APPENDIX E
Red Rock Wastewater Treatment Plant Condition Assessment

AECOM

Township of Red Rock

Red Rock Water Pollution Control Plant
Review of Existing Facility
Technical Memorandum

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1. Introduction

The Red Rock Water Pollution Control Plant (WPCP) is a primary wastewater treatment plant with a rated capacity of 1,272 m^3/d. The facility was constructed in 1977 and consists of the following processes:

- raw sewage screening;
- raw sewage pumping;
- grit removal;
- primary clarifiers;
- chlorine disinfection; and
- anaerobic digestion.

As part of the Class Environmental Assessment for the Red Rock Water Pollution Control Plant upgrade, a review of the existing facility was undertaken. This review was complete by conducting a walkthrough of the facility and review of the design drawings. The following Technical Memorandum summarizes the findings of this review. A list of equipment is included in Appendix A and photographs of the facility are in Appendix B.

2. Building Structures

The building structures are constructed of concrete block with flat built-up roofs. With the exception of cosmetic upgrades such as painting and the replacement of a wood door in the headworks as well as minor concrete repairs, the buildings structures are relatively good condition for their age.

There is some concrete spalling on the walkways around the facility and concrete erosion/cracking where the handrails were cast within the concrete structures which is typical for that type of construction.

There are windows in the digester control building which are likely energy inefficient due to their age. In addition, the insulation in the building likely does not meet current standards, again due to the vintage of the facility.

The concrete tankage and tunnels and below-grade structures were visually inspected. The concrete appears to be in good condition and there was no evidence of active groundwater leakage through cracking in the below-grade concrete structures. There is a small leak that shows up occasionally in the tunnel.

3. Headworks Facility

The headworks facility consists of a coarse bar screen, raw sewage wet well and horizontal grit channels.

3.1 Bar Screen

The bar screen has a 25 mm (1 in) bar spacing which does not provide adequate capture of solids to meet current standards. In current wastewater treatment plant design, grinders are used or bar screens with spacings of 12.5 mm or less are used. This wide bar screen spacing will allow rags and other deleterious materials to pass through the screen into the primary clarifiers and potentially into the digester. This results in clogging of the raw sewage pumps and also likely would impair the quality of the sludge for beneficial reuse, as well as potential clogging of the sludge recirculation piping and heat exchanger piping.

3.2 Horizontal Grit Channels

The horizontal grit channels are 3.3 m (11 ft) long x 530 m (1 ft 9) wide with a proportional weir at the effluent. At a peak flow of 8,395 m^3/d a grit channel has a velocity of 0.6 m/sec at a peak flow assuming 300 mm water depth. Currently MOE guidelines for horizontal grit channels require a maximum velocity of 0.3 m/sec. The grit channels are 3.3 m long. In accordance with MOE guidelines for the peak flow with 2 channels in operation, they should be 9.9 m long. Thus, the current grit channels do not meet current design guidelines based upon the peak flows experienced by the facility. This results in grit being carried over from the grit channels into the primary clarifiers and eventually the anaerobic digester. The grit carryover can potentially result in erosion of sludge piping and pumping systems, as well as a reduction in digester capacity due to grit build-up within the digesters.

3.3 Raw Sewage Pumps

Raw sewage passes through the coarse bar screen into a wet well which is located in the basement of the headworks portion of the plant. This wet well is open to the screening and inlet room and as a result of this, there is substantial corrosion on the piping within that room as well as the bar screen enclosure.

The headworks building appeared to have explosion proof electrical systems; however, the ventilation rates likely do not meet National Fire Protection Association (NFPA) 820 requirements for fire protection for wastewater facilities.

The raw sewage pumps are constant speed bottom section type sewage pumps with shaft drives. The flow from the raw sewage pumping station is controlled via a hydraulic butterfly type control valve located downstream of the raw sewage pumps. Typically butterfly valves are not used in sewage applications as the disk is prone to clogging by capture of rags or other material.

The raw sewage pumps appear to be in relatively good condition; however, they are 30 years old and likely require a major rebuild to upgrade the impellers, wear rings and other components. Two of the three motors for the raw sewage pumps have been replaced over the years. Two of the rotating elements have been changed in the last 10 years or so)

3.4 Raw Sludge Pumping

The raw sludge pumping is accomplished by two piston type pumps, removing raw sludge from the primary clarifiers and discharging it to the anaerobic digester. These raw sludge pumps appear to be in relatively good condition; however, the piping has experienced corrosion and wear and some of the components have been replaced and likely further failures and replacements will be required in the near future as a result of grit carryover from the grit channels.

4. Primary Clarifiers

There are two primary clarifiers, each 13.7 m (45 ft) long by 3.7 m (12 ft) wide a side water depth of 3.3 m (10.75 ft). With these dimensions, the primary clarifiers have a peak flow surface overflow rate of 83 $m^3/m^2/day$. The MOE guidelines require primary clarifiers to have a peak overflow rate of 60 – 80 $m^3/m^2/day$ for clarifiers not handling activated sludge. Thus, the existing primary clarifiers are above the maximum MOE guideline overflow rates.

In addition, the plant does not use alum for coagulation which also affects the performance of the primary clarifiers.

5. Disinfection

Disinfection for the plant is provided through gas chlorination with 68 kg cylinders. The chlorine storage and feed room has a vestibule as well as an eyewash station and chlorine gas detection alarms.

There is no window between the vestibule and the cylinder room.

Chlorine is dosed in a constant flow method to the effluent of the primary clarifiers. The outfall pipe is used for chlorine contact and there currently is not chlorine contact chamber. There is a small chlorine contact chamber providing approximately 30 minutes of detention time at average flow.

6. Anaerobic Digester

Digestion for the primary sludge from the Red Rock Water Pollution Control Plant is provided in a single anaerobic digester. This digester has a sludge recirculation pump for mixing of the digester as well as pumping through a tube in tube sludge heat exchanger.

The digester is a concrete vessel with a concrete roof and no gas storage ability. The gas train consists of a vacuum pressure relief valve with a flame arrestor and another single uncontrolled vent. This gas train does not meet the current CSA B105 M93 requirements for digester gas for several items, including:

- no separate man access hatch – access hatch is combined with the pressure relief vent;
- gas is discharged directly to the atmosphere and is not flared;
- there is a single pressure release vent and current codes require two pressure relief vents;
- the gas piping is constructed of carbon steel.

One of the major issues with the anaerobic digester is that methane gas is discharged directly to the environment and not flared or reused within the process. This retrofit would be difficult for this digester in that the fixed roof does not provide storage of gas to allow the gas to be discharge effectively to a flaring system.

The sludge mixing is provided through a sludge recirculation pump with several discharge points within the digester. This type of mixing system is relatively inefficient and likely negatively affects the digester performance.

