The City of Winnipeg
Water And Waste Department

FLOOD PUMPING STATION CONDITION ASSESSMENT

APPENDIX B16
JESSIE FLOOD PUMPING STATION - FINAL REPORT
DECEMBER 2006

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

SUMMARY

The Jessie Flood Pump Station (FPS) is located in an industrial area at the end of Jessie Avenue west side of the Red River. The station superstructure is a medium sized 77 m^2 building with a 21 m^2 metal clad area on the south side which until 2004 contained Manitoba Hydro's electrical equipment. The building structure consists of loadbearing brick walls, and a flat concrete slab roof supported by steel beams. The exterior brick wall finish is painted due to a chronic graffiti problem. The building appears to be as originally constructed in 1954 and is generally in good condition.

There are three separately coupled, overhung impeller centrifugal pumps installed in the FPS drywell (P105 – 24", 175HP, P106 – 30", 250HP, P107 – 30", 250HP). This station is serviced with a drywell electric resistance unit heater and drywell pressurization fan. There is, however, no main floor cooling fan. Several mechanical upgrades are recommended for this FPS over the next 10 years. A new drywell ventilation system and a main floor cooling fan system are proposed for this FPS. Converting sections of this station's shaft seal water lines from Copper to PVC and replacing the line's valves is also recommended. A new corrosion and wear-resistant coating system is proposed for the drywell's pumps, piping and lineshafts. This station will also benefit from a proposed on-going Ultrasonic Test Program (UTP) and a Vibration Testing/Thermal Scanning Program.

The Jessie Avenue FPS is classified as having a low risk of failure. Extensive riverbank stabilization works are in place at the site and there was no visual evidence of active overall slope instability at the station. An extensive limestone riprap erosion protection blanket is in place along the shoreline and at the time of the inspection the rock appeared to be sound and intact however some degradation of the stone should be anticipated during the remaining life of the station. Additional slope inclinometer monitoring and potential future upgrading of the riprap erosion protection is recommended at this site. A detailed visual inspection of riverbank stability conditions, internal inspection of the outfall pipe, and monitoring of the existing slope inclinometers and piezometers should be performed at the site.

The station substructure appears to be as originally constructed in 1954 and is generally in a good condition. The dry well floor condition is fair while the pump bases are in a good/fair

condition. The discharge box walls, floor and roof are in a good condition. The flap gate was installed in 1998 (new flap on the existing slide thimble) and is in a good condition. The slide gate & thimble were relocated in 1998 (re-used original 1954 gate) and is in a poor condition. The gate chamber concrete is in good condition. There are some silt and mud deposits at the bottom of the gate chamber.

The recommended upgrades and their estimated costs have been compiled by discipline; Building and Site, Mechanical, Geotechnical, Sub-Structure & Gates and Electrical. All of the costs shown are in 2005 dollars and have not been adjusted for price escalation during the upgrade program (i.e. the 11 to 50 year cost estimates are still in 2005 dollars). These estimates include engineering, administration and contingencies. The recommended upgrades have been prioritized by the following categories:

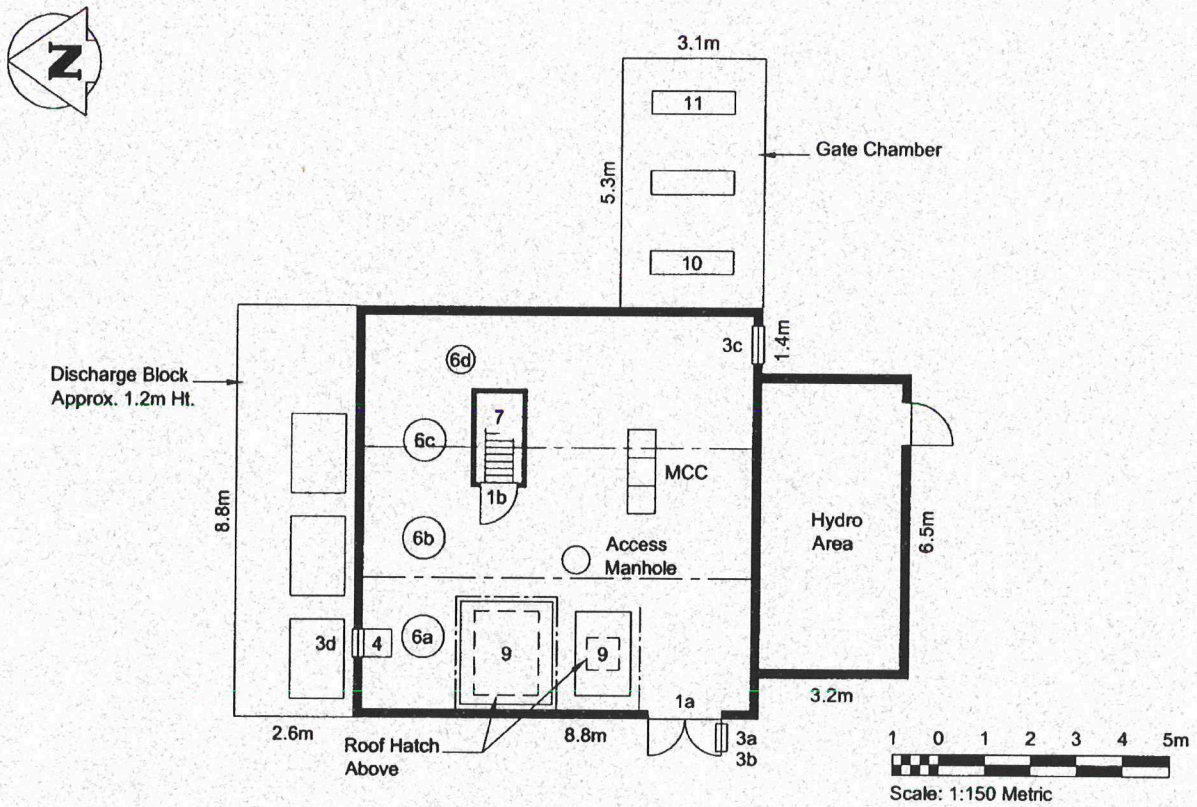
- 0 to 5 year implementation
- 6 to 10 year implementation
- Future upgrades (i.e. 11 to 50 years)

Total estimated costs for this station are as follows:

- 10 year $320,180
- 11 to 50 year $432,460

KEY STATION DATA

BUILDING PLAN



JESSIE FLOOD PUMP STATION SITE INSPECTION
KEY STATION DATA

ITEM DESCRIPTION	ITEM NO.	WIDTH (mm)	HEIGHT (mm)	COMMENTS
Station Data				
Door	1a	1650	2030	2 Leafs
	1b	670	1800	
	1c	-		
Window	2a	-		
	2b	-		
	2c	-		
Louver / Vent	3a	600	200	Mounted in door
	3b	600	200	Mounted in door
	3c	920	600	
	3d	400	600	
	3e	-		
	3f	-		
	3g	-		
Fan (Dry Well)	4	-		Dry well ventilation rate – estimated at 1 100 cfm or 6 air changes per hour.

ITEM DESCRIPTION	ITEM NO.	WIDTH (mm)	HEIGHT (mm)	COMMENTS
Station Data				
Fan (Main Floor Cooling)	5	-		None
Flood Pump Inventory	6a	-		P105 – 24", 175 HP
	6b	-		P106 – 30", 250 HP
	6c	-		P107 – 30", 250 HP
Stair	7	-		Steep, low rails
Ladder	8	-		
Floor Hatch	9	-		2000 x 2200 Main Hatch (precast concrete) 1200 x 1800 Secondary Hatch (wood)
Flap Gate	10	1829	2134	(cast iron)
Slide Gate	11	1829	2134	(cast iron)
Level Control System	12			Ultrasonic
Other Relevant Data				
Year Built				1954
Modifications				Gates + Chamber Modified 1998, Riverbank Stabilization. 1991
Location				End of Jessie Avenue
Tributary				Red River
Building Area				78 sq m (840 sq. ft)
Wall Framing				Load Bearing Brick
Wall Finish (exterior)				Painted Brick
Roof Framing				Concrete Slab & Steel Beams
Roof Slope				Flat
Roofing Type				Felt & Gravel Built-up roof
Windows				None
Renovation Status				Original
Vandalism (type & frequency)				Graffiti – frequently
Substructure				Rectangular drywell, 2 levels of concrete beams, 1 beam per level
Discharge Stoplogs (present, elev.)				None present
Pipes – Outfall Pipe		2130 mm diameter		
Pipes – FPS Pipe				Combined with sewer outfall
Geotechnical Assessment Rating				Low risk of failure
River Meander Pattern				Outside bend
Bank Slope				(Graded) 6H:1V
Surface Drainage				Positive
Existing Bank Works				6 m wide rockfill shear key and riprap blanket
Erosion Conditions				None within limits of riprap
Bank Stability Condition				No evidence of overall instability at FPS

*Sanitary and Flood Pump Structures are not physically linked

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1.0 INTRODUCTION

The Jessie Flood Pump Station (FPS) is located in an industrial area at the end of Jessie Avenue west side of the Red River. The Photos (as referenced throughout this report) can be found in each of the Annexes section, by department, at the end of this report. A building plan, site location plan and station isometric are provided in the summary section of this report, pages iii, v, and vi respectively.

The station superstructure is a medium sized 77 m^2 building with a 21 m^2 metal clad area on the south side which until 2004 contained Manitoba Hydro's electrical equipment (Photo A16-1). The building structure consists of loadbearing brick walls, and a flat concrete slab roof supported by steel beams (Photo A16-5). The exterior wall finish is brick. The exterior face of the brick is painted due to a chronic graffiti problem (Photo A16-3). The interior wall surfaces are unfinished brick. The entry door is a solid core wood unit in a wood frame. There are no windows in this station. The roofing is an aged felt and gravel built-up roof with painted galvanized metal trim. The station building is not insulated.

Jessie FPS is a typical Flood Pumping Station complete with three separately coupled, overhung impeller centrifugal pumps installed in its drywell (P105 - 24", 175HP, P106 - 30", 250HP, P107 - 30", 250HP). The station is serviced with a drywell electric resistance construction heater and drywell pressurization fan. This is not a combination sewage / flood pumping station, rather Jessie sewage pumping station is located separate from the FPS but on the same city street right-of-way.

This station is located along an outside bend on the west bank of the Red River. The overall riverbank slopes down at approximately 6H:1V from the top of bank area down to the Regulated Summer River Level (RSRL). There were two existing slope inclinometers located along the lower bank area. These were installed by KGS Group in 1993.

The substructure consists of a formed concrete wet well, dry well and discharge box. The rectangular dry well is 10.7 m in depth and has a relatively large footprint area of 43 m^2. Immediately downstream of the station is a concrete gate chamber which houses a cast iron flap gate and slide gate. The gate chamber is linked to an outfall pipe that leads to the Red

River. The chamber and gates were most recently modified in 1998. At this time a new flap gate was installed on the existing slide gate thimble. The slide gate was then relocated downstream of the flap gate on a new thimble. The gates installed at the Jessie FPS are large relative to other typical flood pumping stations.

This report describes the results of the condition assessment and the recommended upgrades to extend the life of the station for 50 years. Implementation strategies for these upgrades are described in the Summary Report.

2.0 CONDITION ASSESSMENTS

2.1 BUILDING AND SITE CONDITION ASSESSMENT

2.1.1 Building Superstructure

The building appears to be as originally constructed in 1954 and is generally in good condition.

Exterior

In general the masonry walls are in good condition. The exterior face (approximately 6 mm thick) has spalled off a small number of bricks immediately above the concrete discharge block on the north side (Photo A16-2). This appears to be caused by the absorption of water from the surface of the concrete due to the lack of a curb or flashing, and the effects of freeze/thaw cycling. It is difficult to determine definitively what the cause is, as this may also be exacerbated by the paint finish trapping moisture behind.

