

# SEWPCC Upgrading/Expansion Preliminary Design Report

## SECTION 6 - BUILDING ENVELOPE / STRUCTURE ASSESSMENT

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## **6.0 Building Envelope / Structure Assessment**

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### **6.1 INTRODUCTION**

Stantec conducted a General Facility Condition Assessment of the South End Water Pollution Control Centre located on Lot #149, St. Mary's Road in South Winnipeg. The assessment was limited to providing a general, non-destructive, walk-through review of the structural and building envelope systems only.

The purpose of the Condition Assessment is to provide information needed to evaluate the current structural and building envelope conditions of the facility and identify current and potential problem areas.

Assessments are based on a visual review of a sampling of building elements for the purpose of identifying major deficiencies. Observations were made only of those areas that were readily accessible during our review.

Areas of concern requiring further investigation are identified in the report. Provision of solutions for noted areas of concern is considered beyond the scope of this report.

### **6.2 SCOPE OF WORK**

The condition assessment of the facility was based upon:

- A review of available construction drawings of buildings and structures contained within the facility.
- Informal discussions with plant staff regarding maintenance history and building performance.
- A visual, non-destructive walk-through review of the facility.

Structural components reviewed generally focused on the condition and performance of the primary structural systems. Deficiencies deemed insignificant to the structural integrity of the structures have generally not been reported.

The Building Envelope review addresses the condition and performance of the building envelope systems required to protect the structure and its interior components from damage due to moisture infiltration, air infiltration, and premature deterioration of building components.

Our scope of work specifically excluded:

- Assessment of mechanical and electrical systems.
- Assessment of process equipment including associated piping, ducting, wiring, etc.

- Items considered part of an ongoing maintenance program, such as painting, damaged finishes, minor concrete repairs, malfunctioning doors, etc. Maintenance items, which were considered safety issues, have been identified.
- Assessments of site features such as roads, curbs, pavements, manholes, etc.
- Environmental assessments.
- Material sampling and testing.
- Verifying operation of systems.
- Inspection of concealed elements, intrusive openings, or opening of system components.
- Confirmation of construction relative to provided documentation.
- Engineering design/analysis.
- Life safety study and Building Code compliance study.

The assessment is based, in part, on information provided by others. Unless specifically noted, we have assumed that this information is correct and have relied on it in developing our conclusions.

It is possible that unexpected conditions may be encountered at the facility, which have not been explored within the scope of this report. Should such an event occur, Stantec should be notified in order that we may determine if modifications to our conclusions are necessary.

