Water & Sewer Utility

What we do… Water System

- The Water and Sewer Utility is responsible for the maintenance and repair of the Town's water systems including water pumping stations, and to provide residents and businesses with a sufficient supply of high quality *safe* drinking water to meet their needs.
- Secondary responsibility to provide fire protection within the service area.
- The water distribution system includes 4 water pumping stations (8 wells), 1 reservoir, 1 booster station, 115 hydrants, mains (45 km.) and services.

Water System

What we do… Sewer System

- The Town of Cornwall Water & Sewer Utility operates a sanitary sewer collection and treatment system that removes contaminants from wastewater and household sewage to produce an environmentally safe fluid waste stream (or treated effluent) and a solid waste (or treated sludge) suitable for disposal.
- The sanitary system includes 2 aerated lagoons with UV disinfection, 10 lift stations, 548 manholes, mains (47 km.) and services.

North River Wastewater Lagoon

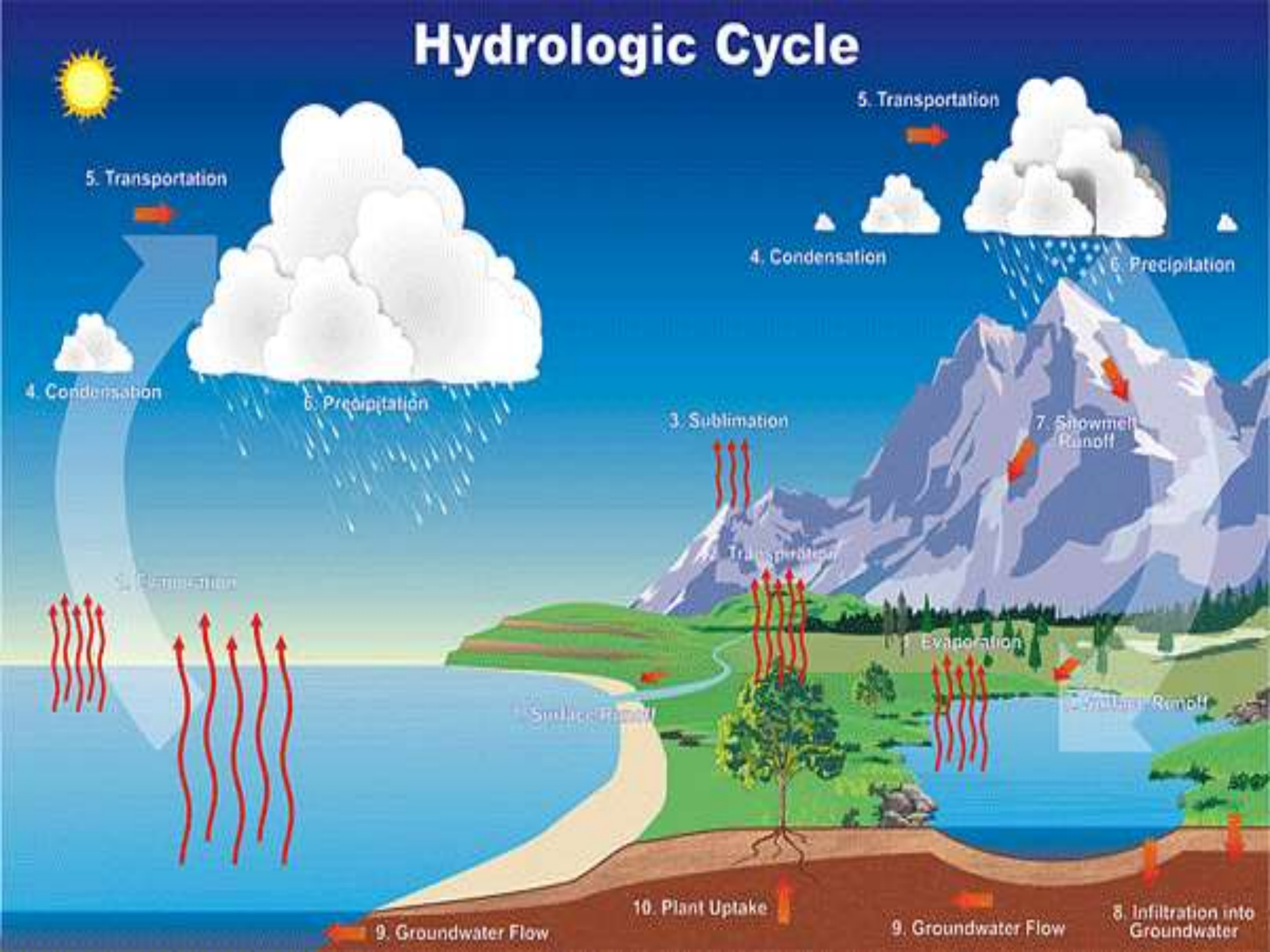
Facility Classification

- The Town of Cornwall Water & Sewer Utility is classified:
  - Class I Wastewater Treatment
  - Class II Wastewater Collection
  - Class II Water Distribution

Cornwall Service Area

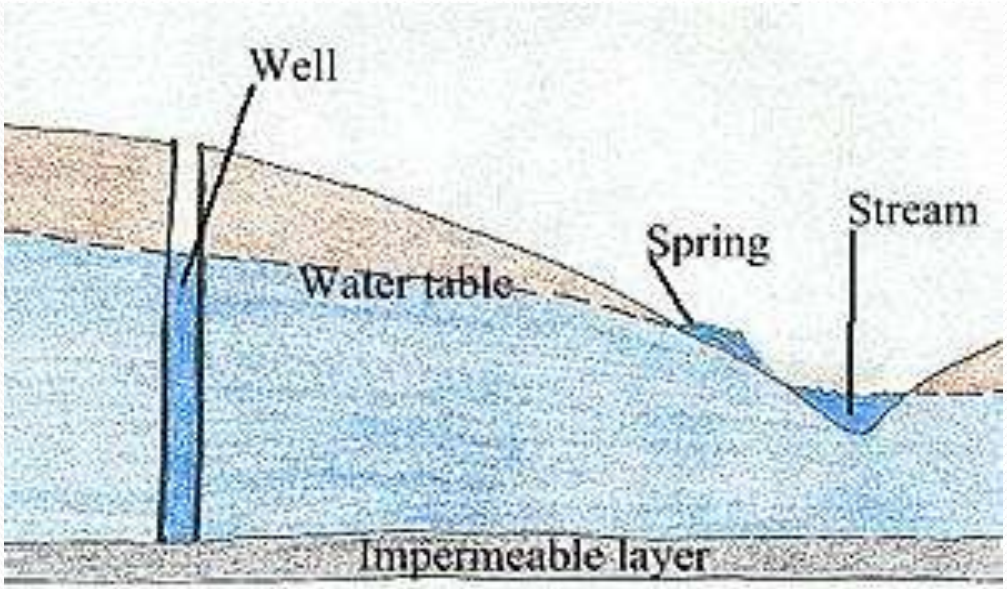
Sources of Water

- 100% of PEI's drinking water comes from groundwater
- As groundwater flows through an aquifer it is naturally filtered, it is considered to be the purest form of natural water
- The natural filtering process and the long retention time underground means that groundwater is usually free from disease-causing organisms and requires very little treatment


Hydrologic Cycle
5. Transportation
4. Condensation
6. Precipitation
3. Sublimation
7. Snowmelt Runoff
Evaporation
Surface Runoff
10. Plant Uptake
9. Groundwater Flow
9. Groundwater Flow
8. Infiltration into Groundwater

Wells

- A well is how we access the groundwater for use from the aquifer



Water Pumping Stations

Groundwater Issues

- It often contains more dissolved minerals such as calcium, magnesium, iron, manganese and sulfur compounds
- Can be contaminated by:
  - Leakage from underground storage tanks
  - Poor waste disposal practices
  - Agricultural chemicals
  - Salt water intrusion

Purifying Our Water

- For the purpose of public health, water is disinfected (chlorinated) to ensure that water is safe to drink and does not contain disease-causing microorganisms. This is a requirement of any public drinking water supply on PEI.
- When chlorine is added to the water a variety of chemical processes take place
  - Chlorine reacts with the compounds in the water and with the water itself
  - These reactions, chlorine residual, are able to kill many microorganisms in the water