Roof

The felt and gravel built-up roofing is in fair condition. The gravel is fairly loose and full of silt. The roof is drained internally by a single roof drain. The painted metal fascias and trim are generally in fair condition.

Doors

The wood entry door and frame are in fair condition. The paint finish on both the door and frame is poor.

Aesthetics

Aesthetically the station building blends in reasonably well with the surrounding community. In general the station building appears structurally sound and reasonably well maintained.

2.1.2 Interior Features / Safety Issues

Permanent steel guardrails are provided around the main floor equipment hatches (Photo A16-7).

A galvanized steel stair with intermediate landings provides access to the drywell below (Photo A16-9). The stairs are steep but allowable by code for service areas. Due to the installation of the foamed plastic insulation around the top of the drywell there is insufficient hand clearance along the stair handrails at these locations creating a potentially unsafe condition when using the stair. The height of the guardrails around the intermediate landings is approximately 900 mm (less than the 1 070 mm required by the current Manitoba Building code), and only a top rail is provided (Photo A16-10).

The drywell ceiling and the upper 2 400 mm of the drywell walls are lined with 50 mm of flammable foamed plastic insulation (extruded polystyrene – STYROFOAM) which is a potential fire/safety hazard.

2.1.3 Building Site and Security

Driveway

An overgrown gravel driveway leads to the building.

Grade

The main floor of the building is approximately 100 mm above grade. The surrounding grade is relatively flat all around and slopes away from the building towards the river on the east side. There is no concern with local site drainage around the structure.

Security

The site is completely open. The site is not illuminated at night. Graffiti is a frequent problem at this station. Other than normal wear and tear, there are no other signs of damage due to vandalism.

2.2 MECHANICAL CONDITION ASSESSMENT

2.2.1 General

There are three separately coupled, overhung impeller centrifugal pumps installed in the FPS drywell. This station is serviced with a drywell electric resistance unit heater and drywell pressurization fan. There is, however, no main floor cooling fan.

2.2.2 Ventilation

Drywell Ventilation

The existing drywell ventilation fan is intended for protection of occupants from contaminated air only and is located on the building's main floor. This single-speed 1 100 cfm fan is operated only when personnel are present in the drywell. An intake duct draws air from outside through a louver and transfers it via discharge ductwork to a location above the drywell floor. Since there is no direct extraction of contaminated air from the drywell floor, this arrangement is only diluting the air in the drywell, not providing direct air changes. The air change rate is therefore less than six Air Changes per Hour (ACH). The City of Winnipeg Water and Waste Department has established the requirement to provide ventilation for personal protection in FPS drywells at 15 ACH. A more reliable method for ensuring a consistent 15 ACH is to provide two fans for drywell ventilation. One fan and duct would supply air to the top of the drywell while the other fan and duct would exhaust air from the bottom of the drywell.

Main Floor Cooling Ventilation

This FPS is not equipped with a cooling fan to remove the heat generated by the FPS motors and switchgear when flood pumps are in operation. Installation of a properly-sized fan and intake louvers would increase FPS reliability by minimizing the potential for exceeding electrical thermal overload limits. Details describing the criteria for fan selection and sizing are contained in the Summary Report.

2.2.3 Piping

Shaft Seal Water Piping and Valves

The shaft seal water line provides water to the packing gland for cooling and lubrication. This station's shaft seal water piping has only been partially converted over to PVC, the remaining piping is copper with a small portion of carbon steel threaded into the packing gland itself (Photo B16-1). Minor surface corrosion is present on the strainer and valves installed on this piping (Photo B16-2). Corroded piping and valves should be considered for replacement. Large sections of copper piping at this station may be replaced with PVC to avoid the potential for corrosion damage where copper was previously installed.

Flood Pump Piping

The suction lines on Pumps 105, 106, and 107 are corroding and have lost their protective paint where the pipe meets the floor (Pump 105 = Photo B16-3, Pump 106 = Photo B16-4, Pump 107 = Photo B16-5).

The discharge piping at this FPS runs horizontally and exits the drywell just above the floor level. Minor surface corrosion is present on the flood pump discharge piping (Pump 106 = Photo B16-6).

Surface corrosion is present on the suction flange hardware, suction victaulic coupling, discharge flange hardware, and discharge victaulic coupling. However, the corrosion on these components is not advanced enough to warrant consideration for replacement.

Ultrasonic testing was performed at Jessie FPS in January 2005. The P105 (24" pipe), P106 (30") and P107 (30") suction and discharge lines were tested to determine remaining wall thickness at several points around the circumference and longitudinally on the lines. The welded carbon steel discharge lines had a thickness ranging from 0.313" to 0.369" on P105, from 0.164" to 0.304" on P106, and from 0.170" to 0.307" on P107. The cast iron suction lines had a thickness that are higher as would be expected for cast iron in comparison to carbon steel. The suction line thickness ranged from 1.136" to 1.209" on P106, from 0.375" to 1.048" on P107 and from 0.327" to 0.360" for P105. Although external surface corrosion makes visual inspection difficult, the opinion of Canadian Structural Inspection Services was that the P105 suction line is carbon steel rather than cast iron, an assumption that is supported by the relatively lower thickness compared to cast pipe at a similar size. Archive drawings do not indicate the specific material used for the suction line.

ASME B31G-1991 "Manual for Determining the Remaining Strength of Corroded Pipelines" is a supplement to ASME B31.3 and was referred to in our assessment of the condition of the discharge piping at this station. The chief limitation of the ultrasonic testing that was performed is that all points along the entire surface area of the piping have not been tested. Since only a sampling of points has been arbitrarily selected, it is possible that areas with less wall thickness than the tested area have been overlooked. Testing at an increased number of transducer locations would have required a significantly higher expenditure for stripping of the entire surface of existing lead based paint and subsequent immediate painting of the piping once the tests were complete. Testing at an increased number of transducer locations was therefore considered impractical.

Based on our review of the data and taking into account the limitations of the test procedure and ASME B31G-1991, some of the piping at this FPS is in questionable condition. The P106 and P107 discharge lines have a wall thickness that appears to have experienced an appreciable amount of corrosion and/or erosion damage. The exterior surface of these discharge pipes does not suggest an unusual amount of corrosion has taken place, however some corrosion is masked by the piping paint and naturally any internal corrosion/erosion would not be visible without disassembling the pipe at the couplings. Although the analysis performed cannot predict the expected timing of a pipe failure, P106 and P107 are in a state where they should be

monitored for further damage and an allowance for replacement of these lines should be made for long-term budgeting purposes.

This piping should be considered for the ultrasonic monitoring program to allow an evaluation of consequential progression of corrosion and/or erosion of the suction and discharge piping. Due to the existing condition of the piping, a test frequency of every five years is suggested for this FPS.

2.2.4 Pumps

There are three separately coupled, overhung impeller centrifugal pumps installed in the FPS drywell (P105 – 24", 175HP, P106 – 30", 250HP, P107 – 30", 250HP). These pumps start and stop in sequence based on the level in the wetwell as determined by the ultrasonic level control system.

Pump 105 is shown in Photo B16-7. Areas of concern are as follows:

1. Pump bowl paint is flaking.
2. Water is pooling within the shroud (Photo B16-8) because the drain hole is too high and is plugged (Photo B16-9).
3. The line shaft is becoming very corroded (Photo B16-9) due to splashing and water accumulation in the shroud.

Pumps 106 and 107 are shown in Photos B16-4 and B16-10. The only area of concern for these pumps is:

1. The pump bowl paint is flaking due to corrosion on and around the bearing cover (Photo B16-11).

The corroded surfaces mentioned above should be sandblasted and re-painted while the water-pooling problem can be mitigated by paint application and possibly drain hole modification. All other components not addressed above as areas of concern are considered to be in acceptable condition, this assessment should be re-evaluated in another 8 to 10 years.

2.2.5 Line Shaft Assemblies

Vibration testing was performed at this FPS in 2004. From this testing it was concluded that the line shaft assembly on all three pumps is in good condition. For further details on the vibration

test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

2.3 GEOTECHNICAL CONDITION ASSESSMENT

2.3.1 Existing Site Conditions

The Jessie Avenue FPS is located along an outside bend on the west bank of the Red River. The overall riverbank slopes down at approximately 6H:1V from the top of bank area to the Regulated Summer River Level (RSRL). Within the limits of the right-of-way the bank was covered with native grasses and occasional mature trees. Upstream and downstream of the station the bank was covered with numerous mature trees and scrub brush. Upper bank conditions are shown on Photos C16-1 and C16-2. There were two existing slope inclinometers located along the lower bank area, which were installed by KGS Group in 1993. Monitoring of the instrumentation has been performed by KGS Group periodically between 1993 to spring 2004.

Extensive riverbank stabilization works are in place at the site consisting of a 6 m wide by 100 m long rockfill shear key, riprap blanket, and upper bank excavation (offloading). Construction was performed in 1991/92 under City of Winnipeg Waterway Permit 112/91. KGS Group was responsible for the riverbank slope stability assessment and geotechnical design of the stabilization works and details are outlined in Reference 16.

There was no visual evidence of overall riverbank instability within the limits of the slope stability improvement works. In general, the existing riprap in place along the shoreline appeared to be in good condition, as shown on Photo C16-3. The material ranged in size from 50 to 450 mm, with a D_{50} of approximately 300 mm and extended approximately 50 m downstream and 100 m upstream of the outfall pipe.

Upstream and downstream of the FPS beyond the limits of the upper bank regrading there were several inactive retrogressive slump blocks located along the mid to upper bank areas. There was no evidence of recent movements but reactivation of the slump blocks could occur in the

future. Beyond the limits of the existing riprap blanket there was active ongoing shoreline erosion.

An internal inspection of the outfall pipe was performed in 2004 but the pipe outlet could not be reached due to the river level. Along the portion of the pipe that could be inspected there were significant joint separations or displacements observed. Some of the joints within the concrete pipe appeared to have been sealed with grout in the past.

2.3.2 Historic Bank Performance

Aerial Photography

1988 - There was an extensive head scarp located along the top of bank area at the FPS that extended a significant distance upstream and downstream. There was also evidence of active erosion along the shoreline area. The bank was covered with mature trees and native grasses from the pumping station down to the river edge. Upstream of the station there appeared to be evidence of concrete rubble or stone riprap along the lower shoreline at some of the properties.

1992 - An extensive riprap blanket is apparent along the shoreline at the FPS extending both upstream and downstream of the outfall pipe. The bank at the station and immediately downstream appeared to have been regarded compared to the conditions on the 1988 photography. There was no evidence of slope movements at the station. Bank conditions upstream and downstream of the FPS were generally consistent with the 1988 photos with a historic head scarp still apparent along the mid to upper bank area.

1998 - There was no evidence of slope instability at the FPS within the limits of the bank works. A granular pathway is visible along the top of bank area and extends both upstream and downstream of the station. The historic head scarp located along the top of bank area upstream of the station appeared to be consistent with conditions observed on the 1988 and 1992 photography.

Existing Records

As discussed previously riverbank stability improvement works were installed at the Jessie FPS in winter 1991/92. KGS Group was responsible for the riverbank slope stability assessment and geotechnical design of the stabilization works and details are outlined in Referenced 16.

2.3.3 Geotechnical Assessment Rating

The Jessie Avenue FPS is classified as having a low risk of failure. The risk of failure criteria is described in the Summary Report. Extensive riverbank stabilization works are in place at the site and there was no visual evidence of active overall slope instability at the station. An extensive limestone riprap erosion protection blanket is in place along the shoreline and at the time of the inspection the rock appeared to be sound and intact however some degradation of the stone should be anticipated during the remaining life of the station.