The sludge recirculation pump has experienced some corrosion/erosion leakage in the past which is likely a result of grit within the raw sludge as a result of poor grit removal performance.

There is only one sludge heat exchanger and sludge recirculation pump. The Township has a shelf spare pump which can be used if the main recirculation pump fails. However, having one pump and one heat exchanger does affect redundancy. The heat exchanger has evidence of some sludge leakage from the joints and likely requires cleaning to restore its performance.

7. Electrical Systems

There is an MCC as well as a 56 kW (75 hp) standby generator. The MCC was constructed in 1977 and it is likely difficult to obtain spare parts for upgrading the MCC. In addition, the MCC does not have any spare sections for any future upgrades.

8. Control Building

The control building has a small lab and washroom facility, with an office in the digester control building. The lab is approximately 3 m x 3 m and is relatively small for this type of facility, especially given the records and monitoring requirements of current wastewater treatment plants.

9. Instrumentation and Control

The instrumentation and control at the facility includes:

- effluent chlorine residual analyzer; This is measuring chlorine in the potable water coming to the plant.
- paperless chart recorder for chlorine residual and flow; as above potable water
- effluent flowmeter based upon a v-notch weir in the effluent;
- verbatim autodialler for alarms; and
- chlorine gas leak detection.

10. Conclusions

Based upon the evaluation of the existing water pollution control plant, the following conclusions are made:

- The equipment and buildings appear to be in good shape; however, they are 30 years old and are reaching the end of their useful life.
- There is inefficient grit removal which results in grit being carried over into the primary clarifiers, potentially eroding the sludge pumping system and using up digester capacity.
- The bar screen has 25 mm (1 in) spacings which are relatively wide and potentially allow rags and other debris to pass through the screens, resulting in clogging of the raw sewage pumps and potentially the sludge pumping systems, as well as reducing the potential for beneficial reuse of the biosolids.
- The raw sewage wet well results in corrosion of piping in the below grade areas.
- The raw sewage flow control is via a butterfly valve which could be prone to clogging with rags and debris.
- The primary clarifiers have insufficient area to meet current MOE guidelines surface overflow rate.
- The digester gas system does not meet CSA B105 M93 requirements for digester gas systems.
- The digester gas is discharged directly to the atmosphere without flaring or use in other processes.
- The outfall is currently used for chlorine contact; thus, the MOE requirement of a minimum residual of 0.5 mg/L with a 15 minute contact time cannot be verified. Contact tank provides 30 minutes at average flow.

Appendix A List of Equipment

Bar Screen:	Coarse bar screen 25 mm bar spacing
Raw Sewage Pumps:	Quantity: 3 Type: end suction non-clog sewage pumps with shaft drives Nameplate Data Pump No. 1: Manufacturer: Fairbanks Morse 3 hp 865 rpm Rated Capacity: 420 USgpm @ 17 ft TDH Serial No.: K3A1601193 9.75 in impeller Nameplate Data for Pumps No. 2 and 3 were missing
Primary Sludge Pumps:	Quantity: 2 Manufacturer: David Brown Model No. GTH431/3024NA Ratio: 38.44/1 Rpm: 455
Sludge Recirculation Pump:	Manufacturer: Wemco Model No. 464 Rated Capacity: 69 USgpm @18 ft TDH Rpm: 1,170 Serial No. 240CE-5178 Size: 4 x 4
Boiler:	Manufacturer: IBR 480,000 BTUH
Primary Clarifier:	Plastic chain and flygt system
Heat Exchanger	Tube-in-tube type
Standby Generator:	Manufacturer: Cummins Capacity: 75 hp/50 KVA Complete with transfer switch
Chlorine Residual Analyzer:	Manufacturer: Hach CL17 for potable water not sewage effluent

Verbatim Autodialler

Endress and Hauser Paperless Chart Recorder

Wallace and Tiernan Gas Chlorinator

Wallace and Tiernan Chlorine Gas Detector

68 kg Chlorine Gas Cylinder Scale

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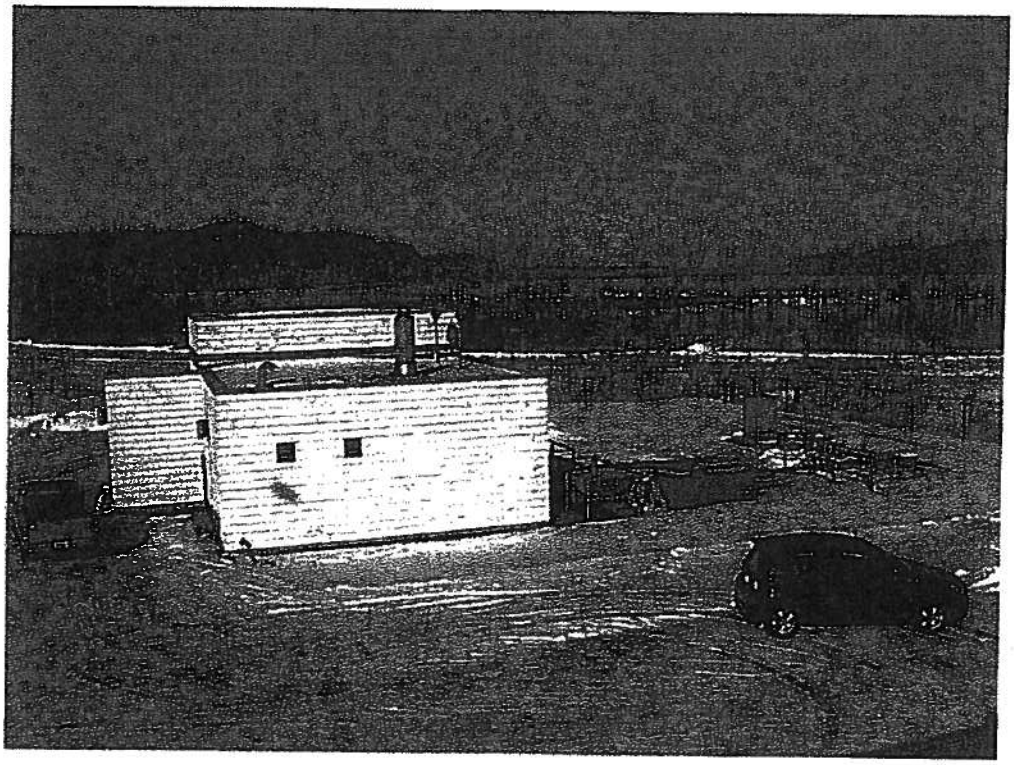
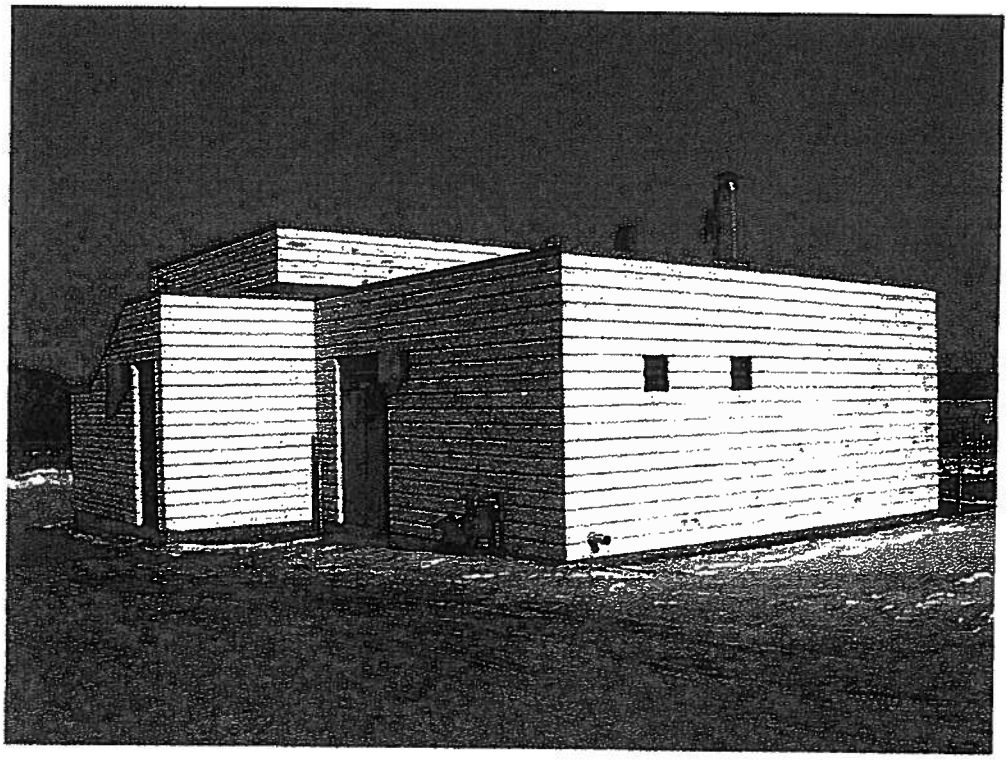
Appendix B