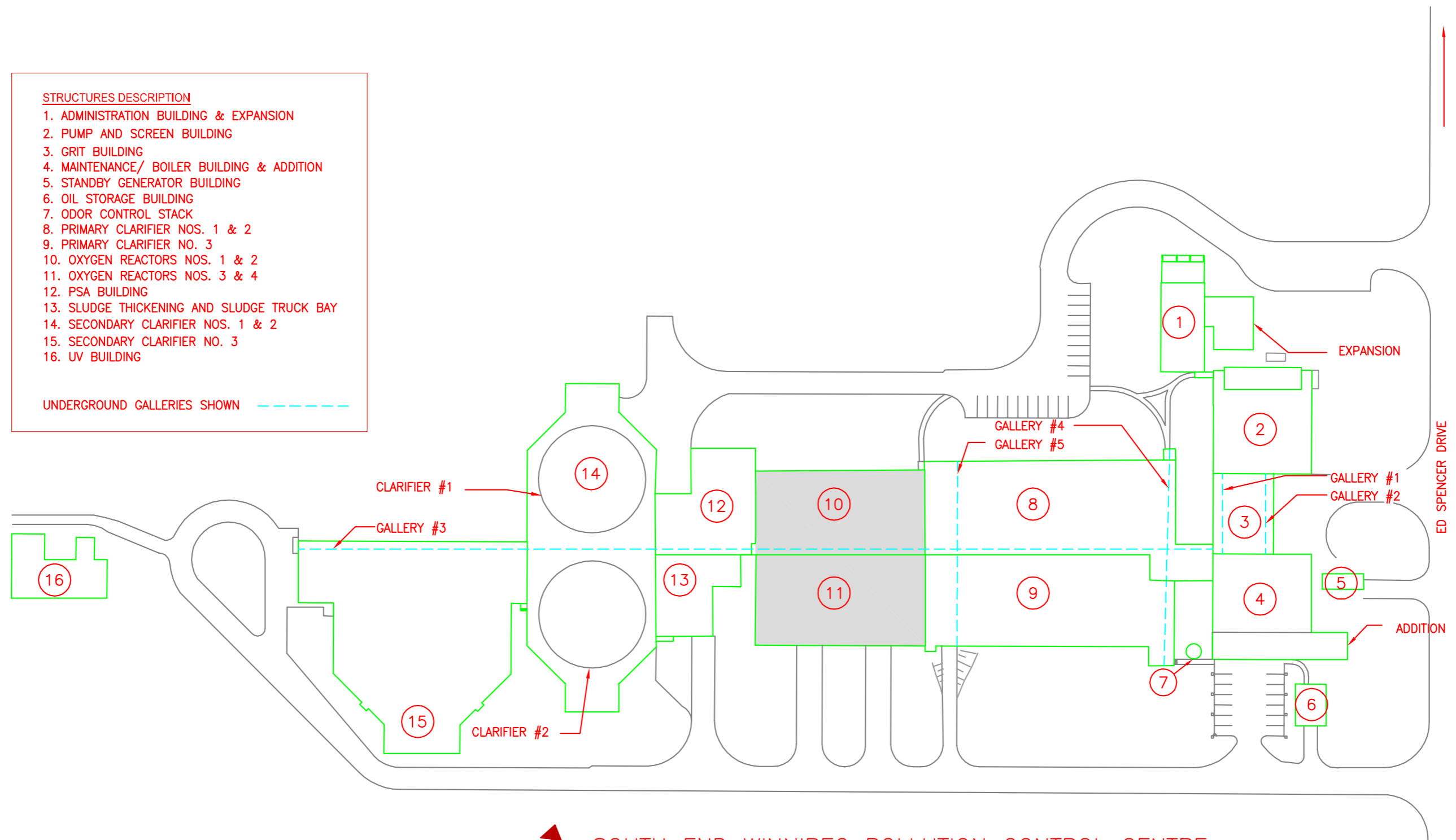
### **6.3 FACILITY ASSESSMENT**

The SEWPCC consists of a number of structures constructed at various times between 1971 and 1998. For the purposes of this report, we have divided the SEWPCC facility into the divisions noted below, with the approximate dates of construction in parenthesis. A site plan indicating location of the building components is included in Figure 6.1. Photographs are included in Appendix C. (Please note that photograph numbers coincide with the corresponding sections, e.g., Photo No. 6.3.1-1 refers to the first photograph for Section 6.3.1.)

- 6.3.1 Administration Building (1971) and Expansion (1990).
- 6.3.2 Pump and Screen Building (1971).
- 6.3.3 Grit Building (1971).
- 6.3.4 Maintenance/Boiler Building (1971) and Addition (1991).
- 6.3.5 Standby Generator Building (1991).
- 6.3.6 Oil Storage Building (1991).
- 6.3.7 Odor Control Stack (1988).
- 6.3.8 Primary Clarifiers Nos. 1 and 2 (1971).
- 6.3.9 Primary Clarifier No. 3 (1989).
- 6.3.10 Oxygen Reactors Nos. 1 and 2 (1971).
- 6.3.11 Oxygen Reactors Nos. 3 and 4 (1990).

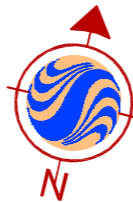
- STRUCTURES DESCRIPTION**
1. ADMINISTRATION BUILDING & EXPANSION
  2. PUMP AND SCREEN BUILDING
  3. GRIT BUILDING
  4. MAINTENANCE/ BOILER BUILDING & ADDITION
  5. STANDBY GENERATOR BUILDING
  6. OIL STORAGE BUILDING
  7. ODOR CONTROL STACK
  8. PRIMARY CLARIFIER NOS. 1 & 2
  9. PRIMARY CLARIFIER NO. 3
  10. OXYGEN REACTORS NOS. 1 & 2
  11. OXYGEN REACTORS NOS. 3 & 4
  12. PSA BUILDING
  13. SLUDGE THICKENING AND SLUDGE TRUCK BAY
  14. SECONDARY CLARIFIER NOS. 1 & 2
  15. SECONDARY CLARIFIER NO. 3
  16. UV BUILDING

UNDERGROUND GALLERIES SHOWN - - - - -



TO PERIMETER HWY

ED SPENCER DRIVE



**SOUTH END WINNIPEG POLLUTION CONTROL CENTRE**  
**SITE PLAN**  
 N.T.S.

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OCT., 2006  
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ORIGINAL SHEET - ANSI B



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Client/Project

SOUTH END WINNIPEG  
 POLLUTION CONTROL CENTRE  
 Figure No.  
 FIGURE 1-SITE PLAN  
 Title  
 SOUTH END WINNIPEG  
 POLLUTION CONTROL CENTRE

- 6.3.12 PSA Building (1971).
- 6.3.13 Sludge Thickening and Sludge Truck Bay (1971).
- 6.3.14 Secondary Clarifiers Nos. 1 and 2 (1971).
- 6.3.15 Secondary Clarifier No. 3 (1990).
- 6.3.16 UV Building (1998).

### **General Comments**

Concrete and concrete coatings of clarifiers, reactors, tanks, chambers, channels, etc. could not be assessed due to contents and/or facility operations. To assess the integrity of these structures, the concrete and coatings should be evaluated when the contents have been removed and/or facility operation temporarily shut down.

Hairline shrinkage cracks in concrete slabs and walls were noted throughout the facility. Signs of moisture migration through the cracks are not yet evident. The cracks should be monitored for signs of continued propagation as part of a regular building maintenance program.

The exterior limestone veneer, which is the predominant exterior finish for most of the facility, has significant discoloration and apparent mould. This suggests moisture migration through the wall system. The type, cause and remediation should be further investigated. The integrity of the membrane and veneer ties should also be evaluated.

In general, the roofing systems of the structures are in various stages of their life spans. It is recommended that a complete audit of the roofing systems be undertaken by a qualified roofing inspection agency.

During the site review, corrosion of various piping and equipment was noted and should be reviewed separately. The flushing water lines are of particular concern.

### **6.3.1 Administration Building and Expansion**

#### **6.3.1.1 Construction**

The Administration Building and the Administration Building Expansion are typically one-storey structures constructed over basement areas. The cast-in-place perimeter basement walls and interior cast-in-place concrete columns are founded on a driven precast concrete pile foundation system. The main floor is framed using a cast-in-place concrete joist and concrete beam system (original) and a cast-in-place concrete flat slab and concrete beam system (expansion).

The roof typically consists of a steel deck on an open-web steel joist framing system. The joists are supported on interior steel beams and steel columns (original) and on concrete block bearing walls along the perimeter (original and expansion).