The existing slope inclinometers installed at the FPS indicate that shallow ongoing slope movements are occurring up to 4 m depth below ground surface within the limits of the right-of-way. Between 1993 to 2004 approximately 50 to 90 mm of down slope movement has been measured. The movements could be related to bank creep or possible shallow rotational sliding above the existing rockfill shear key and riprap blanket. The present rate and magnitude of the shallow movements do not jeopardize the flood pumping station building or outfall pipe at this time but it is possible that increased slope movements could occur in the future, which could have a detrimental impact on the pipe and station.

There is a historic failure scarp located along the top of the bank area upstream of the station that could be reactivated in the future. It is possible that the existing scarp could propagate downstream on to the FPS right-of-way such that the station would be negatively impacted. However in our opinion this is unlikely due to the extensive bank works in place at the site.

2.4 SUBSTRUCTURE AND GATE CONDITION ASSESSMENT

2.4.1 Substructure

The station substructure appears to be as originally constructed in 1954 and is generally in a good condition. The main floor slab is good with some minor hairline cracks. The plywood and pre-cast concrete hatch covers are generally good.

The dry well concrete beams and shaft guide mounts are in a good condition. The concrete beams have been patched at a few locations along the bottom and sides but these repairs

appear to be performing well (Photo D16-3). There are minor cracks on all walls around the perimeter of the dry well. White residue (efflorescence) and staining is evident along some cracks indicating past seepage and some corrosion of wall reinforcement. This is particularly evident at the concrete in-fills around the pump intake pipes (Photo D16-5). There is evidence of patching from previous crack repairs.

The floor condition is fair as it has many significant cracks throughout that propagate in all directions (Photo D16-7). The pump bases are in a good/fair condition. There are hairline cracks evident on most grout shoulders. At least two concrete pedestals have major spalling at the base with exposed reinforcing (Photo D16-8). Some base plates and anchor bolts have minor surface corrosion.

The discharge box walls, floor and roof are in a good condition. There are minor cracks on the interior of the walls. The roof concrete has been previously patched in some areas.

The station wetwell appears to be generally in a good to fair condition. The roof slab and beam are in good condition but have a few large concrete spalls with exposed rebar (Photo D16-16). Exposed rebar is visible at other locations on the underside of the slab and beam but it is not causing the concrete to spall. The walls are in good condition with no concrete spalling, or cracking but there is some segregation of concrete at construction joints.

The intermediate slab and beams are in good condition with no concrete spalling or cracking. There is exposed rebar on the underside but it is not causing the concrete to spall. The railings on the intermediate slab are in good condition, but do not provide adequate protection and safety. There is a large gap near the ladder to the lower level that requires a section of guardrail to be installed (Photo D16-19). The ladder is new and in good condition with no safety cage.

The trashracks have a lot of debris and silt covering them (Photo D16-21). They look to be in good to fair condition with no damage. The trashracks have corrosion but no section loss (Photo D16-22). There are two slide gate shafts attached to the walls with guides. The shafts are in poor condition with heavy corrosion and section loss (Photo D16-23). The guides are damaged and in poor condition with heavy corrosion and section loss (Photo D16-24). The

wetwell floor has high water and could not be inspected. The inlet and outlet culverts are in good condition with no concrete spalling or cracking.

2.4.2 Gates

Flap Gate

The flap gate was installed in 1998 (new flap on the existing slide thimble) and is in a good condition. Minor corrosion is beginning on the surface of the gate stiffeners and at the edges of the thimble (Photo D16-9). The gate seating face was not accessible for inspection.

Slide Gate

The slide gate & thimble were relocated in 1998 (re-used original 1954 gate) and are in a poor condition (Photo D16-11). The slide gate is very heavily corroded throughout with significant section loss. The slide frame anchor bolts are newer and in a good condition. The thimble has heavy surface corrosion but no section loss. The gate seating face is fairly smooth with some corrosion.

The slide gate was not operated to monitor the travel since it takes two hours to open and close. The operator shaft and guide mounts are in a fair condition. The gate chamber concrete is in a good condition. There are some silt and mud deposits at the bottom of the gate chamber.

2.5 ELECTRICAL CONDITION ASSESSMENT

2.5.1 General

The KGS Report, "Flood Control Adequacy Review Study", looked at 14 representative stations and examined the following electrical aspects of the flood pump stations. The study determined the existing motors, motor starters, main distributors, pump controls and SCADA System equipment were in acceptable condition and do not require major upgrade.

Main Service

The main service (Manitoba Hydro) was found to be of adequate capacity.

Flood Pump Motor Starters

The motor starters for the pumps were also found to be in good condition and to provide reliable service. Although they are old, they are of heavy-duty construction and have experienced very little hours of use due to the nature of the FPS and spare parts are still available. Accordingly no remedial action is required for the starters.

Flood Pump Motors

The report determined that the flood pump motors were also judged to be in acceptable condition with no major remedial action required. WWD has an ongoing program to upgrade the motor insulation on selected stations. Where moisture is present the existing insulation absorbs the moisture and reduces the motor insulation values. This requires drying out in the spring before use. The motors are removed and refurbished with a better quality insulation system. The costs for this ongoing program are not included in these estimates.

Flood Pump Controls

The report determined that the existing bubbler or ultrasonic level control systems were in adequate condition and did not require any major upgrade.

The dial up SCADA system was judged to be in good condition. WWD is considering a major upgrade of its' SCADA system and the costs and scope would be handled as a separate project.

2.5.2 Lighting

The interior lighting consists of incandescent bulb fixtures. These fixtures are not used frequently and as such would not normally be replaced on an energy conservation basis. There

is inadequate lighting in the drywell in this station. This is normally supplemented with trouble lights for specific tasks. The fixtures should be upgraded to modern fluorescent type sealed fixtures. This will provide quality light with minimal maintenance and no requirement to connect extra lighting.

There is currently no exterior lighting. A more modern facility would typically have several High-Pressure Sodium (HPS) fixtures controlled via photocell. This would allow good security lighting for the building at relatively low maintenance.

2.5.3 Controls

The ultrasonic level control, which starts and stops the pumps, performs well and no significant problems have been encountered.

An RTU communicates over a telephone line to the WWD SCADA centre. The FPS is polled on a regular schedule (8 – 15 min) and reports back on an "exception" or "change of state" basis.

3.0 RECOMMENDED UPGRADES AND ESTIMATED COSTS

Recommended upgrades for each of the assessment areas; building and site, mechanical, geotechnical, substructure and gates, and electrical are described in Sections 3.1, 3.2, 3.3, 3.4 and 3.5 below. Estimated costs for the recommended upgrades and the basis for the estimates are summarized in Section 3.6 and the Detailed Cost Estimates are shown on Table B16.1.

3.1 BUILDING AND SITE RECOMMENDED UPGRADES

The following repairs and upgrades are recommended, to accommodate the Mechanical upgrades, ensure uninterrupted performance of the station, extend the functional life of the station, and when possible reduce the level of upkeep maintenance required. Based on the location and the existing general condition ***this station is not a priority for aesthetic upgrading***. Criteria for the aesthetic upgrading is described in the Summary Report.

1. ***Roofing -*** Remove the existing felt and gravel roofing and all associated fascia flashing and trim. Install a new 2-ply SBS Modified roofing system membrane to the surface of the existing concrete roof slab. Patch and repair existing slab and substrates as required. Replace all metal trim with new prefinished metal equivalents. Also replace all roof hatch covers with new units utilizing pressure treated lumber and plywood covered with a new prefinished metal pan flashing.

2. ***Entry Door*** - Replace existing wood entrance door and frame with new steel door and frame. Patch and paint.

3. ***Masonry Wall Opening*** - Rework existing exterior brick wall to facilitate the installation of cooling fan and ventilation louver(s) as specified by Mechanical.

4. ***Masonry Wall Flashing*** - Install a new hot-dipped galvanized flashing along all brick supported directly on the surface of the discharge block or similar concrete chamber. The flashing should extend up at least three brick courses, terminate in a mortar joint and be sealed with joint sealant. The bottom shall extend outward over the concrete surface and be sealed to the concrete.

5. ***Masonry Wall Repairs*** - Provide an allowance for minor brick repair and localized joint repointing. Allowance should also allow for localized repainting of all repaired or reworked areas.

6. ***Insulation Protection*** - Install an approved thermal barrier over existing foamed plastic insulation in drywell.

7. ***Stair Guardrail*** - Install bolt-on intermediate rail to two stair-landing guardrails in drywell.

3.2 MECHANICAL RECOMMENDED UPGRADES

3.2.1 General

This FPS would benefit from several mechanical upgrades. The following sections provide basic descriptions of these recommended measures. Criteria and background information regarding the rationale for the proposed upgrade measures are given in the Summary Report.

3.2.2 Ventilation

Drywell Ventilation

To bring the FPS into compliance with the WWD-specified criteria of 15 Air Changes per hour drywell ventilation rate, the existing ventilation arrangement will have to be revised. An arrangement that discharges approximately 3 000 cfm at ceiling level of the drywell and extracts at 3 100 cfm near the floor of the drywell would offer the most effective air transfer. This simultaneous supply and exhaust arrangement ensures that air changes are made at a known rate. A single fan arrangement can only dilute contaminated air, rather than provide direct air changes.

Both fans would be installed near the top of the building's exterior wall on the main floor of the FPS. The supply fan would draw air in through a louver and transfer it through ductwork to discharge the air at the top of the drywell. The exhaust duct would be located with its intake end 2 ft above the drywell floor and its discharge louver on the FPS main floor wall. The station's

existing drywell pressurization fan is undersized at 1 100 cfm and therefore would be removed from service.

Main Floor Cooling Ventilation

To provide station cooling during 90°F outdoor air temperatures and when all three pumps are running, the 14 000 cfm cooling fan from the Newton flood pump station should transferred to this FPS and installed. A vane axial fan mounted on a steel frame and equipped with a silencer is appropriate for this FPS. This upgrade will also require that additional intake louvers be installed to ensure an adequate amount of air is drawn across the motors. The 5 HP fan motor will be equipped with a VFD and controlled by a temperature sensor to modulate fan speed from 40 to 100%. Optimal locations for the fan and louvers would be determined in the final design-engineering phase. The ideal layout would draw a maximum amount of air through the station and across the motors while having the fan discharge oriented away from private residences. Details describing the criteria for fan selection and sizing are contained in the Summary Report.

3.2.3 Piping

Shaft Seal Water Piping and Valves

1. **Convert Copper Piping to PVC** – To extend the life of the shaft seal water piping at this station, as much as possible existing copper should be converted over to PVC. For this station, this involves some of the shaft seal main line as well as the branch lines that extend to each pump.

2. **Replace Existing Valves** – The main line valves (strainer, check, solenoid, PRV, and gate valves) and the valves (swing check and gate valves) on the branch lines to the pumps should be considered for replacement as per the attached cost summary table (Table B16.1).

3. **Replace Copper Pipe at Drywell Entry Point** – The copper shaft seal water piping at the entry point to the drywell should be replaced to prevent it from further surface corrosion resulting in loss of base material and structural integrity.

4. **Replace Copper Pipe at Tie-in to Pump(s)** - The sections of the copper shaft seal water line that tie-in to the pumps do not need to be replaced. Although this conclusion is not anticipated to change, the condition of this piping and its potential need for replacement should be re-evaluated in 8 to 10 years. If this section of pipe ever needs to be replaced, it cannot be converted to PVC since it threads directly into a FNPT port on the pump.

Flood Pump Piping

1. **Replace Flood Pump Pipe Victaulic Couplings and/or Flange Nuts and Studs** – None of the suction or discharge side victaulic couplings or flange couplings' nuts and studs on any of the pumps need to be replaced. Although this conclusion is not anticipated to change, the condition of this item and its potential need for replacement should be re-evaluated in 8 to 10 years.