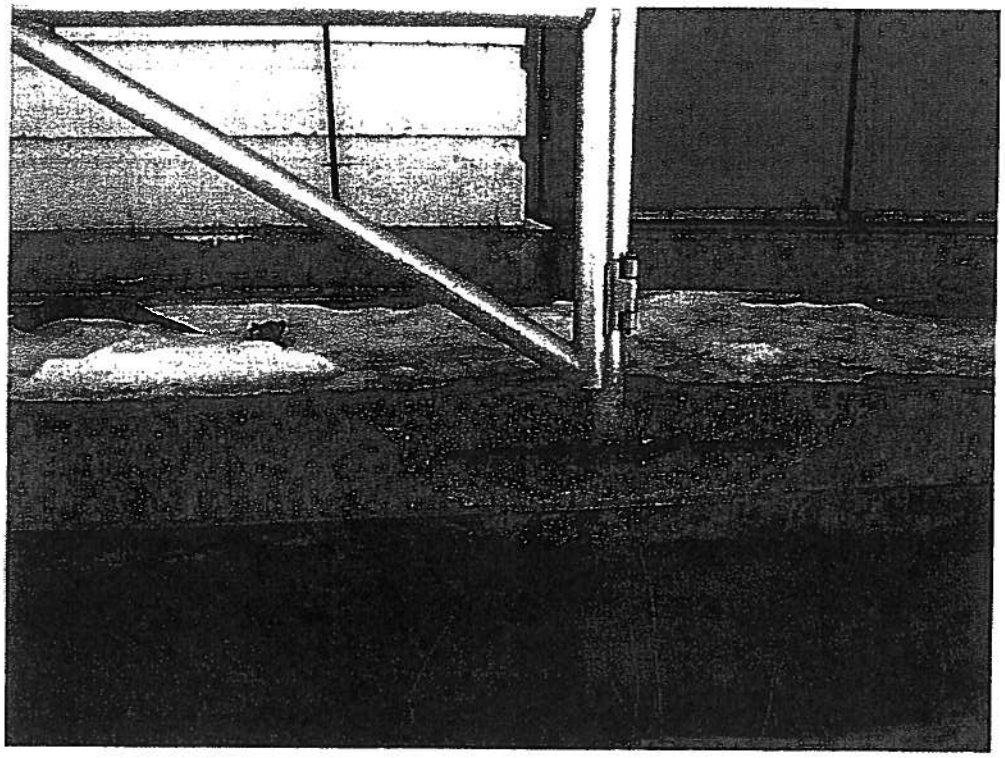
Facility Photographs



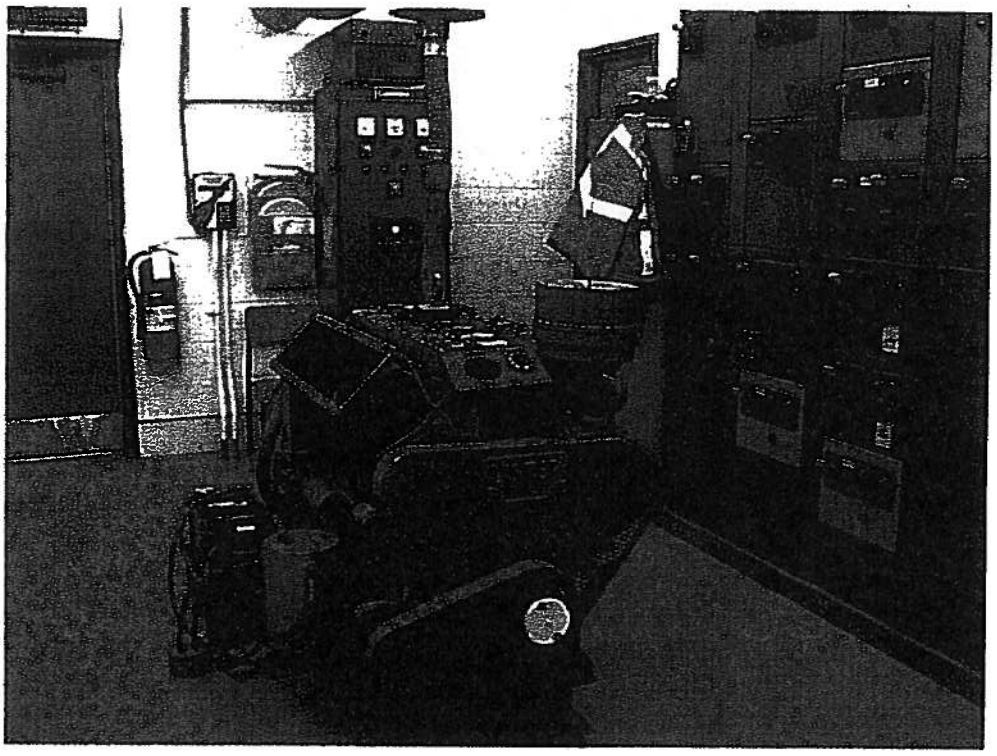
Photograph 1. Control Building and Primary Clarifier



