-29
  - VAPOR BARRIER TO BE: 6 MIL.
  - SURFACE AREA: 1,144 SQ FT
  - APPROX. TOTAL SHIPING WEIGHT = 11,000 POUNDS AND 500
  - 1-1/2" x 1/2" STAINLESS STEEL ANCHORS
  - 1-1/2" x 1/2" STAINLESS STEEL ANCHORS
  - ALL JOINTS TO BE CALKED AND SEALED
  - CUT AND FLASH DETAILS FOR THE ROOF SHEETED WALLS ONLY.



# PRELIMINARY

**FilterBox**

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE AND IS SUBJECT TO CHANGE WITHOUT NOTICE.



**WALLS ARE 6 1/2\"/>**

NO.	DATE	DESCRIPTION	BY	CHKD.	STATUS
1	12-11-07	ISSUED FOR PERMIT	...	...	...
2	12-11-07	ISSUED FOR PERMIT	...	...	...
3	12-11-07	ISSUED FOR PERMIT	...	...	...
4	12-11-07	ISSUED FOR PERMIT	...	...	...
5	12-11-07	ISSUED FOR PERMIT	...	...	...
6	12-11-07	ISSUED FOR PERMIT	...	...	...
7	12-11-07	ISSUED FOR PERMIT	...	...	...
8	12-11-07	ISSUED FOR PERMIT	...	...	...
9	12-11-07	ISSUED FOR PERMIT	...	...	...
10	12-11-07	ISSUED FOR PERMIT	...	...	...

**DOWNLAND CONTRACTING LTD.**

WASTE WATER TREATMENT PLANT BUILDING DESIGN

1000 2 ST 2