2. **Discharge Pipe Replacement** – Although the analysis performed cannot predict the expected timing of a pipe failure, Pumps 106 and 107 are in a state where they should be more closely monitored than the other stations for further damage. In addition, an allowance for replacement of these lines should be made for long-term budgeting purposes.

Review of the ultrasonic test data for the remaining piping indicates that discharge pipe replacement does not appear to be necessary for Pump 105.

Another set of ultrasonic test data should be acquired in five years to re-evaluate the results of this assessment.

3.2.4 Flood Pumps

Bearing Cover Hardware Replacement

The nuts and studs securing the bearing covers do not need to be replaced. Although this conclusion is not anticipated to change, the condition of this hardware and its potential need for replacement should be re-evaluated in 8 to 10 years.

Packing Gland Cover Hardware Replacement

The nuts and studs securing the packing gland covers do not need to be replaced. Although this conclusion is not anticipated to change, the condition of this hardware and its potential need for replacement should be re-evaluated in 8 to 10 years.

Packing Gland Cover Replacement

The packing gland covers on the pumps do not need to be replaced. Although this conclusion is not anticipated to change, the condition of these covers and their potential need for replacement should be re-evaluated in 8 to 10 years.

Pump Bushing Clearance Assessment

Vibration testing was performed at this station in 2004. From this testing it was concluded that this assembly appears to be in good condition on all three pumps. For further details on the vibration test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

3.2.5 Line Shaft Assemblies

Vibration testing was performed at this station in 2004. From this testing it was concluded that the line shaft assemblies are in good condition. For further details on the vibration test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

3.2.6 Sandblasting and Painting

As a minimum, the remaining copper pipe should be monitored for corrosion, although surface cleaning and painting of the piping would provide better long-term protection. Sandblasting and repainting of all the flood pumps, line shafts, suction and discharge piping corroded surfaces should be performed to extend the life of these components.

PPG Phillips and Carlson Sandblasting were asked to provide information on the ideal coating system that would provide a tough, long-lasting, corrosion resistant finish for these items. They have recommended that the following process and materials be utilized:

1. Initial stripping with paint stripper to remove as much lead based paint as possible. This should reduce the lead hazard enough that sandblasting could be done without the spent blast media being considered hazardous waste.
2. Sandblast any residual material to clean surfaces to base metal.

3. Apply one coat of zinc rich primer.
4. Apply one coat of high build epoxy primer.
5. Apply top coat.

Scaffolding or other means of providing access to line shafts and piping at higher levels will have to be setup as part of this work.

3.2.7 Monitoring

Ultrasonic Testing

Review of the ultrasonic test data acquired in January 2005 suggests that the suction and discharge piping at this FPS should be placed on an ultrasonic monitoring program that has the FPS tested at approximately five year intervals. This approach will increase the probability that piping problems are detected before they can progress to a state where they could result in a line failure.

Vibration Testing and Thermal Scanning

Vibration testing and thermal scanning was performed at this FPS to detect any immediate problems and establish a baseline that future monitoring can be compared against. Vibration testing tends to reveal mechanical problems such as misaligned shafts and bearing faults. Thermal scanning will expose electrical issues that result in hotspots in the electrical components' infrared signature. These two measures are ongoing as a part of the work program by KGS Group with the assistance of Motor Check Canada. Vibration Testing and Thermal Scanning are typically conducted during the same site visit.

In addition to the initial test that has been completed, an ongoing vibration testing and thermal scanning program should be initiated that has this FPS re-tested every 8 to 10 years.

3.2.8 Miscellaneous

Pump 105 is experiencing corrosion problems due to water pooling within the shroud. If the problem is not alleviated by clearing the drain hole, consideration should be given to providing a drain hole at a lower elevation. Another alternative is to rely on the painting upgrade measure described in Section 3.2.6 for corrosion protection.

On Pump 107, nuts and studs securing the packing gland cover should be tightened to prevent further leakage.

3.3 GEOTECHNICAL RECOMMENDED UPGRADES

3.3.1 0 to 10 Year Upgrades

A detailed visual inspection of riverbank stability conditions, internal inspection of the outfall pipe, as well as installation and monitoring of two new slope inclinometers should be performed at the site within the next two years and monitoring performed every two years thereafter. The results of all of the monitoring should be documented and stored in a database format maintained by the City. Installation of two new inclinometers is required because the existing inclinometers at the site are approaching the limit of their measurement.

3.3.2 Future (11 to 50 Year Upgrades)

In addition to the monitoring recommended in Section above, the City should make a cost allowance for upgrading of the existing riprap blanket to reduce the potential for shallow slope movements at the site. A preliminary design consideration would be to extend the rock further up the bank. The construction timing for the riprap upgrading is dependent on potential movement rates at the site, which can be determined from the recommended monitoring program. Based on the rate of movement measured between 1993 and 2004 we do not anticipate upgrading of the riprap will be required within the next 10 years.

Inspection of the riverbank stability conditions, internal inspection of the outfall pipe and monitoring of the slope inclinometers is also recommended every five years for the remaining life of the station.

The results of the inspections and monitoring can be used to better define the rate and magnitude of the ongoing shallow slope movements and determine if any future bank works are required. The estimated cost is outline below.

3.4 SUBSTRUCTURE AND GATES RECOMMENDED UPGRADES

The following repairs and upgrades are recommended within the next 10 years to extend the functional life of the station. Criteria and background information related to the various recommended upgrades are described in the summary report. The estimated cost of the upgrades and their relative priority are summarized in Table B16.1.

1. ***Grade Beams*** **-** No repairs required.
2. ***Hatch Covers*** - No repairs required.
3. ***Dry Well Beams*** - No repairs required.
4. ***Dry Well Walls*** - No repairs required.
5. ***Dry Well Floor*** - No repairs required.
6. ***Pump Bases*** - Remove loose deteriorated concrete at spalled locations on pedestals. Sandblast any exposed reinforcing steel and then patch repair areas with grout. Remove and replace any loose or fractured base plate grout.
7. ***Discharge Box*** - No repairs required.
8. ***Stoplogs & Guides*** – No repairs required.
9. ***Flap Gate & Thimble*** – No repairs required.
10. ***Slide Gate & Thimble*** - Remove existing slide gate and frame. Wire brush clean and/or sandblast existing corroded thimble and apply new protective surface coating. Replace damaged wedges, wedge bolts and sealing strips as required. Install new slide gate and frame complete with new anchor bolts.
11. ***Gate Chamber Concrete*** - Remove any accumulated debris from the base of the chamber.

12. ***Access Platforms*** - Install a new structural steel platform/catwalk to access the pump shaft guide mounts for regular mechanical maintenance. The platforms will be located at the level of the existing intermediate concrete support beams and will be accessed from the existing stairway/ladder. Platforms will have a grated surface wide enough for one maintenance worker and will be equipped with standard handrails on each side.

13. ***Wetwell Roof Slab and Beams*** – Remove loose deteriorated concrete at spalled locations. Patch all repair areas with grout.

14. ***Wetwell Walls and Columns*** – No repairs required.

15. ***Wetwell Intermediate Slab and Beams*** – No repairs required.

16. ***Wetwell Floor / Inlet and Outlet Culverts*** – No repairs required.

17. ***Wetwell Trashracks*** – Trashracks to be cleaned, inspected, and minor repairs performed as required.

18. ***Wetwell Slide Gate, Shafts and Guides*** – Replace existing slide gates, shafts, guides, and operators with new.

19. ***Wetwell Ladders and Railings*** – Intermediate railing required at area of access to lower ladder.

20. ***Additional Unidentified Scope Items*** – Provide an allowance for miscellaneous structural items that may arise during the implementation of the upgrade program.

A brief inspection of the gates should be performed annually as part of the department's regular gate maintenance program. Specifically the condition of the anchor bolts and wedge bolts should be monitored and any sheared bolts replaced. Any accumulated debris that may interfere with the operation of the gates should be removed. A detailed condition assessment of the gates and substructure should be performed every 10 years for the remaining life of the station. An allowance for future upgrade costs beyond the initial 10 year program has been included in the tables.

3.5 ELECTRICAL RECOMMENDED UPGRADES

The interior and exterior lighting should be replaced/upgraded with other building upgrades. An allowance has been made to replace all lighting over the 50 year span as this typically exceeds the life-span of lighting fixtures.

An allowance has been made for minor electrical items, which will arise over the years (minor conduit replacement etc.)

Electrical Costs associated with the mechanical items such as improved ventilation are included in the mechanical cost estimates.

There is no cost considered for thermal scanning, as costs for this task have been included with mechanical estimates and when performed on a regular basis should help avoid other larger electrical costs.

3.6 TOTAL ESTIMATED UPGRADE COSTS AND PRIORITIES

3.6.1 Total Estimated Costs

The recommended upgrades, as shown in Table B16.1 and their estimated costs have been compiled by discipline; Building and Site, Mechanical, Geotechnical, Sub-Structure & Gates and Electrical. All of the costs shown are in 2005 dollars and have not been escalated for future costs (i.e. the 11 to 50 year cost estimates are still in 2005 dollars). These estimates include engineering, administration and contingencies. The recommended upgrades have been prioritized by the following categories:

- 0 to 5 year implementation
- 6 to 10 year implementation
- Future upgrades (i.e. 11 to 50 years)

Table B16.1 shows the estimated costs and priorities for the next 10 years (i.e. 2006 to 2016) as well as the cost estimated for the remaining 50 year life of the stations (i.e. 11 to 50 years). Total estimated costs for this station are as follows:

- 10 year $320,180
- 11 to 50 year $432,960

Priorities of very high, high, medium and low have been assigned to the 10 year cost estimates. These are shown on the cost estimate sheets and reflect the relative urgency of each of the work items. Items assigned a very high priority should be completed as soon as possible, high

priority items within the next 1 to 3 years and medium priority items within the next 4 to 7 years. Low priority items should be addressed within the next 10 years.

In some cases, the future upgrades have been assigned a probability to reflect the uncertainty associated with the future need to undertake the work scope. The rationale for assigning probabilities to the future upgrades is described above and in the Flood Pumping Station Summary Report.

The future costs and their associated probabilities (where applicable) are shown in Table B16.1 for each of the individual station cost estimates.

3.6.2 Basis of Cost Estimate

Building/superstructure costs are based on a combination of contractor estimate, past experience and recent tendered prices for similar work by the Water and Waste Department at the Flood Pump Stations.

Estimated mechanical costs include all labour and materials necessary to complete the work described for each item. Construction labour rates of $50/hour have been applied in most cases with the exception of items such as Ultrasonic Testing and Sandblasting/Painting where labour has been rolled into a lump sum cost estimate provided by a contractor.

Geotechnical costs are based on recent construction tenders received for similar work and KGS Group experience in completing numerous riverbank monitoring and stabilization projects in Winnipeg. Similarly, substructure and gate cost estimates are based on contractor input, recent similar WWD project tender pricing, supplier quotations and KGS experience.

Cost associated with the substructure and gate upgrades are based on recent similar work by WWD, discussion with contractors familiar with work of this nature, supplier quotations and KGS Group experience.

Electrical cost estimates are based on engineering experience.

An allowance of 20% of the total estimated construction costs for Engineering and Administration have been included. This estimate allows for final design work such as drawing production (where necessary) as well as materials or equipment selection and specification. Contract Administration and technical assistance during the initial implementation phase are also included in this engineering allowance.

A 20% contingency has been considered in the estimate since the details of each implementation item are preliminary and could be affected by complications in the field and/or cost fluctuations of materials, equipment and labour. As well the contingency reflects the preliminary nature of the estimate at this stage and the fact that additional, minor, scope items will likely be added at the final design stage.

4.0 REFERENCES

4.1 REFERENCE REPORTS

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2. A. Dean Gould ITL, 1980, Appendix 3 Report on Riverbank Stability at the Proposed Outfall in St. John's Park for the St. John's/Polson Sewer Relief Project Phase 1.