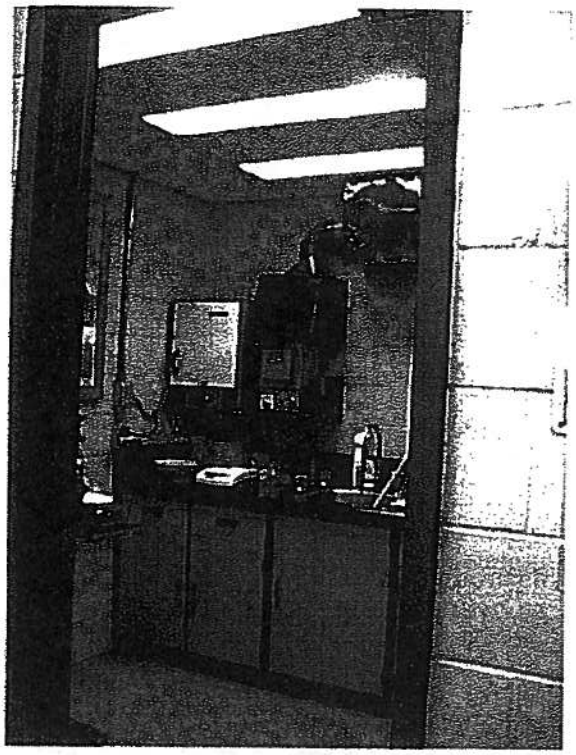
Photograph 2. Control Building



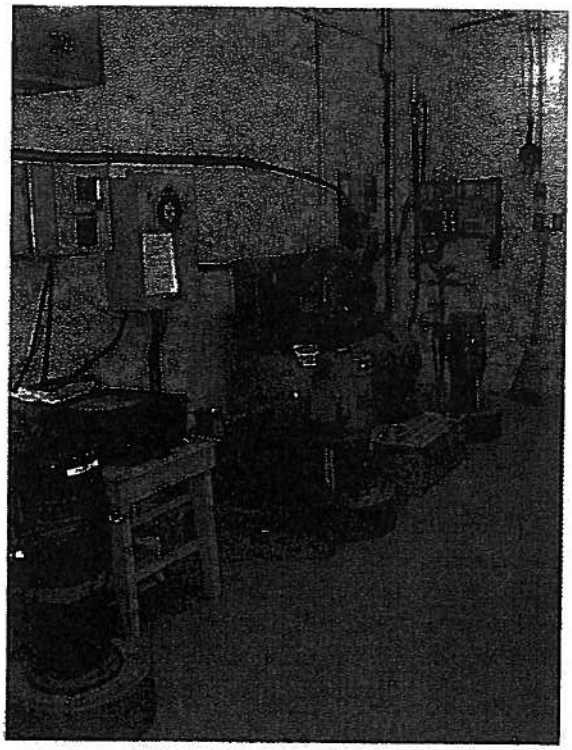
Photograph 3. Spalled Concrete at Handrail