The building wall envelope typically consists of an insulated masonry cavity wall with a limestone finish.

The flat roof has been constructed utilizing an insulated built-up roofing system.

### **6.3.1.2 Structural Assessment**

- The majority of the primary structural framing members are concealed by wall finishes and ceiling finishes. Reviews of the main floor and roof structure were made at select locations by removing ceiling panels.
- No signs of significant structural distress were noted at the time of the review.
- Minor hairline shrinkage cracks and spalling of concrete was noted at the exterior north entry slab. The spalled concrete requires repair and the cracks should be sealed to prevent future spalling.
- Plant staff has reported water infiltration into the northwest corner of the men's locker room located in the basement. A basement wall expansion joint is located near this corner and may be the source of the leak. Investigation of this joint is recommended to confirm water entry point.

### **6.3.1.3 Building Envelope Assessment**

#### 6.3.1.3.1 Exterior Walls

- See General Comments, Section 6.3, regarding limestone veneer.
- Moisture infiltration was noted at the interior wall construction joint at the ramp to the Grit Building and should be further investigated.

#### 6.3.1.3.2 Exterior Closures

- Exterior caulking at the windows requires replacement at most windows.

#### 6.3.1.3.3 Roofs

- Caulking at the corner parapet flashings should be replaced.

#### 6.3.1.3.4 Interior Conditions

- There is apparent mould on the wall behind the pipes along the north wall of the Laboratory Storage Room.
- Cracking of plaster finish below the window on the west wall requires further investigation in the Waiting Area Room MD122.

#### 6.3.1.3.5 General

- There are numerous stained ceiling tiles throughout the building suggesting past leaks and/or condensation from the roof or pipes within the ceiling space.

## **6.3.2 Pump and Screen Building**

### **6.3.2.1 Construction**

The Pump and Screen Building is a multi-level cast-in-place concrete structure, which extends approximately 60 feet below grade at its deepest portion. Construction drawings suggest that the concrete ring wall forming the wells has been constructed down to rock level. The interior walls and beams of the deep well area are founded on cast-in-place concrete caissons to rock. The shallower basement areas are supported on a precast driven pile foundation system.

The main roof has been constructed using precast concrete double tee sections and is approximately 30 feet above grade. A light steel frame, metal clad, mechanical penthouse has been constructed atop the main roof level.

The building wall envelope typically consists of an insulated masonry cavity wall with a limestone finish.

The flat roof is constructed utilizing an insulated built-up roofing system.

### **6.3.2.2 Structural Assessment**

- The concrete ring wall, as viewed from the dry well, has experienced external water infiltration. The wall is wet in numerous locations and significant efflorescence has taken place. Areas of discolorization due to reinforcing steel corrosion as well as areas of exposed reinforcing steel are evident. Further investigation of the perimeter ring wall is recommended in order to assess the integrity of the concrete and reinforcing steel, and to establish measures to protect/reinforce the wall in order to improve its long-term performance. A program of concrete and reinforcement sampling and analysis will be required.
- The exterior entry slab linking the Pump and Screen Building to the Administration Building has exposed reinforcing steel and requires repair.
- The west concrete stair has exposed reinforcing steel and requires cosmetic repair.
- The concrete coating on the wet well walls appear to be damaged. Spalled concrete requires repair.

### **6.3.2.3 Building Envelope Assessment**

#### **6.3.2.3.1 Exterior Walls**

- See General Comments, Section 6.3, regarding limestone veneer.
- Caulking at windows on the west wall should be replaced.
- The seal in the middle glazing unit on the west wall has failed and should be replaced.



#### 6.3.2.3.2 Exterior Closures

- Water leaks at hatch in elevator machine room requires investigation.

#### 6.3.2.3.3 Roof

- This appears to be the original roof. It has been extensively patched and should be scheduled for replacement.
- Caulking of the flashing at the parapet corners should be redone.

#### 6.3.2.3.4 Interior Conditions

- Loose railings were noted. A general review of railing integrity should be undertaken and repaired as part of an on-going maintenance program.

### 6.3.3 Grit Building

#### 6.3.3.1 Construction

The Grit Building is a single-storey concrete structure featuring two (2) cast-in-place concrete grit tanks extending approximately 21 feet below the ground floor level. Galleries 1 and 2 are located below grade around the grit tanks. Drawings indicating foundation systems were not available for review.

The roof structure consists of precast concrete double tee sections supported on a concrete frame system.

The building wall envelope typically consists of an insulated masonry cavity wall with a limestone finish.

The flat roof is constructed utilizing an insulated built-up roofing system.

#### 6.3.3.2 Structural Assessment

- Hairline cracks in concrete slabs with associated efflorescence stains are evident in the walkways around the grit tanks. The cracks appear to be shrinkage cracks and should be sealed using an epoxy injection system. The concrete slabs should also be tested to determine if the apparent moisture migration has affected structural integrity. A program of concrete and reinforcement sampling and analysis will be required.
- Concrete around the clarifier drain is spalled and requires repair.
- Exposed reinforcing steel in the concrete stair in the Grit Area stair was noted and should be repaired.
- The floor slab in the Grit Bin area is not draining properly and has standing water. This appears to be an inherent design issue. Attempts to improve drainage have been made with limited success. To date this appears to be a functional issue only.

### **6.3.3.3 Building Envelope Assessment**

#### 6.3.3.3.1 Exterior Walls

- See General Comments, Section 6.3, regarding limestone veneer.

#### 6.3.3.3.2 Roof

- The roof is aging and should have a condition report prepared by qualified roofing inspection agency. Some roof patches are 'bubbling' and should be repaired.
- Damaged flashing should be replaced.
- The skylight is cracked and requires replacement.