3. A. Dean Gould, P.Eng., January 1988, Report on Riverbank Stability Analysis Newton Avenue Outfall.

4. Baracos and Marantz, December 1956, Soil Mechanics Investigation Proposed Ash Street Pumping Station.

5. City of Winnipeg – Works & Operations Division, 1986, Basement Flooding Relief Program Review.

6. City of Winnipeg, 1989, City of Winnipeg Instruction Manual of Operations for Flood pumping Station (Orange Book).

7. Dillon Consulting Limited, 1983, Winnipeg Flood Protection – Volume 1 (High River Levels – Engineering Review).

8. Dyregrov & Burgess, August 1986, Geotechnical Report Cockburn Flood & Wastewater Power Station.

9. Geotewan Engineer, July 28, 1989, Geotechnical Investigation Hart Wastewater Pumping Station Upgrading.

10. Hardy BBT Limited, October 1991, Riverbank Pathway Between Mostyn Park & Cornish Avenue Geotechnical Feasibility Study.

11. KGS Group Letter/Report, June 29, 1989, Assiniboine River Walkway Geotechnical/Hydraulic Feasibility Study.

12. KGS Group Letter/Report, September 16, 2004, Proposed Transformer Installation Aubrey Street FPS Geotechnical Investigation and Riverbank Stability Assessment.

13. KGS Group Report, December 2003, 2003 Outfall Maintenance Program Dumoulin Outfall RR-58 Geotechnical Evaluation.

14. KGS Group, 2002, City of Winnipeg Flood Manual "Flood Pump Station Overview Report" (Appendix E) and data Sheets included in Appendix F.
    - Flood Pump Stations – Metric Geodetic – Baseline Data – Control Elevations
    - Flood Pump Stations – Metric Geodetic – Baseline Data – Station Elevations

- Flood Pump Stations – Metric Geodetic – Baseline Data – Pumps
- Flood Pump Stations – Metric Geodetic – Baseline Data – Outfall & Miscellaneous

15. KGS Group, Report, December 2004, Granite Curling Club Riverbank Stability Evaluation.

16. KGS Group, Report, June 29, 1990, Jessie FPS Riverbank Stability Study and KGS Group, Report, October 1991, Functional Design Report.

17. Templeton Engineering Company, March 1975, Riverbank Stability Study at the Proposed Hawthorne Outfall Replacement

18. UMA Engineering, December 1980, Geotechnical Evaluation for Slope Stabilization at Mager Drive.

19. UMA Engineering, December 1995, Geotechnical Investigation for North West District Outfall Restriction St. John's Avenue Outfall.

20. UMA Engineering, February 1986, Report on Proposed Outfall Repairs at Cornish Avenue & Clifton Avenue Sites.

21. UMA Engineering, January 1989, Report on Geotechnical Investigations for the Polson Avenue and Armstrong Avenue Outfalls.

22. UMA Engineering, March 1991, Geotechnical Investigation for the Syndicate Street Outfall.

23. UMA Engineering, March 1991, Geotechnical Investigations for Selkirk Avenue Outfall.

24. UMA Engineering, May 1990, City of Winnipeg Waterworks, Waste and Disposal Department Lyndale Drive Slope Stability Study.

25. UMA Engineering, September 1990, Mager Drive Pumping Station Preliminary Slope Stability Investigation.

26. UMA Letter Report, January 30, 1992, Selkirk FPS

27. UMA Letter Report, July 25, 1991, Selkirk FPS

28. UMA, January 1993, Jefferson Avenue Outfall

4.2 REFERENCE DRAWINGS

Author	Title	Year	Drawing
City of Winnipeg, Engineering Department	Jessie Avenue Flood Pumping Station - Sections	1954	683 - 4, File #FP10169
City of Winnipeg, Engineering Department	Jessie Avenue Flood Pumping Station - Details	1954	683 - 5, File #FP10170
City of Winnipeg, Engineering Department	Jessie Avenue Flood Pumping Station - Plans and Elevations	1954	683-8, File #FP10173
City of Winnipeg, Engineering Department	Jessie Avenue Flood Pumping Station - 3000 GPM Pump Installation	1955	683 -7, File #FP10172
Greater Winnipeg Sanitary District	Jessie Ave. Comminutor Station Addition - Details	1955	285
Greater Winnipeg Sanitary District	Jessie Ave. Comminutor Sta. - Details of Comm. Well Cover & New Weir in Flood Pumping Station	1955	286
Greater Winnipeg Sanitary District	Jessie Ave. Station - Reinforcing Detail	1956	287
Greater Winnipeg Sanitary District	Jessie Ave. Comminutor Station - Addition	1957	284
City of Winnipeg, Waterworks, Waste and Disposal Department	Jessie Ave. Wastewater/Flood Pumping Station - Riverbank Stabilization - Outfall Plan & Profile	1991	LD 1126, File #LD 10398
The City of Winnipeg, Waterworks, Waste and Disposal Department	Jessie Avenue Wastewater/Flood Pumping Station - Riverbank Stabilization - Manhole Details	1991	LD 1127, File #FP10399
City of Winnipeg Works and Operations Division Water and Waste Department	Jessie Flood Station-Electrical and Control	1997	97-FS-Q-3
The City of Winnipeg, Waterworks, Waste and Disposal Department	Jessie Avenue Flood Pumping Station - Plans and Details	1998	LD -1861
The City of Winnipeg, Waterworks, Waste and Disposal Department	Jessie Avenue Flood Pumping Station - Gate Chamber Reinforcing Details	1998	LD - 1862
The City of Winnipeg, Waterworks, Waste and Disposal Department	Jessie Avenue Flood Pumping Station - Outfall	-	1318, File #FP10009

ANNEXES

ANNEX A16
BUILDING AND SITE
PHOTOS

PHOTO A16-1

MAIN ENTRY ON WEST SIDE

PHOTO A16-2

DISCHARGE BLOCK ON NORTH SIDE

PHOTO A16-3

EAST SIDE

PHOTO A16-4

ROOF - LOOKING SOUTHWEST

PHOTO A16-5

STEEL BEAMS AND CONCRETE SLAB ROOF

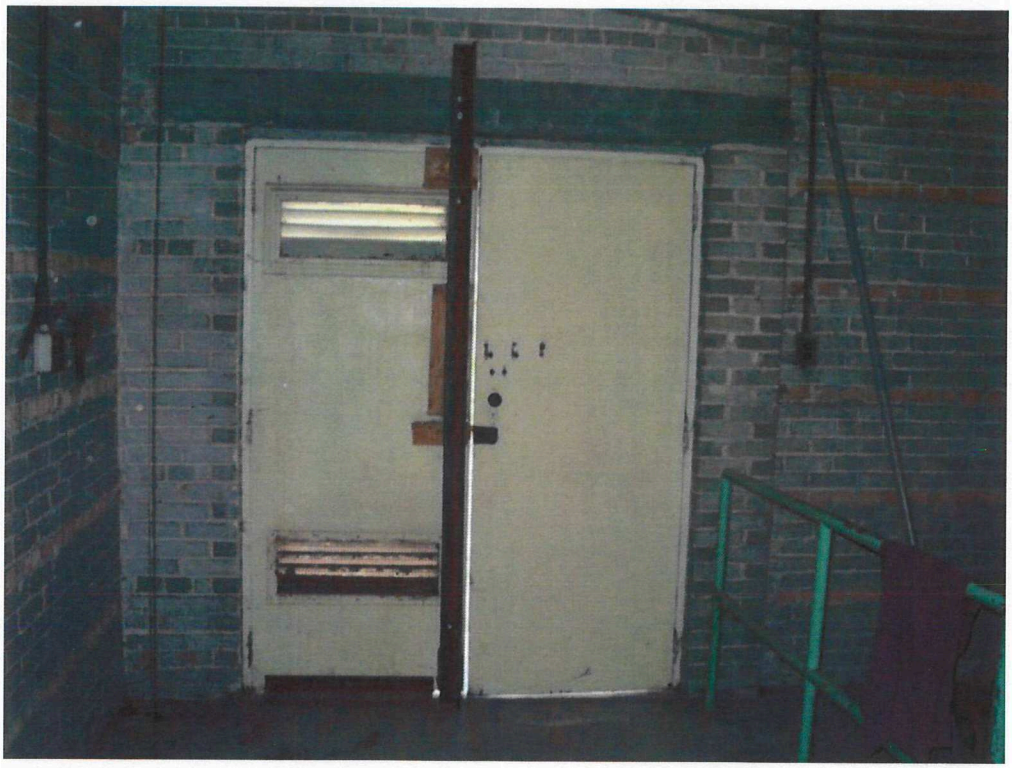

PHOTO A16-6

MAIN ENTRY DOORS FROM INTERIOR

PHOTO A16-7

GUARDRAIL AROUND EQUIPMENT HATCH

PHOTO A16-8

ACCESS TO DRY WELL

PHOTO A16-9

FOAMED PLASTIC INSULATION AT TOP OF DRY WELL

PHOTO A16-10

DRY WELL ACCESS STAIR - NO INTERMEDIATE RAIL

ANNEX A16
BUILDING AND SITE
DATA COLLECTION SHEETS
AND TEST RESULTS

FLOOD PUMP STATION SITE INSPECTION
BUILDING SUPERSTRUCTURE & BUILDING SITE
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-04
INSPECTOR: R. Nickel, KGS Group

BUILDING SUPERSTRUCTURE

EXTERIOR WALLS

General Description	Brick Masonry
Insulation	Not Insulated
Wall Thickness	200mm
Wall Height (Interior)	3400mm

Construction (Exterior to Interior):

200mm clay brick - Exterior painted

Note:
Hydro area enclosed with painted metal cladding

Condition (General)	Good
Condition (Ext. Finish)	Good
Condition (Int. Finish)	Unfinished

Comments:

1. Some exterior brick faces spalling off at courses immediately above discharge block on north side. No curb or flashing provided at this location.
2. Muliple paint layers on exterior due to graffiti problem.