Chlorination

- Chlorine may be added to water in the form of chlorine gas, hypochlorite, or chlorine dioxide. All types of chlorine will kill bacteria and some viruses.
- Cornwall uses sodium hypochlorite as its disinfection agent. Though it is less pure than chlorine gas it also means that it is less dangerous for those who are processing the water purification.
- Chlorine is added to the water before the water reaches the distribution system

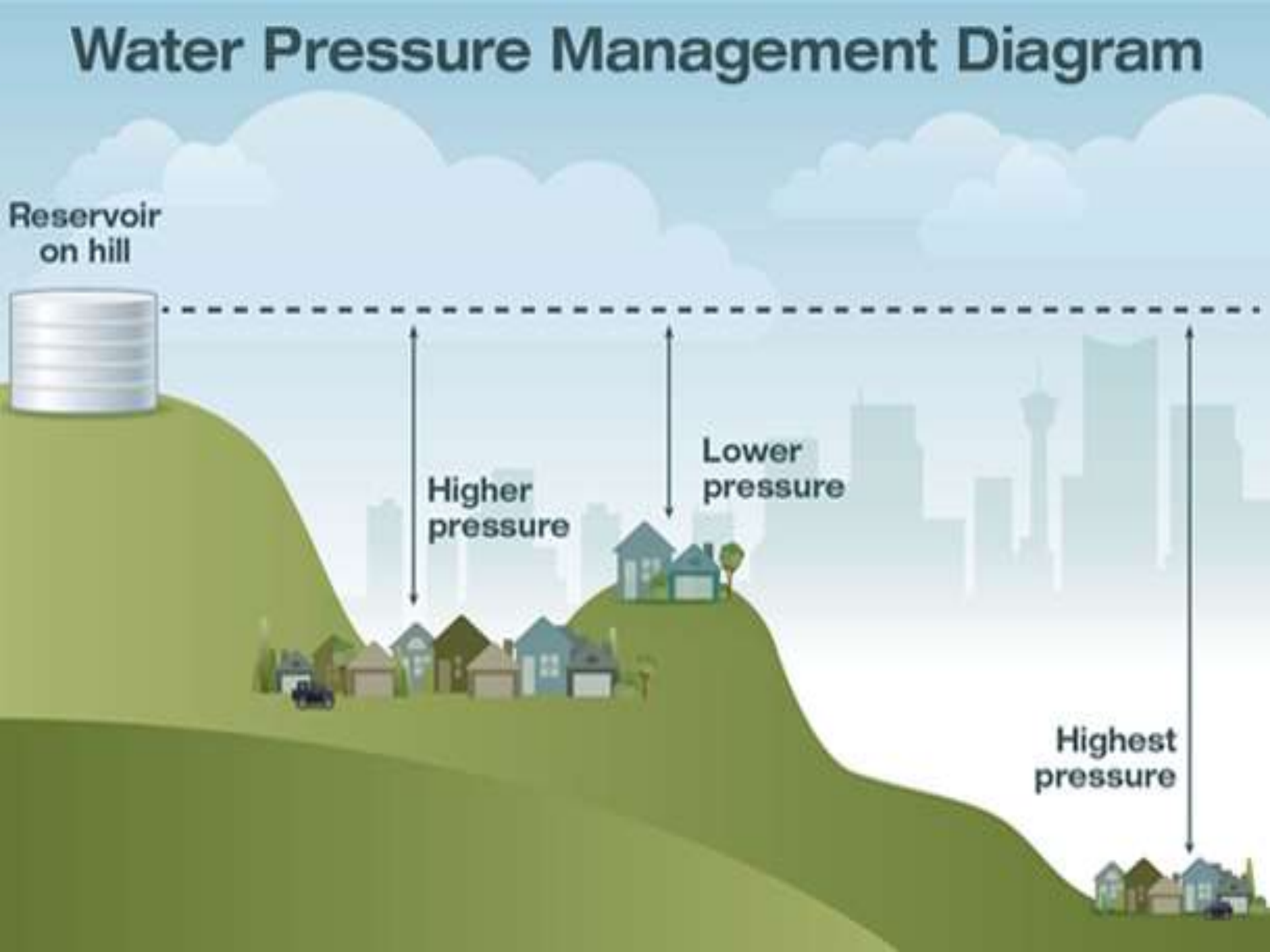
Chlorine Analyser Station

Water Pressure

- In 2001, the Town needed water storage capacity and commissioned the building of the of the Town's reservoir. The reservoir is designed to provide 31 psi at the highest elevations in Town and 80 psi at the lowest elevations.
- The system is also designed to ensure adequate pressure throughout the Town for fire protection.