#### 6.3.3.3.3 Interior Conditions

- A roof leak is suspected in the southeast corner of the Grit Tank Area and should be investigated.
- Loose railings at the stair should be repaired.

### **6.3.4 Maintenance/Service Building**

#### **6.3.4.1 Construction**

The Maintenance/Service Building is a single-storey concrete structure with a mezzanine level. A boiler room is located in the basement. The perimeter basement walls and interior concrete columns are founded on a driven precast concrete foundation system.

The roof structure has been constructed using precast concrete double tee sections supported on a cast-in-place concrete framing system.

The building wall envelope typically consists of an insulated masonry cavity wall with a limestone finish.

An insulated built-up roofing system has been installed atop the flat roof.

#### **6.3.4.2 Structural Assessment**

- Hairline stress cracks were noted on the workshop floor area over a basement column. These cracks appeared old in nature and currently would not be considered structurally significant. Sealing of the cracks would be recommended to prevent wash-water from penetrating the slab.
- Cracks in masonry partition walls in the storage/tool room suggest that the main floor slab may have undergone deflection. Future monitoring of the main floor slab for signs of continued concrete block cracking is recommended.

### **6.3.4.3 Building Envelope Assessment**

#### 6.3.4.3.1 Exterior Walls

- See General Comments, Section 6.3, regarding limestone veneer.

#### 6.3.4.3.2 Roof

- The parapet flashing is rusted in places and should be scheduled for replacement.
- The roof is aging and should have a condition report prepared by a qualified roof inspection agency.

#### 6.3.4.3.3 Interior Conditions

- The door and frame to the southeast exit stair has shifted and is jamming. The door and frame must be replaced. The reason for shifting of the wall is not apparent and should be investigated.

### **6.3.5 Standby Generator Building**

#### **6.3.5.1 Construction**

The Standby Generator Building is a single-storey structure featuring a cast-in-place concrete main floor structural slab and grade beam system on a driven precast concrete pile foundation. An underground link to the Maintenance/Boiler Building is also included.

The roof is framed using precast concrete planks bearing on perimeter concrete block walls.

The exterior walls are typically constructed as insulated masonry cavity walls utilizing limestone veneer.

An insulated built-up roofing system has been installed atop the flat roof framing consisting of sloped concrete topping, rigid insulation, EPDM membrane, rigid insulation, scrim sheet, gravel ballast and pavers.

#### **6.3.5.2 Structural Assessment**

- The structure generally appears to be in good condition with no signs of significant structural distress.
- The stair in the link to the maintenance building is experiencing leaking at a concrete construction joint and should be investigated and repaired.

#### **6.3.5.3 Building Envelope Assessment**

##### 6.3.5.3.1 Exterior Walls

- See General Comments, Section 6.3, regarding limestone veneer.

#### 6.3.5.3.2 Exterior Closures

- No issues.

#### 6.3.5.3.3 Roof

- No issues.

#### 6.3.5.3.4 Interior Conditions

- No issues.

### 6.3.6 Oil Storage Building

#### 6.3.6.1 Construction

The Oil Storage Building is a single-storey structure featuring perimeter concrete grade beams on a cast-in-place concrete friction pile foundation, slab-on-grade floor, and a precast concrete plank roof framing system bearing on perimeter concrete block masonry walls.

The perimeter walls consist of painted concrete block, air barrier, rigid insulation, and prefinished metal cladding. An insulated stucco finish is featured at the base of the building and around the overhead door.

An insulated built-up roofing system has been installed atop the flat roof.

#### 6.3.6.2 Structural Assessment

- The building appears to be in sound structural condition with no significant signs of structural distress.

#### 6.3.6.3 Building Envelope Assessment

##### 6.3.6.3.1 Exterior Walls

- No issues.

##### 6.3.6.3.2 Exterior Closures

- No issues.

##### 6.3.6.3.3 Roof

- No issues.

##### 6.3.6.3.4 Interior Conditions

- No issues.

### **6.3.7 Odor Control Stack**

#### **6.3.7.1 Construction**

The structure for the Odor Control Stack consists of a metal stack constructed on a below grade cast-in-place concrete box structure. The structure is supported on a precast concrete pile foundation system.

#### **6.3.7.2 Structural Assessment**

- The operation of the stack prevented access into the below grade concrete structure. An external review of the structure did not reveal signs of significant structural distress.

#### **6.3.7.3 Building Envelope Assessment**

Not Applicable.

### **6.3.8 Primary Clarifiers Nos. 1 and 2**

#### **6.3.8.1 Construction**

The structure associated with Primary Clarifiers Nos. 1 and 2 is a single-storey concrete structure featuring cast-in-place concrete floor slabs, beams and below grade concrete tanks, channels and galleries. The structure is founded on a driven precast concrete piling system.

The superstructure primarily consists of a cast-in-place concrete frame supporting precast concrete double tee roof sections.

The exterior walls have been constructed as an insulated masonry cavity wall with limestone veneer.

An insulated built-up roofing system has been constructed atop the flat roof framing members.

#### **6.3.8.2 Structural Assessment**

- Hairline concrete cracks have developed along the clarifier walls as seen from the galleries. The crack patterns have both a vertical and horizontal orientation. The horizontal cracks suggest cracking due to bending stresses. The vertical cracks may be attributed to concrete shrinkage. Signs of moisture migration could not be detected. These cracks should be monitored for signs of leakage as part of an on-going maintenance program.
- A double tee roof section located in the fan room is damaged at bearing and requires repair.
- Spalling of concrete at the guardrails around the clarifier tanks should be repaired.
- Exposed reinforcing steel at the base of tank wall is visible in Gallery No. 4 (north). This condition, and similar conditions, should be investigated to confirm the integrity of the concrete wall, and the areas of exposed reinforcing steel should be repaired.