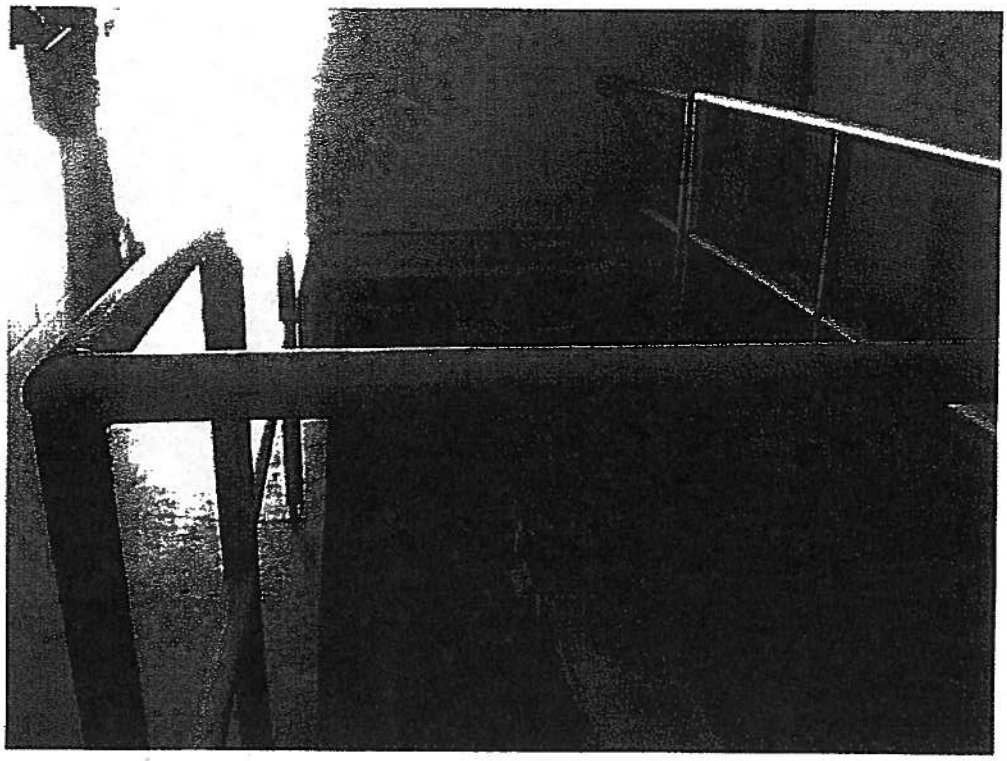
Photograph 4. Standby Generator and MCC



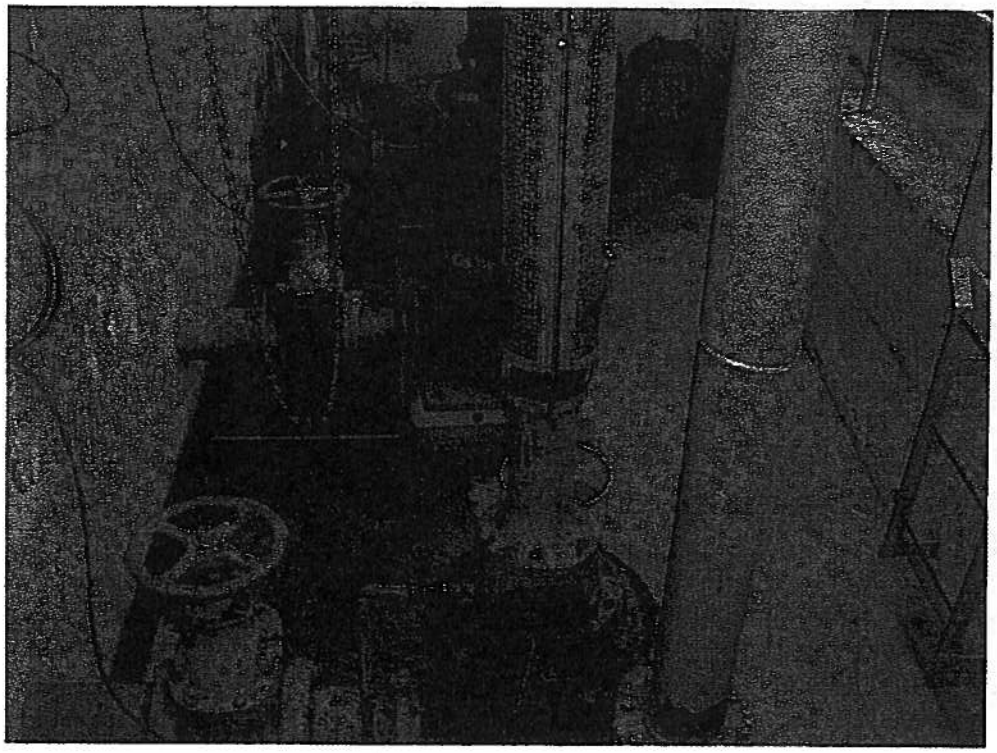
Photograph 5. Laboratory



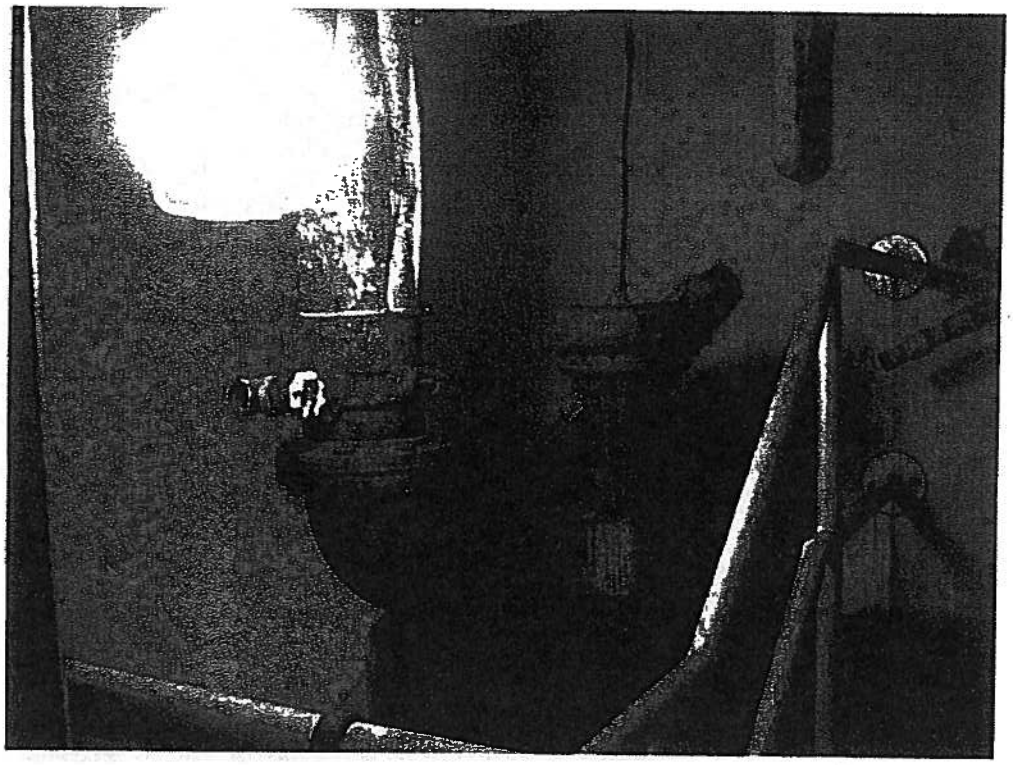
Photograph 6. Compressor, Online Instruments and Raw Sewage Pump Motors