ROOF

General Description	Cast-In-Place Concrete
Roof Slope	Flat
Insulation	Not Insulated

Construction (Exterior to Interior):

Felt & gravel - Built Up Roof
(assumed to be installed directly over concrete slab)
150mm concrete slab
Steel beams

Condition (General)	Good
Condition (Int. Finish)	Unfinished

Comments:

Roof Hatch (slightly vented around perimeter)
-Painted metal pan flashing (rusting)
-19mm wood sheathing
-38x89 wood joists at 400mm o/c

Roof Weather Barrier	Felt & Gravel - Built Up Roof
Last Replacement	Unknown
Condition (General)	Fair

Comments

1. Roofing installation appears to be fairly old
2. Good gravel cover but mostly loose with considerable silt content
3. No blisters or ridging noted
4. Internal roof drain - strainer cap in place

Overhang (Width)	None
Soffits	None
Soffit Finish	n/a
Condition (General)	n/a
Condition (Finish)	n/a

Comments

Fascia & Trim	Formed Steel Sheet
Finish	Paint / Galvanized
Condition (General)	Fair
Condition (Finish)	Fair

Comments

1. Gravelstop/Fascia trim rusting from roof side

Roof Drainage Control	Internal Roof Drain
Material	n/a
Finish	n/a
Condition (General)	Good
Condition (Finish)	n/a

Comments

1. Strainer cap in place

EXTERIOR DOORS

Door Construction	Wood (solid core)
Door Finish	Paint
Frame Construction	Wood
Framing Finish	Paint
Condition (General)	Fair
Condition (Finish)	Poor

Comments

1. Exterior face splitting - with paint flaking
2. Basic/original hardware - slide bolt and padlock

WINDOWS

General Description	None
Window Glazing	n/a
Framing Construction	n/a
Framing Finish	n/a
Condition (Glazing)	n/a
Condition (Framing)	n/a
Condition (Framing Finish)	n/a

Comments

INTERIOR WALLS

General Description: Wood Frame

Construction (Exterior to Interior):
Painted plywood
38x89 wood studs at 400mm o/c
Painted plywood

Condition (General): Good
Condition (Finish): Good

Comments

INTERIOR DOORS

Door Construction	Plywood
Door Finish	Paint
Frame Construction	Wood
Framing Finish	Paint
Condition (General)	Good
Condition (Finish)	Good

Comments

FLOOD PUMP STATION SITE INSPECTION
BUILDING SUPERSTRUCTURE & BUILDING SITE
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-04
INSPECTOR: R. Nickel, KGS Group

INTERIOR FEATURES / SAFETY ISSUES

Stairs	1. Painted galvanized steel checker plate treads and landings 2. Steep
Handrails	1. Painted galvanized steel pipe 2. Only single top rail at stairs and intermediate landings 3. No hand clearance at insulation
Ladders	
Guardrails	1. Painted galvanized steel pipe guardrail around equipment hatches 2. Fixed railing with top and intermediate rails
Floor Hatches	1. Wood plank cover over main equipment hatch opening 2. Precast concrete planks over bar screen area
Foamed Plastic Insulation	1. 50mm extruded polystyrene insulation at drywell ceiling and upper 2.4m of drywell walls - fire hazard due to high Flame Spread rating
Other	

BUILDING SITE AND SECURITY

SITE PAVING

Driveway Construction	None
Condition	n/a
Sidewalk Construction	None
Condition	n/a
Width x Length	n/a
Comments	

SITE DRAINAGE Good

Comments

1. Site generally level on north, west and south sides and slopes away from building on east side.
2. Main floor approximately 100mm above grade on west side

FENCING

Fencing Function(s)	n/a
Fencing Construction	None
Fencing Finish	n/a
Condition (General)	n/a
Condition (Finish)	n/a
Height x Length	n/a

Comments

GENERAL SECURITY & VANDALISM

General Site Security: Open site

Exterior Lighting

Fixture Locations	None
Site Lighting Levels	Poor
Control	n/a

Comments

Evidence of Graffiti: 1. Yes - this is a constant problem

Evidence of Damage: 1. No - just minor wear and tear on building

Comments: 1. Building has been repeatedly painted to cover graffiti

ANNEX B16
MECHANICAL
PHOTOS

PHOTO B16-1

SHAFT SEAL WATER LINE - COPPER PIPING

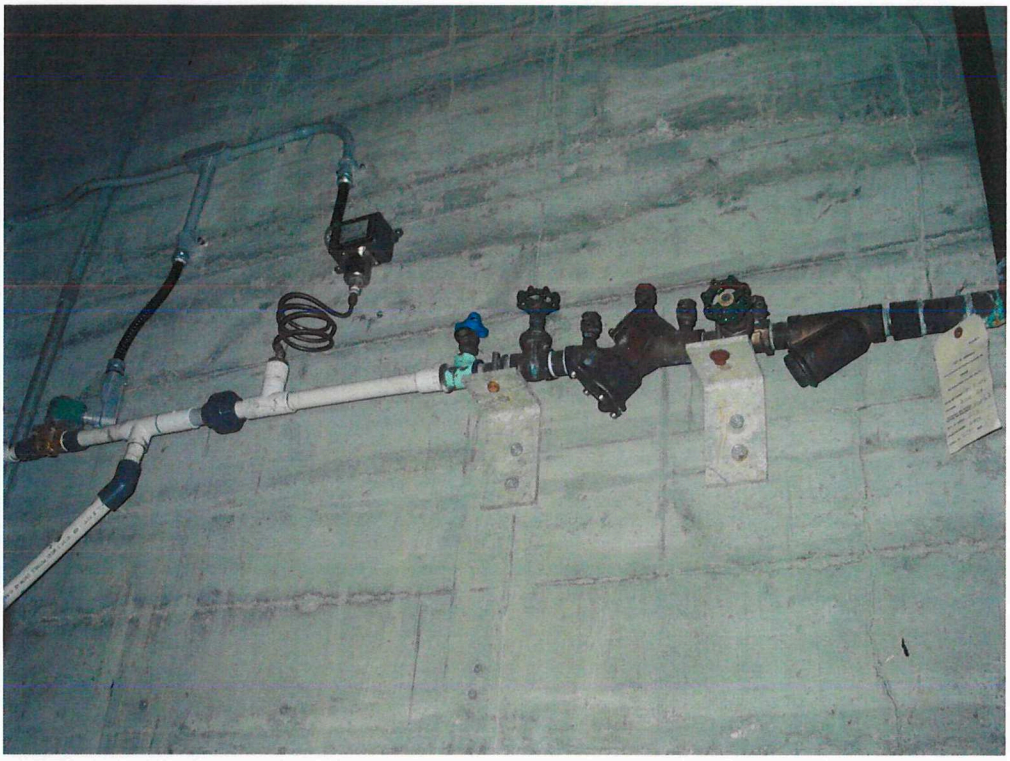

PHOTO B16-2

SHAFT SEAL WATER MAIN LINE VALVES - CORROSION ON STRAINER, CHECK VALVE AND GATE VALVES

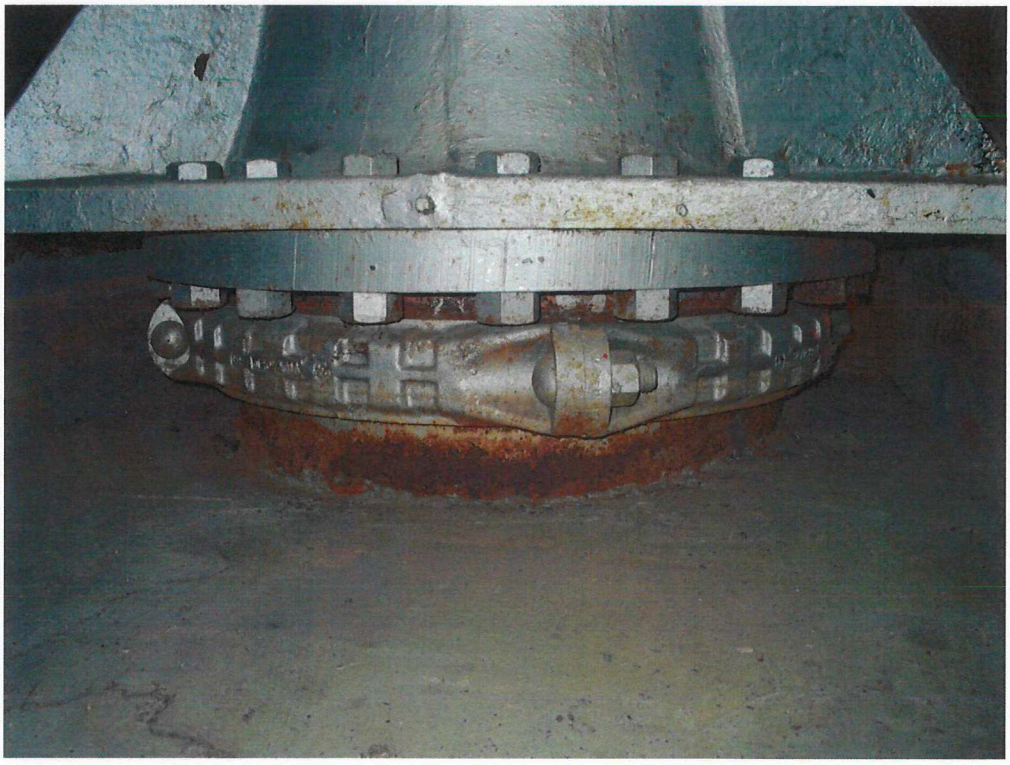

PHOTO B16-3

CORROSION ON PUMP 105 SUCTION LINE

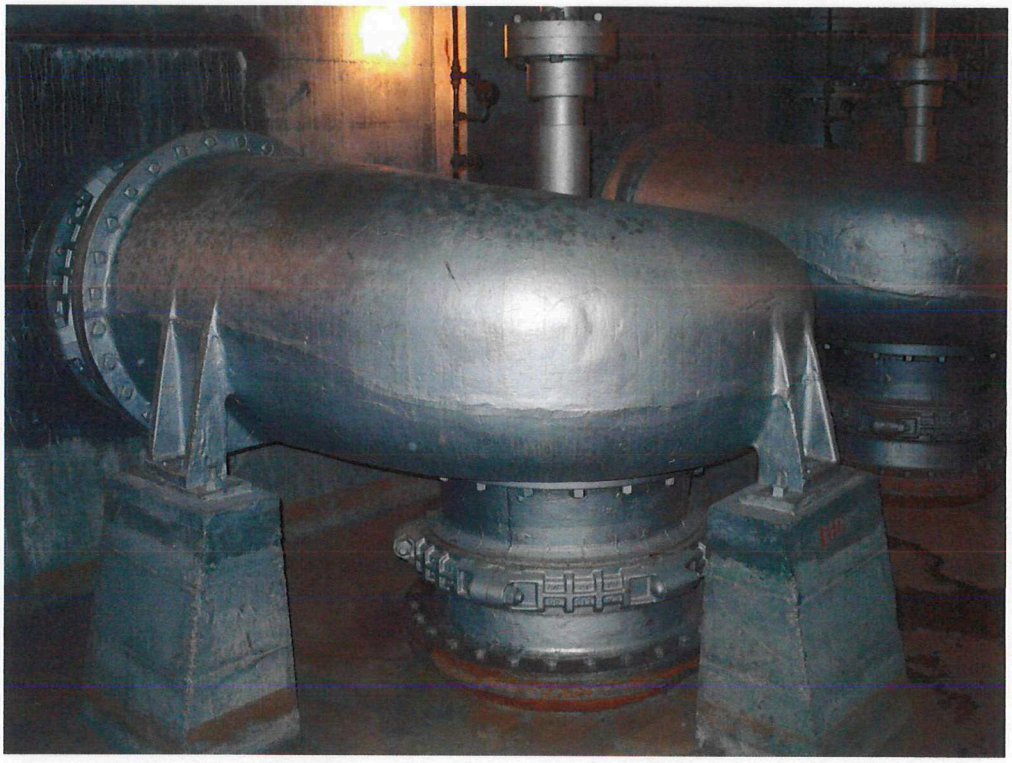

PHOTO B16-4

CORROSION ON PUMP 106 SUCTION LINE

PHOTO B16-5

CORROSION ON PUMP 107 SUCTION LINE

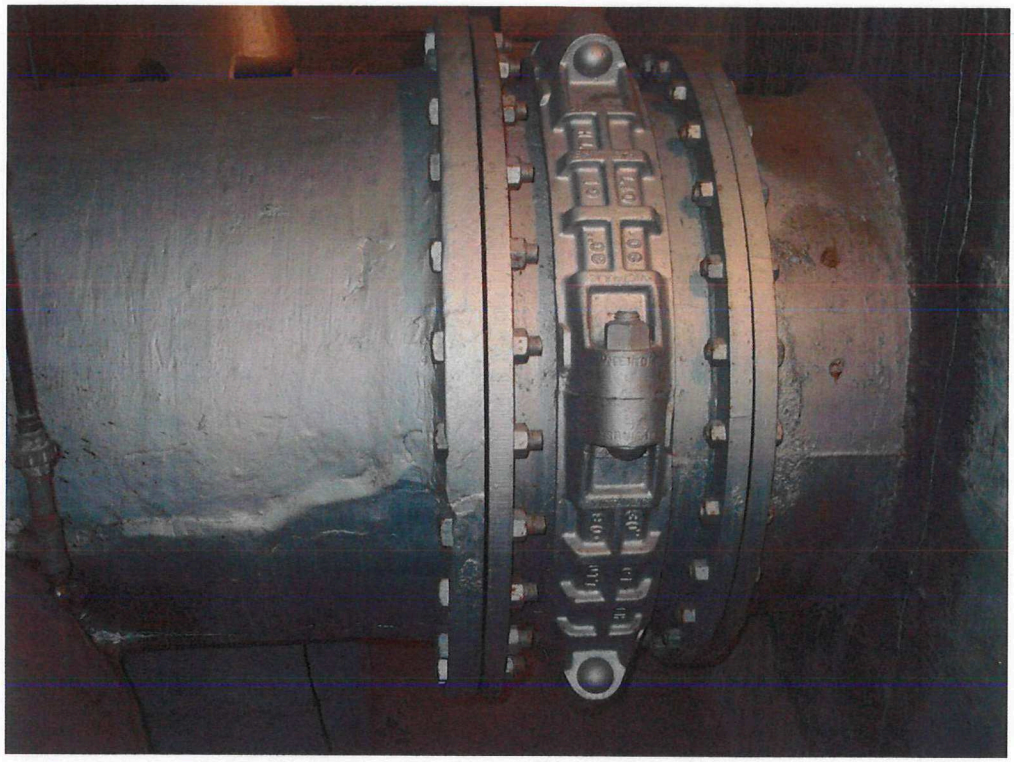

PHOTO B16-6

CORROSION ON PUMP 106 DISCHARGE LINE (CORROSION IS PAINTED OVER)