### **6.3.8.3 Building Envelope Assessment**

#### 6.3.8.3.1 Exterior Walls

- See General Comments, Section 6.3, regarding limestone veneer.

#### 6.3.8.3.2 Exterior Closures

- No issues.

#### 6.3.8.3.3 Roof

- No issues.

#### 6.3.8.3.4 Interior Conditions

- Corrosion at the roof drain pipes should be investigated.

### **6.3.9 Primary Clarifier No. 3**

#### **6.3.9.1 Construction**

The structure associated with Primary Clarifier No. 3 is a single-storey concrete structure featuring cast-in-place concrete floor slabs and beams and below grade concrete tanks, channels and gallery sections founded on a driven precast concrete piling system. The structure abuts the south side of the Primary Clarifier Nos. 1 and 2 Structure.

The superstructure primarily consists of a cast-in-place concrete frame supporting precast concrete double tee roof sections.

The roof over the fan room and stairway area at the southeast corner of the structure is framed with a reinforced cast-in-place concrete slab. A steel frame penthouse has been constructed on the southwest corner of the main roof area.

The exterior walls have been constructed using a combination of an insulated metal cladding (north and east) and insulated cavity wall construction with limestone veneer (west) on concrete block back-up walls.

An insulated built-up roofing system has been constructed atop the flat roof framing members.

#### **6.3.9.2 Structural Assessment**

- Hairline concrete cracks have developed along the clarifier walls as seen from the gallery. The crack patterns have both a vertical and horizontal orientation. The horizontal cracks suggest cracking due to bending stresses. The vertical cracks may be attributed to concrete shrinkage. Signs of moisture migration could not be detected. These cracks should be monitored for leakage as part of an on-going maintenance program.
- A section of exterior concrete paving slab requires repair at the southeast corner of the structure.

### **6.3.9.3 Building Envelope Assessment**

#### 6.3.9.3.1 Exterior Walls

- No issues.

#### 6.3.9.3.2 Exterior Closures

- No issues.

#### 6.3.9.3.3 Roof

- No issues.

#### 6.3.9.3.4 Interior Conditions

- No issues.

### **6.3.10 Oxygen Reactors Nos. 1 and 2**

#### **6.3.10.1 Construction**

The structure associated with Oxygen Reactor Nos. 1 and 2 is an underground cast-in-place concrete tank structure founded on a driven precast concrete piling system. Underground Gallery No. 3 runs along the south end of the structure.

The flat reinforced concrete roof of the tank is slightly above grade, waterproofed, insulated and topped with a reinforced concrete paving slab.

#### **6.3.10.2 Structural Assessment**

- The exterior rooftop paving slab, in general, exhibits thermal cracking in numerous areas. The slab is nonstructural but will require cracks to be sealed in order to prevent further deterioration.
- Exposed reinforcing steel along the tank wall is visible in Gallery No. 5 (north). This condition, and similar conditions, should be investigated to confirm the integrity of the concrete wall and the exposed reinforcing steel areas should be repaired.
- The parapet edge generally requires repair and a damaged fence post support location was noticed in one area along the north wall.

#### **6.3.10.3 Building Envelope Assessment**

- Vegetation is forming on the rooftop, suggesting progressive deterioration of the roofing system.

### **6.3.11 Oxygen Reactors Nos. 3 and 4**

#### **6.3.11.1 Construction**

The structure associated with Oxygen Reactors Nos. 3 and 4 is an underground cast-in-place tank structure founded on a driven precast concrete piling system. The structure abuts the gallery to Oxygen Reactors Nos. 1 and 2 along its south side.

The flat reinforced concrete roof of the tank is slightly above grade, waterproofed, insulated and topped with a reinforced concrete paving slab.

#### **6.3.11.2 Structural Assessment**

- The exterior rooftop paving slab, in general, exhibits thermal cracking in numerous areas. The slab is nonstructural but will require cracks to be sealed in order to prevent further deterioration.
- Hairline concrete cracks have developed along the reactor tank walls as seen from Gallery No. 3 and Gallery No. 5 south. The crack patterns have both a vertical and horizontal orientation. The horizontal cracks suggest cracking due to bending stresses. The vertical cracks may be attributed to concrete shrinkage. Signs of moisture migration could not be detected. These cracks should be monitored for signs of leakage as part of an on-going maintenance program.
- Efflorescence was noted at the lower tank wall of Reactor No. 4 in Gallery No. 5 south. This may suggest moisture migration through the wall. Internal wall coatings and the integrity of the concrete and reinforcing steel should be investigated.

#### **6.3.11.3 Building Envelope Assessment**

- Vegetation is forming on the rooftop, suggesting progressive deterioration of the roofing system.

### **6.3.12 PSA Building**

#### **6.3.12.1 Construction**

The PSA Building for the purposes of this report includes the PSA room, UNOX equipment room, blower rooms, compressor room and an electrical room.

The PSA Building is a single-storey concrete structure with a basement. The structure is founded on a driven precast concrete foundation system.

The superstructure is predominantly a reinforced concrete frame supporting precast concrete double tee sections. The double tee roof sections over the compressor room bear on concrete block masonry units.



The exterior wall of the PSA Building is an insulated masonry cavity wall with a limestone veneer. The south face of the compressor room features three (3) large glazing units.

An insulated, built-up roofing system has been constructed atop the flat roof framing members.