Town of Cornwall Reservoir

Water Pressure Management Diagram



Computer Monitoring

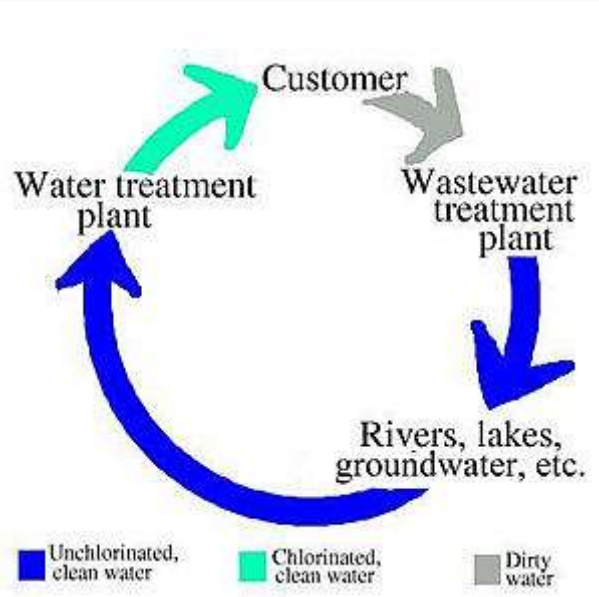
- The Town of Cornwall uses a SCADA (supervisory control and data acquisition) system to provide control of remote equipment in all areas of operation.
- The system monitors and automatically activates pumps based on pre-set points of hydraulic pressure (water production) or floats (lift stations).
- The system also creates alarms any time a pump fails to start or other issues occur.

VTSCADA

SCADA
Overview
Warren Grove
East Wiltshire
66 GPM
N.R.Lagoon
Candlelight Park
Sunrise Cove
York Point
Business Park
Filling
Northgate
71 GPM
Ferry Road
Cornwall UV / Blwrs
Primrose Pt 3
Meadowbank
113 GPM
Primrose Pt 2
River Point
Primrose Pt 1

Wastewater Treatment

- Wastewater is channeled to a wastewater treatment plant where it is cleaned and released back into our environment.



Sources of Wastewater

- Wastewater can be classified as domestic, industrial, or storm, according to its origin.
- Domestic sources include water used for normal activity in homes, businesses and institutions.
- In Cornwall, storm wastewater is collected through ditches, culverts and storm sewers and is not mixed with sanitary sewer. The storm wastewater system is managed by the Provincial Department of Transportation and Energy.