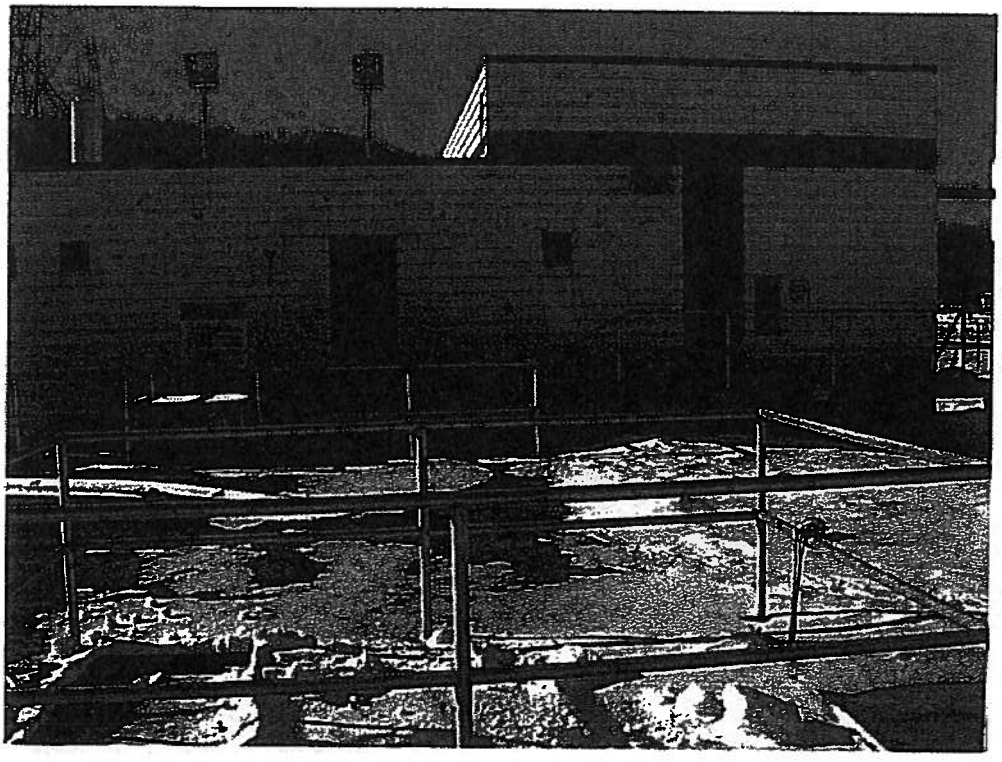
Photograph 7. Grit Channels



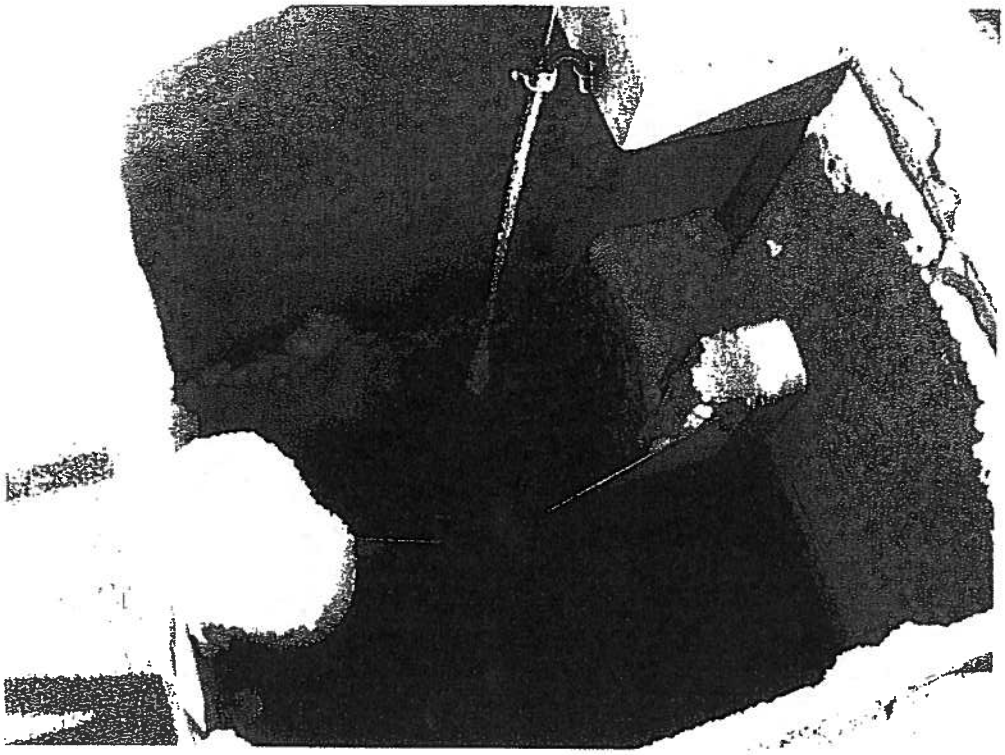
Photograph 8. Raw Sewage Pumps



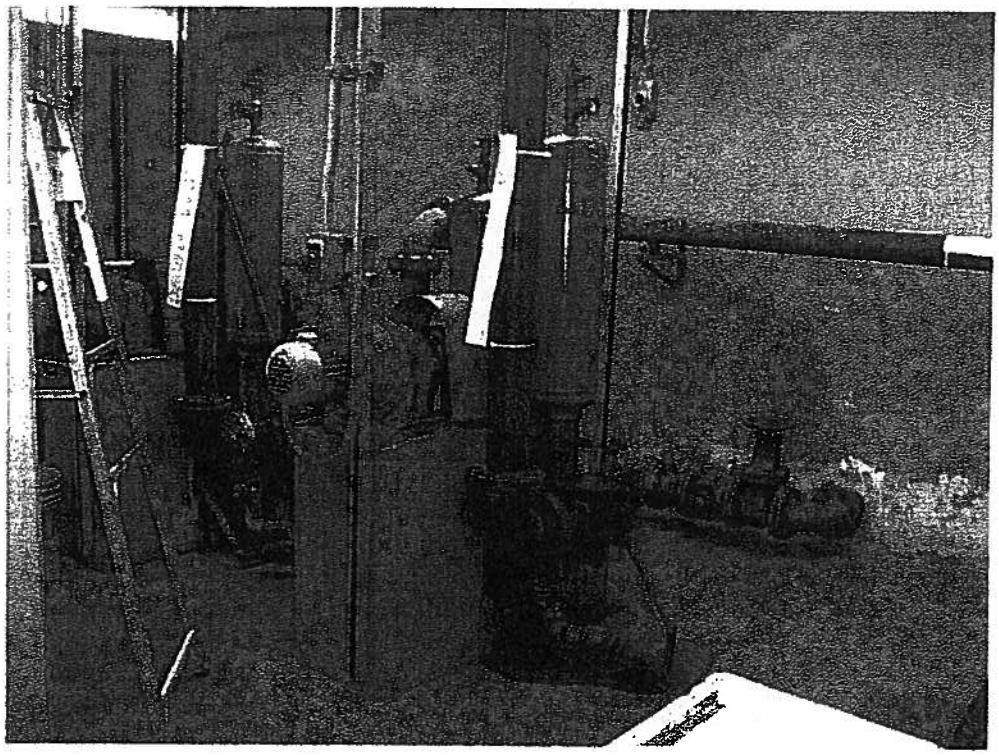
Photograph 9. Raw Sewage Control Valve



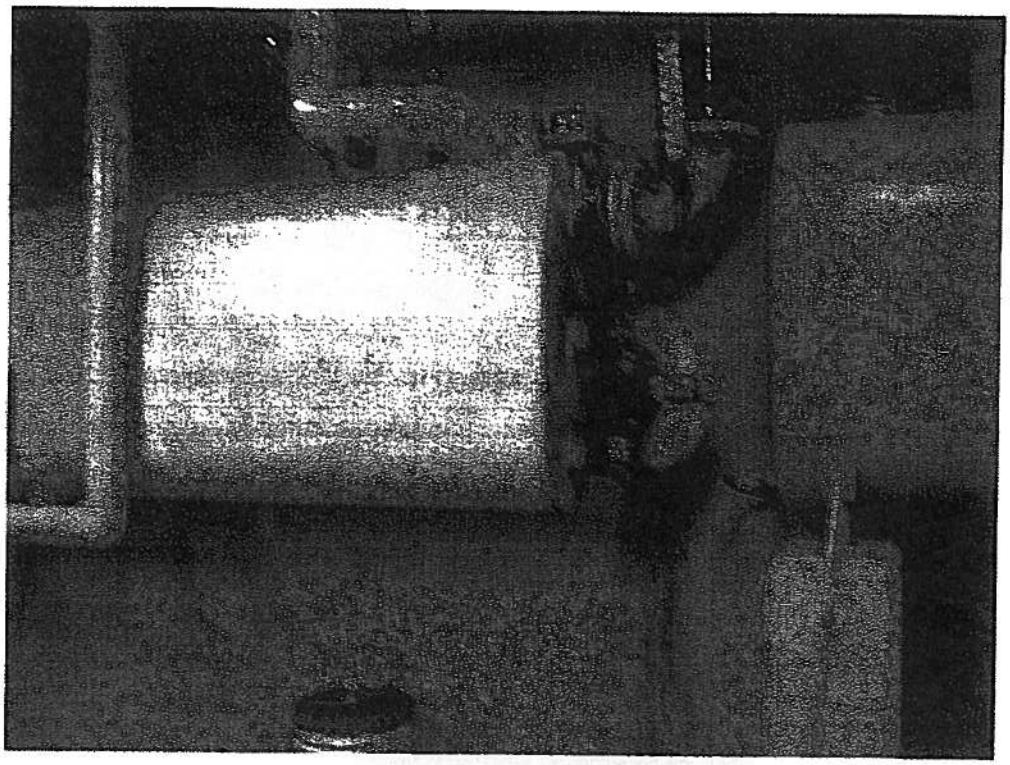
Photograph 10. Primary Clarifiers



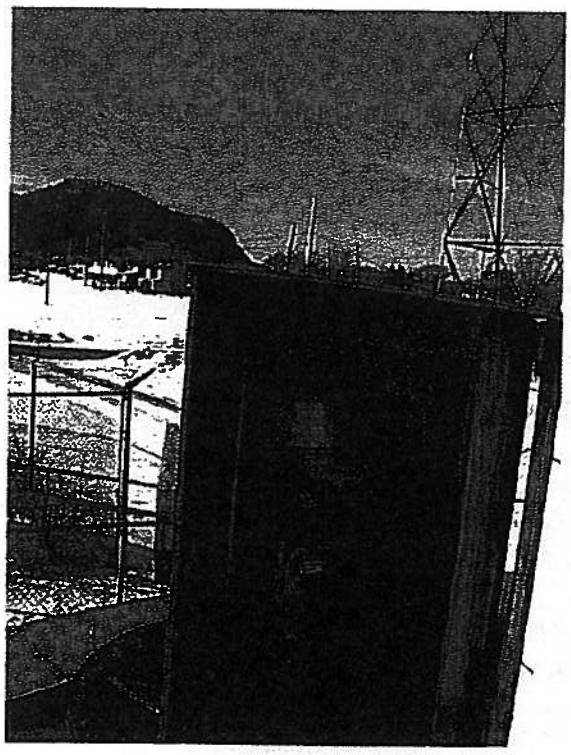