### **6.3.12.2 Structural Assessment**

- Horizontal cracks were noted in the exterior wall of the Secondary Blower Room located in the basement. These cracks should be monitored for further propagation.

### **6.3.12.3 Building Envelope Assessment**

#### **6.3.12.3.1 Exterior Walls**

- See General Comments, Section 3.0, regarding limestone veneer.

#### **6.3.12.3.2 Exterior Closures**

- No issues.

#### **6.3.12.3.3 Roof**

- No issues.

#### **6.3.12.3.4 Interior Conditions**

- Past moisture leakage can be noted on the acoustic ceiling panels over the electrical panel boxes. The roof structure should be investigated for possible sources of leakage.

### **6.3.13 Sludge Thickening and Sludge Truck Bay**

#### **6.3.13.1 Construction**

The structures for the Sludge Thickening and Sludge Truck Bay are single-storey structures founded on a driven precast concrete pile foundation system.

The sludge thickening structure is constructed over reinforced concrete tankage, and its superstructure consists of a reinforced concrete frame supporting precast double tee roof sections.

The sludge truck bay floor framing consists of a structural concrete floor slab system supported on grade beams. The superstructure of the sludge truck bay features exterior steel columns and steel roof beams supporting an open web steel roof joist framing system.

The exterior walls of the sludge thickening portion of the structure typically consist of insulated masonry cavity walls with a limestone veneer. The south exterior wall of the truck bay portion is constructed similar to that of the sludge thickening section. The east wall of the truck bay portion is clad using insulated metal paneling.

The flat roofs over both the sludge thickening and sludge truck bay structures feature an insulated built-up roofing system.

**6.3.13.2 Structural Assessment**

- In general, the sludge thickening and sludge truck bay structures appear to be in sound structural condition with no obvious signs of structural distress.

**6.3.13.3 Building Envelope Assessment****6.3.13.3.1 Exterior Walls**

- See General Comments, Section 3.0, regarding limestone veneer.
- Limestone veneer requires repointing along west side.

**6.3.13.3.2 Exterior Closures**

- No issues.

**6.3.13.3.3 Roof**

- Recaulking of the parapet cap flashing corner is required.
- 'Bubbling' in the roof membrane at the south end should be investigated and repaired as required.
- There is damage to the membrane at the pipe supports, which should be investigated and repaired.

**6.3.13.3.4 Interior Conditions**

- No issues.

**6.3.14 Secondary Clarifiers Nos. 1 and 2****6.3.14.1 Construction**

The structure associated with Secondary Clarifiers Nos. 1 and 2 is a single-storey structure featuring two (2) circular, below grade cast-in-place concrete tanks supported on a driven precast concrete pile foundation system. Underground Gallery No. 3 separates the tanks.

The superstructure is constructed as a cast-in-place reinforced concrete frame supporting precast concrete single tee roof framing sections.

The exterior walls are generally constructed as an insulated masonry cavity wall featuring limestone veneer. The fan room at the south end of the structure is metal clad.

An insulated, built-up roofing system has been constructed atop the flat roof over the clarifier tanks.

**6.3.14.2 Structural Assessment**

- The southwest section of the ground level concrete slab around Secondary Clarifier No. 1 is cracked and is delaminating. A hairline cracking pattern coinciding with the reinforcing steel grid is visible. Adequate concrete cover to reinforcing steel is questionable. Cracks also

appear at the underside of the slab. The structural integrity of this slab and all slabs around the clarifiers should be investigated and repaired as required. A program to establish extent of delamination in combination with concrete and reinforcement sampling will be required.

- Steel ties between precast roof sections are not coated. Steel will be susceptible to corrosion. A coating of paint will protect the steel from corrosion.
- Exposed reinforcing steel in the precast concrete double tee roof beams was noted in the southwest corner of the building (Clarifier No. 2). Column stirrups are also exposed in this area. We recommend that a further investigation to confirm the structural integrity of the roof sections and column be performed and that remedial repair be undertaken as required.

### **6.3.14.3 Building Envelope Assessment**

#### 6.3.14.3.1 Exterior Walls

- See General Comments, Section 6.3, regarding limestone veneer.
- The top two (2) courses of limestone below the cap flashing on the west wall and east wall has mortar deterioration and some loose stones. The stone should have the mortar replaced in these areas, and the cause of this deterioration investigated.
- Damaged metal panels on the south end, which should be repaired.

#### 6.3.14.3.2 Exterior Closures

- No issues.

#### 6.3.14.3.3 Roof

- There is some 'bubbling' of the roof membrane at the southwest parapet and in the central roof area. The cause should be investigated and repaired as required.
- The corners of the parapet flashing on the fan house roof should be recaulked – Clarifier No. 2.
- 'Bubbling' of the roof membrane on Clarifier No. 1 should be investigated and repaired as required.
- Cap flashing should be recaulked at the corners.

#### 6.3.14.3.4 Interior Conditions

- Corrosion is noted on the roof drains.

### **6.3.15 Secondary Clarifier No. 3**

#### **6.3.15.1 Construction**

The structure associated with Secondary Clarifier No. 3 is a single-storey concrete structure with a basement/gallery area and an open circular tank, which extends below grade. The structure is supported on a driven precast concrete pile foundation system.

The superstructure consists of a cast-in-place reinforced concrete frame supporting a roof framing system comprised of a combination of cast-in-place reinforced concrete slabs, precast concrete planks, and precast concrete double tee sections (over tank).

The exterior walls are constructed using insulated metal cladding (south and southeast) and insulated masonry cavity walls with a limestone veneer (west and north).