PHOTO B16-7

PUMP 105

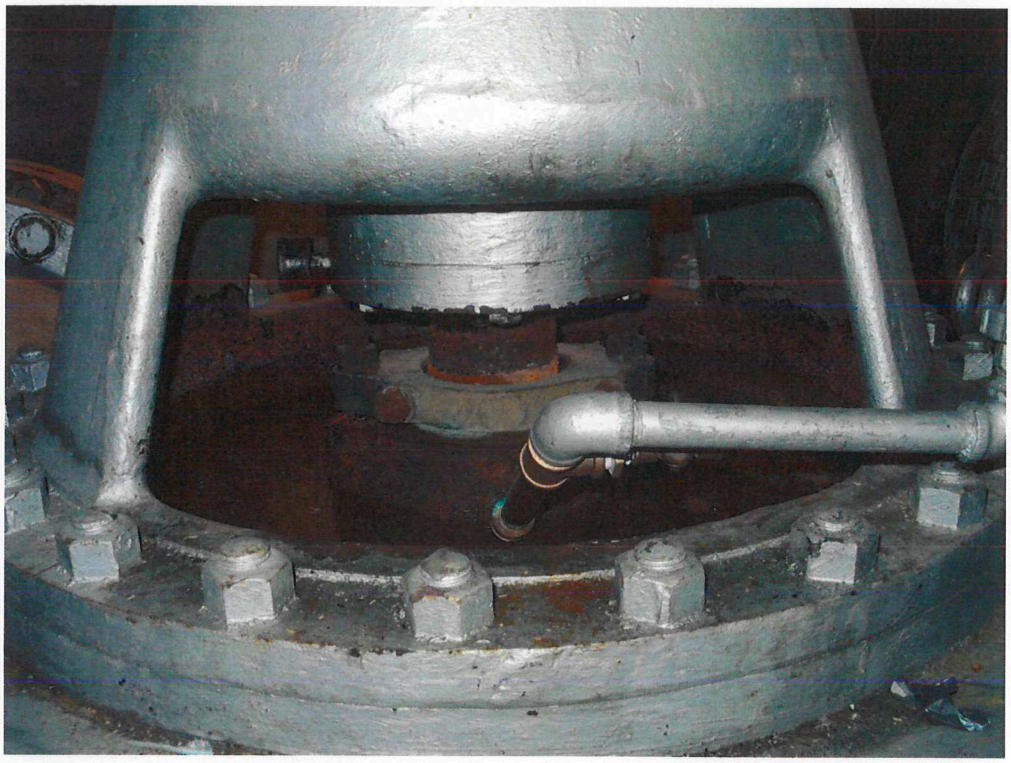

PHOTO B16-8

PUMP 105 - PACKING GLAND COVER AND SHROUD

PHOTO B16-9

PUMP 105 - WATER POOLING AROUND PACKING GLAND

PHOTO B16-10

PUMP 107

PHOTO B16-11

PUMP 107 - CORROSION ON BEARING COVER

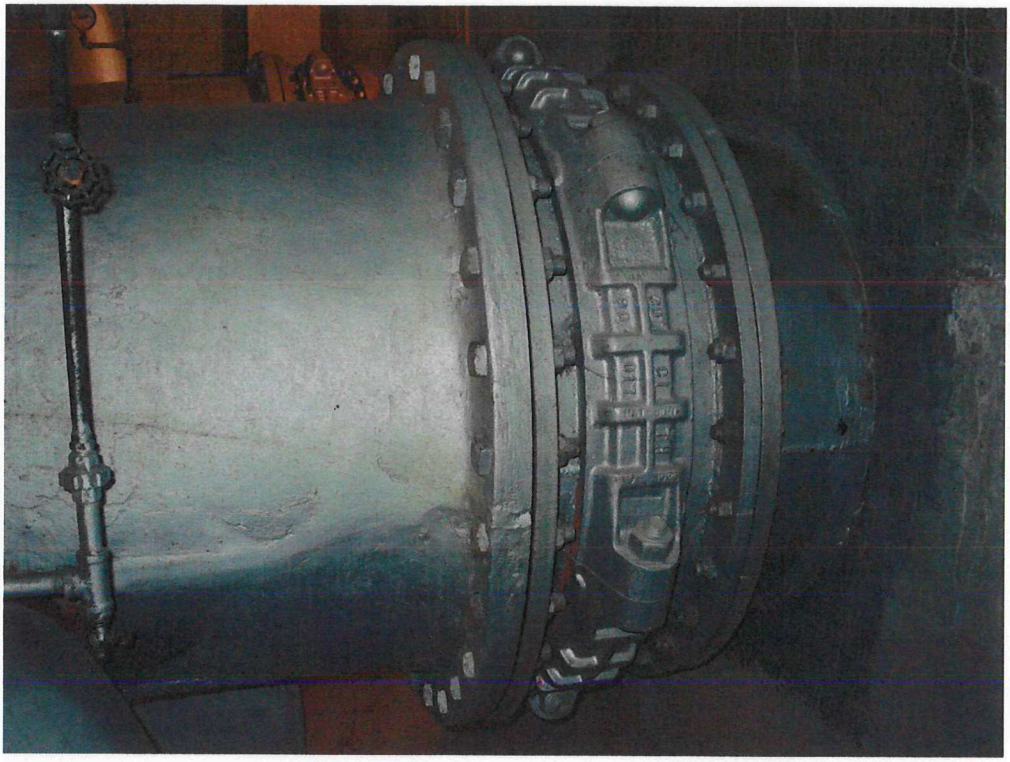

PHOTO B16-12

PUMP 107 - DISCHARGE LINE

ANNEX B16
MECHANICAL
DATA COLLECTION SHEETS
AND TEST RESULTS

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

HVAC EQUIPMENT
Main Floor Cooling Fan

FAN DATA

Tag	
Make	
Model No.	
Size	
Arrangement	
Airflow	CFM
Pressure	in. w.g.
RPM	
Serial No.	
Date of Manufacture	
Type	
Drive	
Acoustic Lining	
Exhaust Orientation	
Installation Type	

Comments / Condition Assessment

- No main floor cooling fan installed at this station.

FAN MOTOR DATA

Tag	
Make	
Model No.	
Serial No.	
HP	HP
RPM	rpm
Volt	V
Phase	Ph.
Current Draw	amp
Freq.	Hz
Frame	

Comments / Condition Assessment

- No main floor cooling fan installed at this station.

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

HVAC EQUIPMENT
Drywell Ventilation / Pressurization Fan

FAN DATA

Tag		
Make	Alpha Manufacturing Co.	
Model No.	1350	
Size		
Arrangement		
Airflow		CFM
Airflow		Air Changes per Hour
Pressure		in. w.g.
RPM		
Serial No.	14257	
Date of Manufacture		
Type	N.O.L	
Drive	Belt	
Discharge Duct Dimensions	11x15 then 16x16	inch x inch
Suction Duct Dimensions	15	inch diam.

Comments / Condition Assessment

- Drywell ventilation (pressurization) appears to be adequate for this station based on qualitative observation (not calculation).

FAN MOTOR DATA

Tag		
Make	Westinghouse	
Type		
Model No.		
Serial No.		
Catalog No.		
HP	¾	HP
RPM		rpm
Volt	120	V
Phase	1	Ph.
Freq.	60	Hz
Current Draw		amps
Frame		
Max. Amb.		deg. C

Comments / Condition Assessment

Estimated fan CFM = 1100 cfm
Drywell volume = 11858 ft^3
Air changes per hour = 5.6 ACH

DRYWELL SIZE

Height	34.0	ft.
Length	25.8	ft.
Width	13.5	ft.
Diameter		ft.
Volume	11858	ft^3

HVAC EQUIPMENT
Heating

DRYWELL HEATER

Tag		
Make	Stelpro	
Model No.	PCH4800T	
Serial No.		
Input	4.8	kW
Output		kW
Volt	240	V
Phase	1	Ph.
Freq.	60	Hz
Current Draw	20	amps
Date	04-2002	

Comments / Condition Assessment

- Aluminum fan blades OK. Very mild surface corrosion of heating element.

MAIN FLOOR HEATER

Tag		
Make		
Model No.		
Serial No.		
Input		kW
Output		kW
Volt		V
Phase		Ph.
Freq.		Hz
Current Draw		amps
Date		

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

PIPING
Shaft Seal Piping
(see data summary for condition ratings)

Main or Pump Branch Service	Pipe Size [inch]	Pipe Condition	Valve Condition	Paint Condition	Joint Condition
Main	¾	Surface corrosion.	Very good – very minor surface corrosion.	Copper (unpainted)	Solder is in good condition.
Main	¾	Good	Very good – very minor surface corrosion.	PVC (unpainted)	Cement is in good condition.
Branch to Pump 105	¾, ½	Good, minor surface corrosion.	Good	Copper (unpainted)	Solder starting to corrode.
Branch to Pump 106	¾, ½	Good, minor surface corrosion.	Good	Copper (unpainted)	Solder starting to corrode.
Branch to Pump 107	¾, ½	Good, minor surface corrosion.	Good	Copper (unpainted)	Solder starting to corrode.
Branch to Pump 105	½	Good	Good	Good (silver painted carbon steel)	Good
Branch to Pump 106	½	Good	Good	Good (silver painted carbon steel)	Surface corrosion at joint btn. copper and c. steel pipe (other joints also).
Branch to Pump 107	½	Good	Good	Good (silver painted carbon steel)	Surface corrosion at joint btn. copper and c. steel pipe (other joints also).

Comments

- Should consider converting remaining copper pipe to PVC.
- Note that the valve on the pipe to dewatering pump 108 is closed as this pump is out of service.

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

Flood Pump Piping
(see data summary for condition ratings)

Pump Tag	Pipe Size [inch]	Pipe Condition	Valve Condition	Paint Condition	Joint Condition
105 Suction	24	Surface corrosion.	N/A	Flaking at corroded areas	Minor surface corrosion.
105 Discharge	24	Minor surface corrosion.	N/A	Minor flaking at corroded areas	Very minor surface corrosion.
106 Suction	30	Minor surface corrosion only where pipe meets floor.	N/A	Very good	Very good
106 Discharge	30	Surface corrosion.	N/A	Very good	Very good
107 Suction	30	Minor surface corrosion only where pipe meets floor.	N/A	Very good	Very good
107 Discharge	30	Surface corrosion.	N/A	Very good	Very good

Comments

- To extend the life of the piping, the suction and discharge lines on 105 and 106 would benefit from cleaning/sandblasting and new paint.
- With 106 and 107, pipe was painted without proper surface cleaning, as a result, corrosion was painted over. All corrosion should be removed prior to painting.