Photograph 11. Effluent Weir



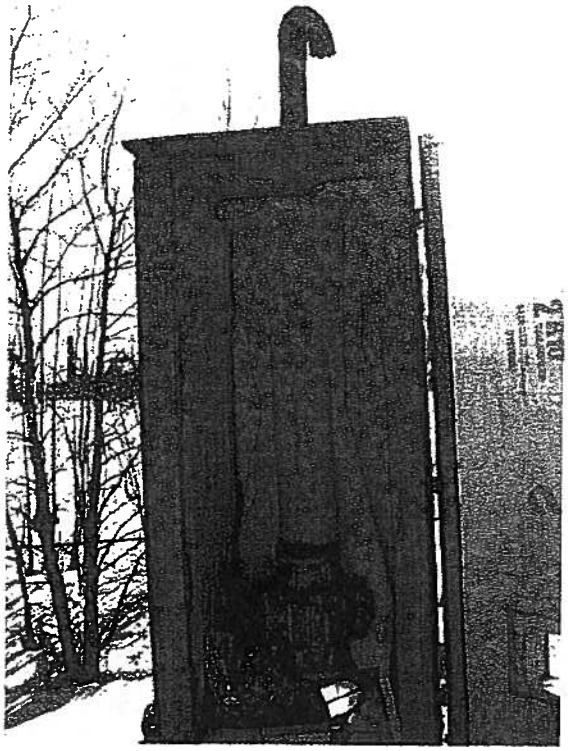
Photograph 12. Raw Sludge Pumps



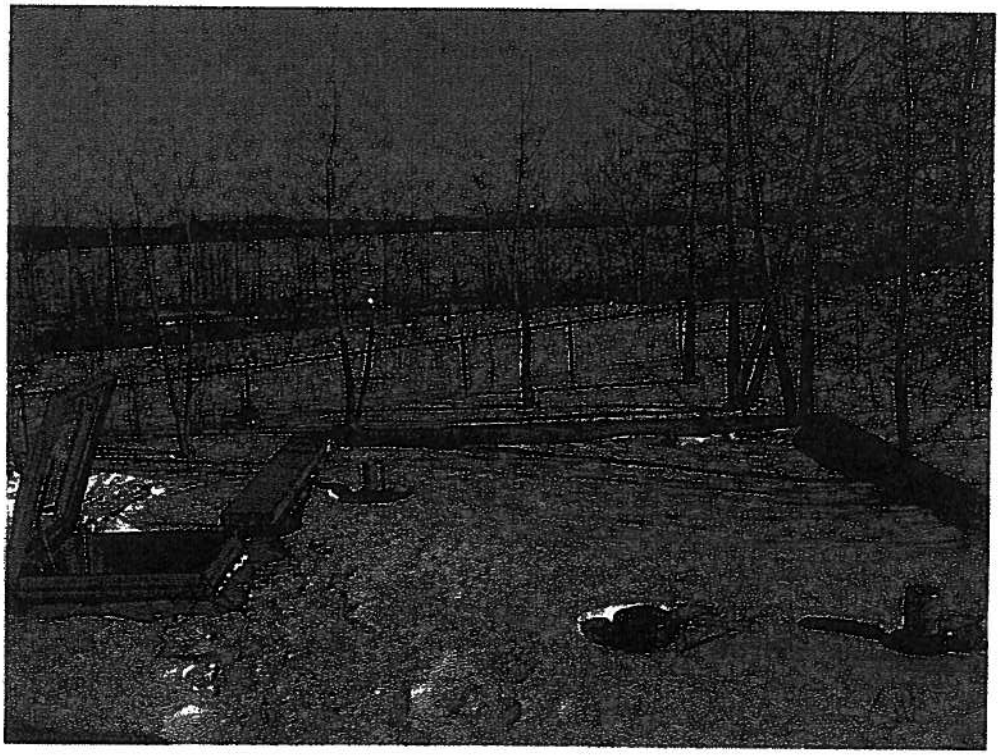
Photograph 14. Sludge Heat Exchanger



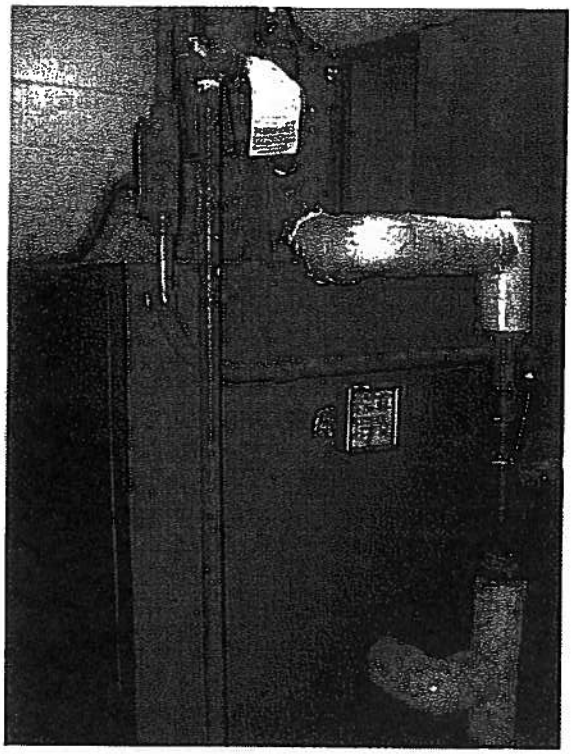
Photograph 15. Digester Relief Valve



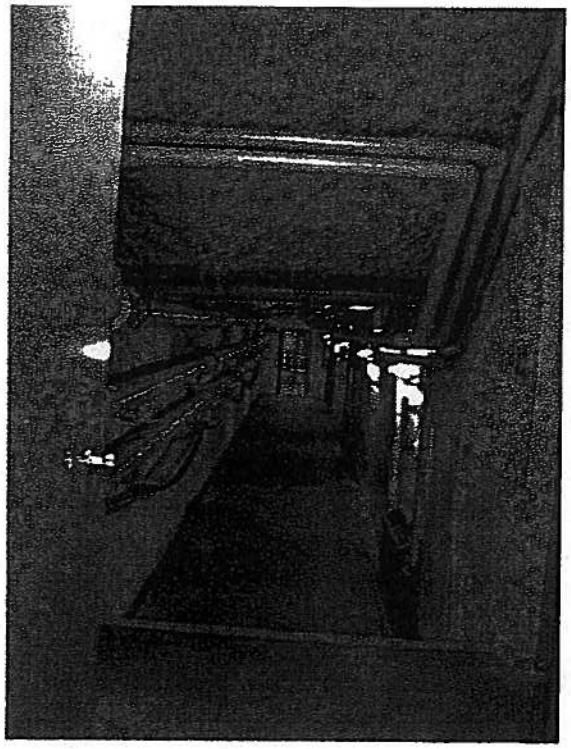