An insulated, built-up roofing system has been constructed atop the flat roof framing system.

### **6.3.15.2 Structural Assessment**

- Maintenance staff indicated that external leakage has been occurring at the northwest corner of the basement wall of Gallery No. 3. It is believed that the leakage is occurring at a pipe penetration through the concrete wall. It is our understanding that the plant staff is currently in the process of repairing the leak.
- A section of handrailing at the north exit requires repair.

### **6.3.15.3 Building Envelope Assessment**

#### 6.3.15.3.1 Exterior Walls

- No issues.

#### 6.3.15.3.2 Exterior Closures

- No issues.

#### 6.3.15.3.3 Roof

- The parapet cap flashing should be recaulked at the corners.
- Caulking of flashing should be redone where deteriorated.

#### 6.3.15.3.4 Interior Conditions

- The concrete block wall at the southwest stairwell (ground floor level) has cracked. This condition should be monitored for signs of continued cracking.
- There is a loose grating on the north side catwalk, which requires repair.

### **6.3.16 UV Building**

#### **6.3.16.1 Construction**

The UV Building is a single-storey structure constructed over cast-in-place, concrete chambers. The structure is supported on a driven precast concrete piling system.

The superstructure consists of perimeter masonry bearing walls supporting a clear span open web steel joist roof framing system.

The exterior walls are constructed as an insulated masonry cavity wall with limestone veneer.

An insulated, built-up roofing system has been constructed atop the roof framing system.

**6.3.16.2 Structural Assessment**

- In general, the UV Building appears to be in very good structural condition with no signs of obvious structural distress.

**6.3.16.3 Building Envelope Assessment**

**6.3.16.4 Exterior Walls**

- No issues.

**6.3.16.4.1 Exterior Closures**

- The exit door is jamming and should be corrected.

**6.3.16.4.2 Roof**

- Some roof ballast is missing from the roof membrane and should be replaced.

**6.3.16.4.3 Interior Conditions**

- It has been reported by Operations personnel that high interior humidity conditions in the winter has caused “freeze-up” at the entrance door. This condition requires further investigation. Continued moisture migration through the exterior walls may affect the building envelope.

**6.4 SUMMARY**

The following tables summarize the observations noted in the report. The items have been categorized as follows:

**Table 6.1 – Description Used to Categorize Structural Components**

<b>Category</b>	<b>Description</b>
1	Item requires further investigation to determine extent of repair required. Immediate action is recommended.
2	Item requires further investigation to determine extent of repair required.
3	Item requires further investigation, which may lead to repair work.
4	Item requires repair or monitoring that is considered to be a part of an on-going maintenance program.
5	Item is optional – cosmetic repair required.

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**6.4.1 Structural Assessment Summary**

**Table 6.2 – Structural Assessment Summary**

<b>Reference Location</b>	<b>Report Section</b>	<b>Item</b>	<b>Category</b>	<b>Recommended Action</b>
General	6.3.0	Corroded piping, especially flushing water line.	1	Investigate extent of corrosion and repair as required.
		Concrete and concrete coatings for clarifiers, reactors, channels, chambers, etc. unavailable for review at time of assessment.	3	Investigate integrity of concrete and concrete coatings upon removal of contents and/or temporary suspension of operations.
Administration Building and Expansion	6.3.1.2	Water infiltration through basement wall in men’s locker room.	2	Investigate performance of expansion joint in wall.
		Hairline cracks and spalled concrete at north entry slab.	4	Repair concrete as required.
Pump and Screen Building	6.3.2.2	Efflorescence and exposed reinforcing steel in below grade ring wall.	2	Investigate integrity of concrete and reinforcing steel and repair as required.
		Exposed reinforcing steel at exterior entry slab.	4	Repair concrete as required.
		Spalled concrete on wet well walls.	4	Repair Concrete as required.
		Exposed reinforcing steel at west stair.	5	Cosmetic concrete repair required.
Grit Building	6.3.3.2	Efflorescence through hairline cracks in concrete walkways around clarifiers at ground level.	1	Investigate integrity of concrete and reinforcing steel.
		Spalled concrete at drain.	4	Repair concrete as required.
		Exposed reinforcing steel at Grit Area stair.	5	Cosmetic concrete repair required.
Maintenance/Service Building	6.3.4.2	Hairline cracks on workshop floor.	4	Seal floor and monitor cracks for further propagation.
Standby Generator Building	6.3.5.2	Leak in basement wall at stair to Maintenance Building.	2	Investigate and repair as required.
Primary Clarifiers	6.3.8.2 and 6.3.9.2	Horizontal and vertical hairline cracks in clarifier walls as visible from gallery.	4	Monitor cracks for moisture migration..

Reference Location	Report Section	Item	Category	Recommended Action
	6.3.8.2	Exposed reinforcing steel at base of concrete tank.	2	Investigate integrity of the concrete wall and repair as required.
		Damaged precast roof section in fan room.	4	Concrete repair required.
		Spalled concrete at guardrails around clarifier tanks.	4	Repair concrete as required.
	6.3.9.2	Damaged exterior concrete paving slab at southeast corner.	4	Repair concrete as required.
Oxygen Reactors	6.3.10.2 and 6.3.11.2	Wall cracks and exposed reinforcing in concrete tank walls.	2	Investigate integrity of the concrete wall and repair as required.
	6.3.10.2 and 6.3.11.2	Thermal cracks in rooftop paving slabs.	5	Cosmetic concrete repair required.
	6.3.10.2	Damaged parapet and fence anchorage.	4	Repair concrete as required.
	6.3.12.2	Horizontal cracks in exterior wall of secondary blower room.	4	Monitor cracks for further propagation.
Secondary Clarifier Nos. 1 and 2	6.3.14.2	Delamination of concrete and concrete apron noted at northeast corner of Clarifier No. 2.	1	Investigate integrity of all concrete aprons and repair as required.
		Exposed reinforcing steel in precast concrete double tee roof sections and column (south end).	2	Investigate integrity of beams and column and repair as required.
		Uncoated steel ties between precast concrete roof sections.	4	Apply protective coating to steel to protect against corrosion.
Secondary Clarifier No. 3	6.3.15.2	Damaged handrail at north exit.	4	Repair handrail as required.