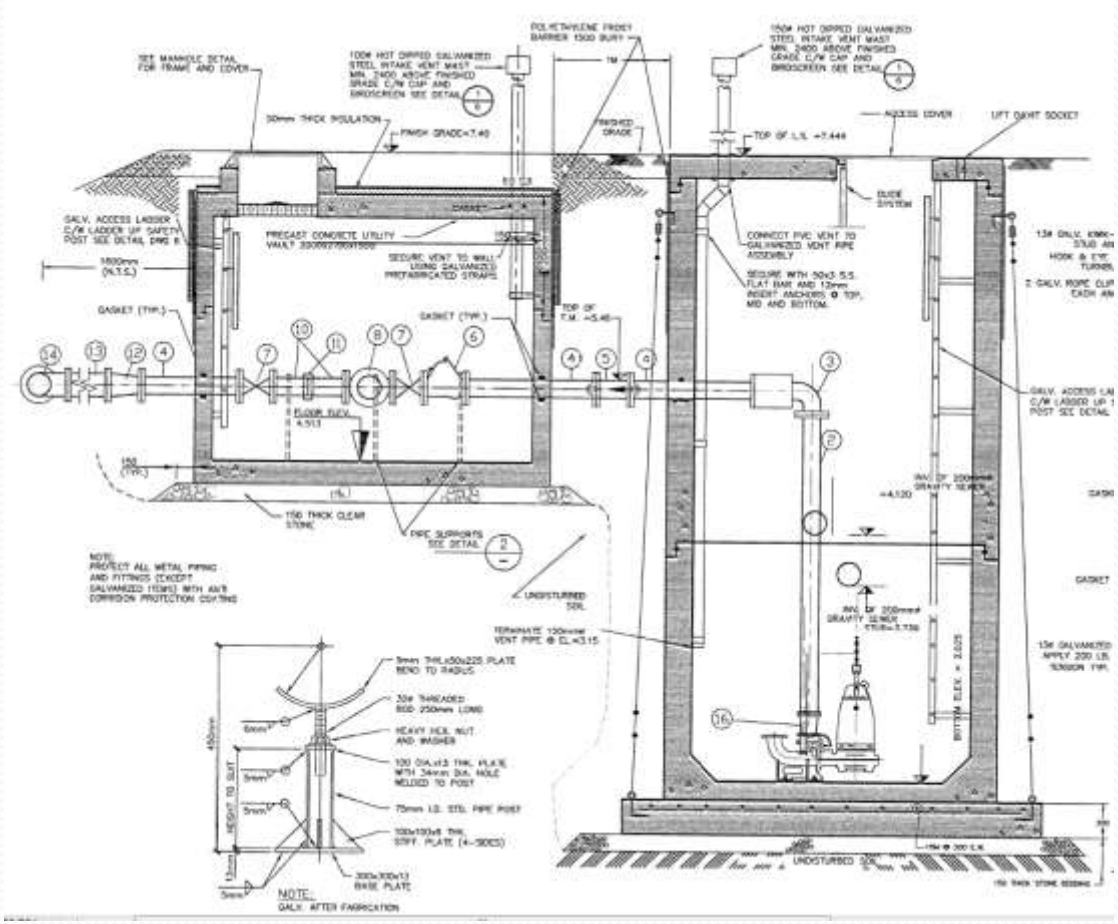
Lift Stations

- Wastewater lift stations are facilities designed to move wastewater from lower to higher elevation, particularly where the elevation of the source is not sufficient for gravity flow.
- The Utility operates and maintains 10 lift stations throughout the Town.

Sewer Lift Station (Business Park)

Lift Station Design

LIST OF FITTINGS		
No.	QTY.	DESCRIPTION
①	2	SEWAGE LIFT PUMP
②	2	150# D.I. MAKE UP PIPE (FLG.-FLG.)
③	2	150#-90° D.I. ELBOW (FLG.)
④	5	150# D.I. MAKE UP PIPE (FLG.-P.E.)
⑤	2	150# BALL CHECK VALVE (FLG.)
⑥	3	150# PLUG VALVE (FLG.)
⑦	2	150 D.I. TEE (FLG.)
⑧	1	150# PLUG VALVE (MJ) C/W 50mm OPERATING NUT, VALVE BOX & JOINT RESTRAINT
⑩	2	150# D.I. MAKE UP PIPE (VIC-FLG)
⑪	1	150# VICTAULIC COUPLING (STYLE 31)
⑫	1	200Øx150mmØ MJ REDUCER
⑭	2	150# 90° BEND MJ C/W JOINT RESTRAINT & THRUST BLOCK
⑮	1	150mmØ BLIND FLANGE
⑯	1	100x150mmØ REDUCER



Sewage Lagoons

- Lagoons are probably one of the most economical ways of treating sewage and producing a highly purified effluent (end product), using natural processes.
- Lagoons can be used as the sole type of water treatment or can be used in conjunction with other forms of wastewater treatment.