Photograph 16. Digester Gas Vent



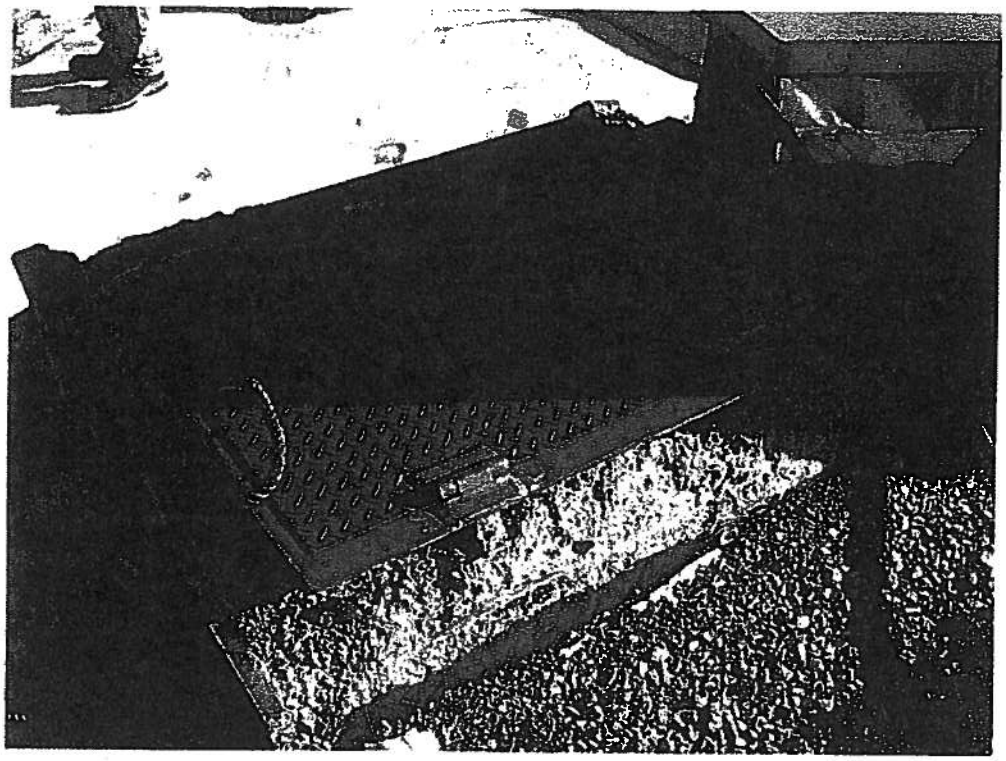
Photograph 17. Digester Control Building Roof and Access



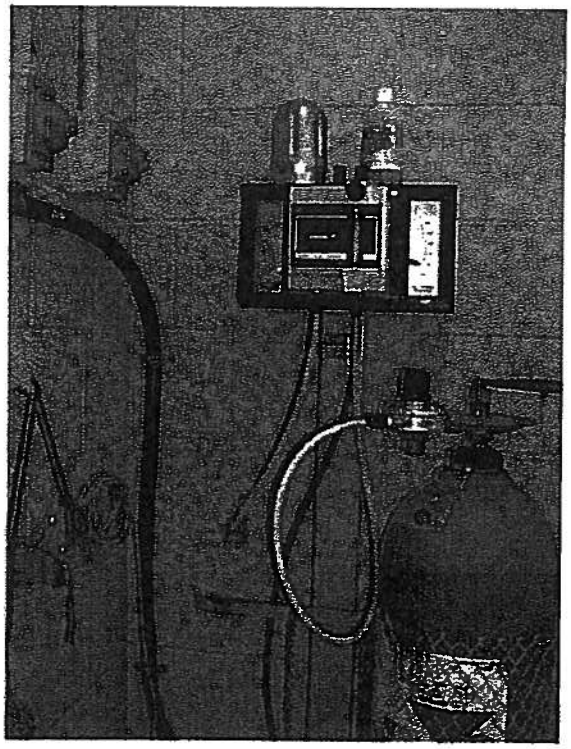
Photograph 18. Boiler



Photograph 19. Tunnel



Photograph 20. Concrete Deterioration on Digester Supernatant Access



Photograph 21. Gas Chlorinator