**6.4.2 Building Envelope Assessment Summary**

Reference Location	Report Section	Item	Category	Recommended Action
Facility Assessment General Comments	6.3.0	Exterior limestone veneer has major discoloration and apparent mold.	2	The type, cause and remediation should be investigated. The integrity of the membrane and veneer ties should also be evaluated.
		Roofing system audit.	2	Roof Inspection Agency to assess condition of all roofing systems and recommend remedial action required.
Administration Building and Expansion	6.3.1.3.1	Moisture infiltration at construction joint at ramp to Grit Building.	2	Investigate source of leak and repair as required.
	6.3.1.3.3	Caulking at the parapet flashing corners has deteriorated.	4	Remove and replace the caulking at the parapet flashings.
	6.3.1.3.4	Apparent mold on the wall behind a pipe in the laboratory storage room.	2	Investigate the type of mold and cause of formation.
		Cracking of plaster finish below window in Waiting Room M0122	4	Investigate cause of noted damage and repair as required.
	6.3.1.3.5	Numerous stained ceiling tiles were noted throughout the building.	4	An investigation should be undertaken as to whether these stained tiles are the result of active leaks.
Pump and Screen Building	6.3.2.3.1	Deteriorated window caulking along west wall.	4	Replace caulking.
		Failed seal in glazing unit along west wall.	4	Replace window.
	6.3.2.3.2	Water leaks are noted around the hatch in the elevator machine room.	2	The source of the leaks requires investigation.
		The roof has been extensively patched.	2	See report Section 3.0.
	6.3.2.3.4	The caulking of the parapet flashing corners is deteriorated.	4	The flashing caulking should be removed and replaced.
Loose railings.		4	Secure loose railings.	
Grit Building	6.3.3.3.2	Aging roof system.	2	See report Section 3.0.
		Damaged parapet flashing was noted.	4	Damaged flashing should be replaced.
		Bubbling of roof patches were noted.	4	The roof patches should be repaired.
		The skylight is cracked.	4	The skylight should be replaced.
	6.3.3.3.3	A roof leak is suspected in the southeast corner of the Grit Tank area.	2	Investigation of this area of the roof should be undertaken.



Reference Location	Report Section	Item	Category	Recommended Action
		Loose railings at stair.	4	Secure railings.
Maintenance/Service Building	6.3.4.3.2	Rusting parapet flashing was noted.	4	The flashing should be scheduled for replacement.
		Aging roofing system.	2	See report Section 3.0.
	6.3.4.3.3	Door jamming at southeast stair.	4	Replace door and jamb.
Primary Clarifiers Nos. 1 and 2	6.3.8.3.4	Corrosion was noted at the roof drain pipes.	2	The corrosion of these pipes should be investigated.
Oxygen Reactors	6.3.10.3 and 6.3.11.3	Vegetation is forming on the rooftop.	2	An investigation should be undertaken to determine the extent of deterioration of roofing system.
PSA Building	6.3.12.3.4	Past moisture leakage was noted on the acoustic ceiling panels over the electrical panel.	1	The roof structure should be investigated as to the source of the leak and repaired as required.
Sludge Thickening and Sludge Truck Bay	6.3.13.3.1	Repoint masonry along west side.	4	Masonry repair required.
	6.3.13.3.3	Caulking on roof parapet flashing has deteriorated.	4	Remove and replace the roof parapet flashing caulking.
		Bubbling was noted in the membrane at the south end of the roof.	2	See report Section 3.0.
		There was damage noted to the roof membrane at the pipe supports.	2	See report Section 3.0.
Secondary Clarifiers Nos. 1 and 2	6.3.14.3.1	The top two courses of limestone on the wet and east walls are loose in places.	2	The stones should have the mortar replaced in these areas and the cause of this condition should be investigated.
		Damaged metal cladding.	4	Repair damaged cladding.
	6.3.14.3.3	Bubbling was noted in the membrane at the southwest and central roof areas.	2	See report Section 3.0.
		Caulking on the roof parapet has deteriorated.	4	Remove and replace the roof parapet caulking.
		Deteriorated cap flashing at corners.	4	Repair cap flashings as required.
	6.3.14.3.4	Corrosion was noted at the roof drain pipes.	2	The corrosion at these pipes should be investigated.

Reference Location	Report Section	Item	Category	Recommended Action
Secondary Clarifier No. 3	6.3.15.3.3	Caulking on the roof parapet flashing has deteriorated.	4	Remove and replace the roof parapet flashing and caulking where required.
	6.3.15.3.4	Loose grating on north side catwalk.	4	Repair and secure grating.
		Cracked concrete wall at ground floor of southwest stairwell.	5	Cosmetic repair required and monitor for continued crack propagation.
UV Building	6.3.16.3.2	Exit door jamming.	4	Repair as required.
	3.16.3.3	Roof ballast is missing from the roof membrane.	4	Replace the missing roof ballast.
	3.16.3.4	High interior moisture condition	4	Further investigation required.