Sewage Lagoons Continued

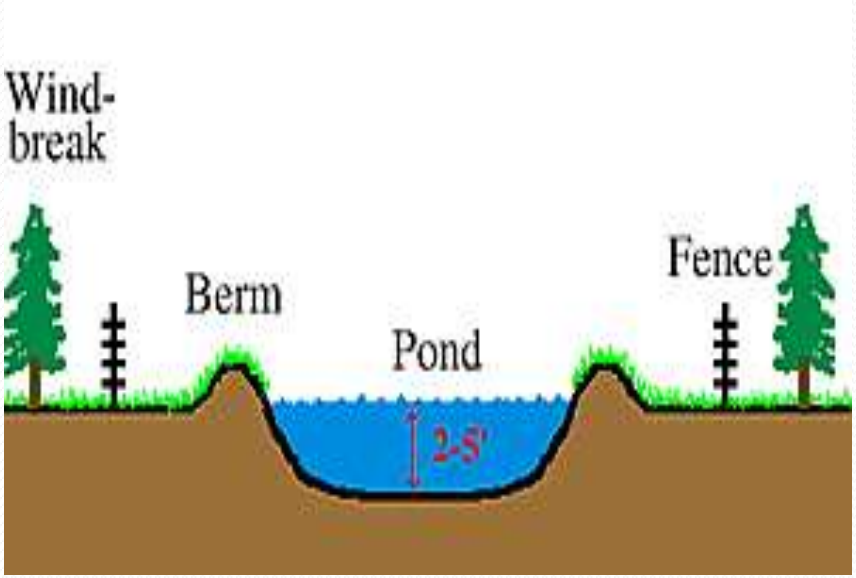
- Sewage lagoons are very simple to construct. A bulldozer is used to remove soil from the ground and create a basin in which water can collect.
- The lagoons and surrounding area must be planned in such a way that the human and natural environments surrounding the pond are not damaged.

North River Lagoon 2004

Typical Sewage Lagoon Continued

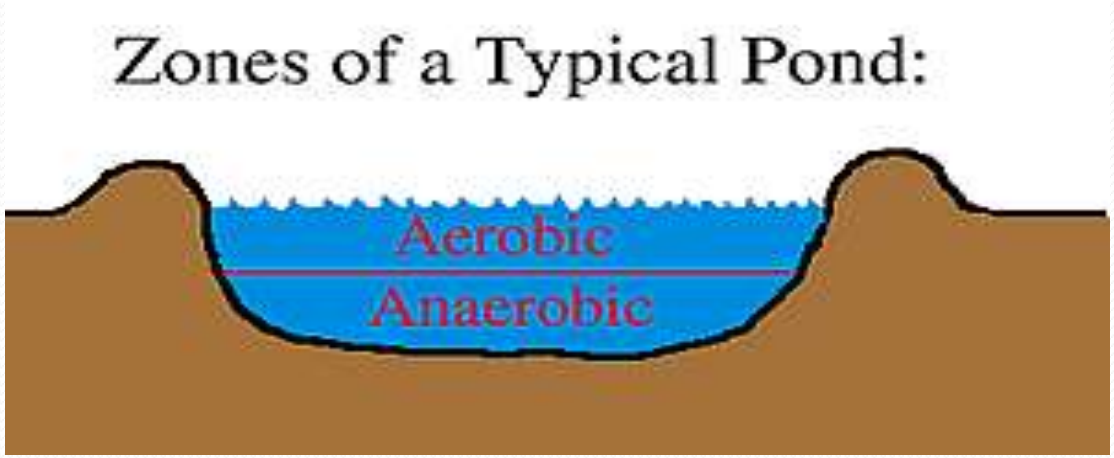
- A lagoon must be completely fenced to keep unwanted visitors out.
- In addition, the area around the fence must be mowed to keep out vermin which could dig holes into the sides of the Lagoon.
- Tree growth must be restricted near the Lagoon since roots could enter the pond and provide a way for sewage to escape if the trees died.

Typical Sewage Lagoon



Aerobic Lagoon

- An **aerobic lagoon** is a lagoon in which oxygen is present throughout the lagoon. All biological activity in the lagoon is aerobic decomposition.
- The lower portions of a Lagoon tend to lack oxygen and to host anaerobic bacteria, as shown in the picture below.



Aerobic Lagoon Continued

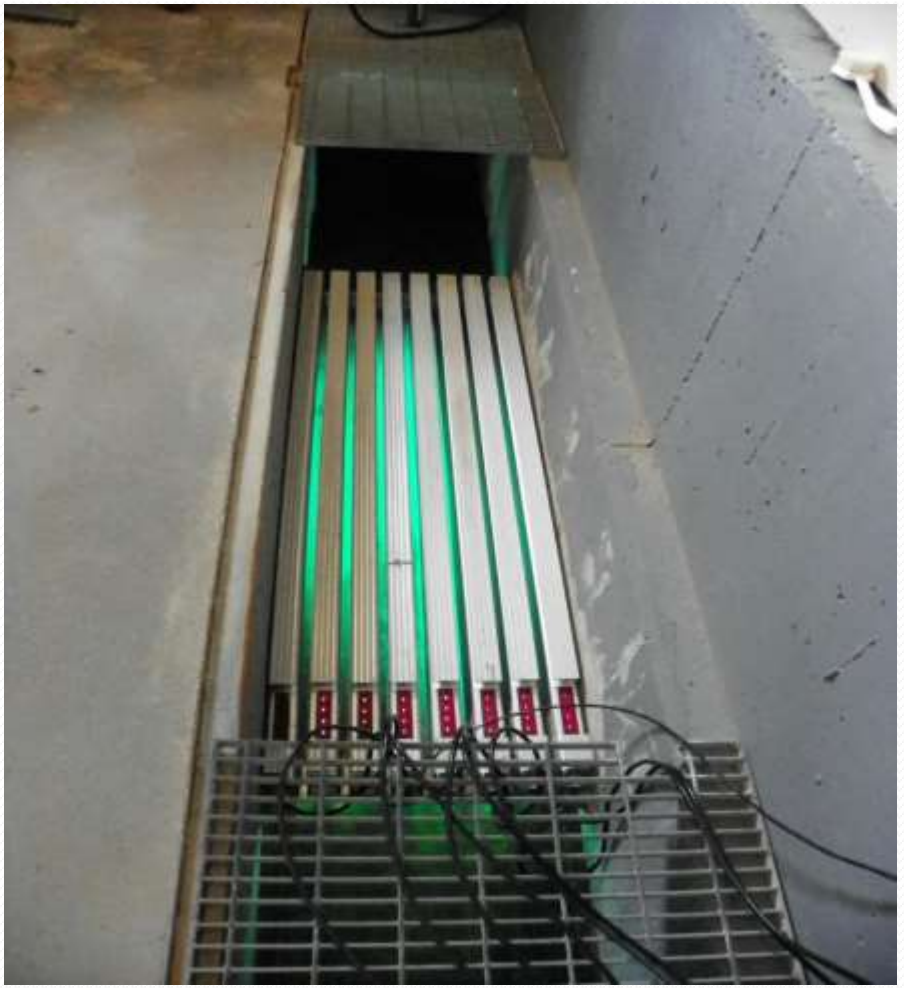
- To maintain aerobic processes throughout the pond the Utility adds oxygen to the water using mechanical or diffused air systems.
- Aerated lagoons allow the depth of the lagoon and/or the acceptable loading levels to be increased.
- The mechanical or diffused aeration systems can be used to supplement natural oxygen production or to replace it.

Aeration System (Cornwall)

Ultraviolet Light for Disinfection

- UV light is produced by low pressure mercury lamps.
- UV doesn't add anything to the wastewater during the disinfection process.
- The UV unit exposes all bacteria to the radiation at close range (i.e. 1.4 inch) to achieve disinfection.
- The wastewater flow is directed through baffles so that the microorganisms will spend a maximum amount of time close to the ultraviolet source.
- After being treated by the UV the fluid waste stream (or treated effluent) is released back into the environment.

Cornwall UV Lights



Hyde Creek Watershed

- Most of Town of Cornwall lies within the Hyde Creek Watershed.
- The Hyde Creek Watershed has many characteristics of an urban watershed. In urban watersheds, storm drains or catch basins are designed to carry storm water away from developed areas to prevent flooding.

Hyde Pond

Ongoing Issues for the Utility

- Mechanical issues
  - Pumps (pumping, lift stations) wear out and need to be replaced
- Maintenance issues
  - Broken water mains/services or blockages in sewer collection systems
  - Aging infrastructure
- Quality of water pumped
  - High sodium or hard water
  - Well Field Protection

Ongoing Issues Continued

- New Regulations (Provincial Environment, Federal Environment, Fisheries and Health Departments)
  - Increased reporting, higher standards.
  - Conditional management plan for Hyde Creek fisheries
- Growth
  - New subdivisions will increase demand on existing infrastructure
  - Expanded Fire Protection

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