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

FLOOD PUMP SYSTEMS

PUMP DATA

Tag	105	
Make	Worthington	
Model No.	24-MCZS-1 VERT. VOL.	
Order No.		
Size	24	
Arrangement		
Flow	15,730	gpm
TDH	34	ft
RPM		
Serial No.	1507389	
Date of Manufacture		
Type		
Shaft Seal Packing Material		

Comments / Condition Assessment

- Water is pooling above the pump bowl because the stuffing box shroud drain hole is too high and is plugged.
- The line shaft is becoming very corroded due to water accumulation in stuffing box shroud.
- Water pooling problem should be corrected, and all affected corroded surfaces such as pump bowl, packing gland cover, stuffing box cover, line shaft should be sandblasted and painted.

PUMP MOTOR DATA

Tag	105			
Make	English Electric Co. of Canada Ltd.			
Model No.				
Type	V-125.5-C			
Serial No.	183047			
HP	175	HP		
RPM	580	rpm		
Volt	550	V		
Phase	3	Ph.		
Freq.	60	Hz		
Current Draw		amp		
Amps per Terminal		amp		
Frame				
Temp. Rise	40	deg. C		
Brg PE/Drive end Grease	6320	every	6	months
Brg OE/Opposite end Grease	926710/40	every	6	months
Duty	Cont.			
Duty	% load every			hours

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

FLOOD PUMP SYSTEMS

PUMP DATA

Tag	106		
Make	Dominion Propeller Pump		
Model No.			
Order No.			
Size	30		
Arrangement			
Flow		gpm	
TDH		ft	
RPM			
Serial No.	333-3		
Date of Manufacture			
Type	Vertical		
Shaft Seal Packing Material			

Comments / Condition Assessment

- Pump casing, packing gland cover, and related nuts and bolts are in very good condition.

PUMP MOTOR DATA

Tag	106		
Make	Westinghouse		
Model No.			
Type			
Serial No.	2-2EO4777		
HP	250	HP	
RPM	705	rpm	
Volt	550	V	
Phase	3	Ph.	
Freq.	60	Hz	
Current Draw		amp	
Amps per Terminal	248	amp	
Frame	686V		
Temp. Rise	50	deg. C	
Brg PE/Drive end Grease		every	months
Brg OE/Opposite end Grease		every	months
Duty	Cont.		
Duty	% load every		hours

Comments / Condition Assessment

- Nameplate notes: Use only high grade oil of 800 to 1000 S.S.U @ 100 deg.F. Change oil every 17500 running hours.

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

FLOOD PUMP SYSTEMS

PUMP DATA

Tag	107		
Make	Dominion Propeller Pump		
Model No.			
Order No.			
Size	30		
Arrangement			
Flow		gpm	
TDH		ft	
RPM			
Serial No.	321-2		
Date of Manufacture			
Type	Vertical		
Shaft Seal Packing Material			

Comments / Condition Assessment

- Packing gland cover is leaking slightly, packing gland cover, nuts and bolts are starting to corrode. Corrosion should be removed and surfaces repainted.

PUMP MOTOR DATA

Tag	107		
Make	Westinghouse		
Model No.			
Type			
Serial No.	1-2EO4777		
HP	250	HP	
RPM	705	rpm	
Volt	550	V	
Phase	3	Ph.	
Freq.	60	Hz	
Current Draw		amp	
Amps per Terminal	248	amp	
Frame	686V		
Temp. Rise	50	deg. C	
Brg PE/Drive end Grease		every	months
Brg OE/Opposite end Grease		every	months
Duty	Cont.		
Duty		% load every	hours

Comments / Condition Assessment

- Nameplate notes: Use only high grade oil of 800 to 1000 S.S.U @ 100 deg.F. Change oil every 17500 running hours.

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

FLOOD PUMP SYSTEMS

PUMP DATA

Tag	108	
Make	Worthington	
Model No.	12-MCV-1-VERT. VOL.	
Order No.		
Size	12	
Arrangement		
Flow	3,600	gpm
TDH	55	ft
RPM		
Serial No.	1487428	
Date of Manufacture		
Type		
Shaft Seal Packing Material		

Comments / Condition Assessment

- This is a dewatering pump and is no longer in service.

PUMP MOTOR DATA

Tag	108			
Make	English Electric Co. of Canada Ltd.			
Model No.				
Type	V			
Serial No.	228988			
HP	60	HP		
RPM	1185	rpm		
Volt	550	V		
Phase	3	Ph.		
Freq.	60	Hz		
Current Draw	60.3	amp		
Amps per Terminal		amp		
Frame	504			
Temp. Rise		deg. C		
Brg PE/Drive end Grease	63162J	every	6	months
Brg OE/Opposite end Grease	6314_J	every	6	months
Duty				
Duty	% load every			hours

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

FLOOD PUMP SYSTEMS

PUMP DATA

Tag		
Make		
Model No.		
Order No.		
Size		
Arrangement		
Flow	gpm	
TDH	ft	
RPM		
Serial No.		
Date of Manufacture		
Type		
Shaft Seal Packing Material		
Comments / Condition Assessment		

PUMP MOTOR DATA

Tag			
Make			
Model No.			
Type			
Serial No.			
HP		HP	
RPM		rpm	
Volt		V	
Phase		Ph.	
Freq.		Hz	
Current Draw		amp	
Amps per Terminal		amp	
Frame			
Temp. Rise		deg. C	
Brg PE/Drive end Grease		every	months
Brg OE/Opposite end Grease		every	months
Duty			
Duty	% load every		hours
Comments / Condition Assessment			

FLOOD PUMP SYSTEMS
Wetwell Level Control System

Type	Ultrasonic		
Compressor Make			
Model No.			
Serial No.			
Motor HP			
Motor RPM			
Date of Manufacture			
Airflow		scfm @	psi
Max. Pressure		psig	
Ultrasonic Controller Make	Milltronics Multiranger Plus		
Tag	CF-206-LIT		
Model No.			
Serial No.			
Date of Manufacture			
Level Transmitter Make			
Tag			
Model No.			
Serial No.			
Calibration		inches H_2O	
Output			
Supply		VDC max.	
Max. W.P.		psig	
Pressure Switch Make			
Tag			
Model No.			
Type			
Serial No.			
Range		psi	
Differential		psi	
Supply		amps	VDC
Enclosure Type			
Constant Differential Relay Make			
Tag			
Model No.			
Pressure Reg. Valve Make			
Tag			
Model No.			
Serial No.			
Range		psi	recommended
Range		psi	actual
Comments / Condition Assessment			

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

PHOTOS

	Acquired
DRYWELL PHOTOS	
Drywell Heater & Elec. Connection	✓
Sump Pump Connection in Drywell	✓
Drywell Ventilation Fan Discharge Duct	✓
Drywell Overall Shot from Bottom of Well	✓
Drywell Overall Shot from Top of Well	✓
Drywell Insulation	✓
Drywell Lighting	✓
Pump(s)	✓
Pump Suction(s)	✓
Pump Discharge(s)	✓
Shaft Seal Main Piping	✓
Shaft Seal Branch Piping to Pump(s)	✓
Shaft Seal Branch Piping at Packing Gland(s)	✓
Electrical Conduit Condition	✓
Wall Condition	✓
Floor Condition	✓
Bearings	✓
Guardrail / Ladder	✓
MAIN FLOOR INDOOR PHOTOS	
Cooling Fan & Motor	—
Cooling Fan Ductwork	—
Drywell Ventilation Fan & Motor	✓
Drywell Ventilation Ductwork	✓
Main Floor Heater	—
Motor(s)	✓
Motor Shaft Connection(s) to Pump	✓
Distribution Panel Schedule	✓
Interior Lighting	✓
Bubbler or Ultrasonic Control	✓
General Telephone Entrance	✓
Interior Shots Summarizing All Walls	✓
Interior Shot of Ceiling / Roof Structure	✓
OUTDOOR PHOTOS	
Overall "Title Page Shot" of Exterior	✓
Exterior Shots Summarizing All Walls	✓
Exterior Shots Summarizing Station Surroundings	✓
Exterior Shots (from ladder) of Flat Rooftop	✓
Typical Exterior Light	—
Air Intakes	✓
Padmount / Poletop Transformer	✓

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

FPS NAME: JESSIE	MAIN PUMP	105	106	107	#	#	#	TOTAL / SUMMARY (NOT INCL. D/W)	COMMENTS
MOTOR HP		175	250	250				675	HP
PACKING GLAND COVER		C2	C1	C2				C1-C2	
PACKING GLAND COVER NUTS & BOLTS CORROSION		C1	C2	C2				C1-C2	
BEARING COVER NUTS & BOLTS CORROSION		NA	C2	C2				NA/C2	
SHROUD NUTS & BOLTS CORROSION		C0	NA	NA				NA/C0	
PUMP BOWL PAINT		P3	P3	P3				P3	
FLOOD PUMP PIPING									
SUCTION									
MATERIAL		D.I.	D.I.	D.I.				D.I.	
CORROSION		C4	C3	C4				C3-C4	
PAINT		P5	P3	P5				P3-P5	
DISCHARGE									
MATERIAL		C.S.	C.S.	C.S.				C.S.	
CORROSION		C2	C1	C1				C1-C2	
PAINT		P3	P0	P0				P0-P3	
JOINT CORROSION									
SUCTION PIPE FLANGED		C2	C2	C3				C2-C3	
SUCTION PIPE VICTAULIC		C2	C2	C2				C2	
DISCHARGE PIPE FLANGED		C2	C1	C1				C1-C2	
DISCHARGE PIPE VICTAULIC		C2	C1	C0				C0-C2	
SHAFT SEAL WATER PIPING									
PIPING									
MATERIAL	CU/PVC	CU	CU	CU				CU/PVC	Main line has corrosion upstream of valve train at elbow. Most of main line is Cu, branches are all Cu.
CORROSION	C4	C2	C2	C2				C2-C4	
PAINT	CU/PVC	CU/P1	CU/P1	CU/P1				CU/PVC/P1	
JOINTS									
TYPE	SOL/THRTEF/CEM	SOL/THRTEF	SOL/THR	SOL/THR				SOL/THRTEF/CEM/THR	
CORROSION	C2	C2	C2	C3				C2-C3	
CONDITION	J2	J2	J2	J3				J2-J3	
VALVES									
CONDITION	C2	C1	C1	C2				C1-C2	

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 25-Aug-2004
INSPECTOR: H. Williams, KGS Group

JOINT CONDITION DEFINITIONS	JOINT TYPES	MATERIALS	CORROSION DEFINITIONS	PAINT CONDITION DEFINITIONS
J0 - Joint is like new, excellent seal	VIC - Victaulic Coupling	D.I. - Ductile Iron	C0 - No Corrosion - Surface is in like new condition	J0 - Joint is like new, excellent seal
J1 - Joint is good but not optimal	FLG - Flanged Connection	C.S. - Carbon Steel	C1 - Very minor surface corrosion - Cross section is barely affected but minor corrosion is visible	J1 - Joint is good but not optimal
J2 - Joint seal (solder/cement/teflon/threads) is slightly worn, corroded or damaged	THR - Threaded	Cu - Copper Pipe / Tubing	C2 - Minor Surface Corrosion - Cross section is slightly affected, corrosion is visible.	J2 - Joint seal (solder/cement/teflon/threads) is slightly worn, corroded or damaged
J3 - Joint seal (solder/cement/teflon/threads) is visibly worn, corroded or damaged, but not leaking	THR/TEF - Threaded w/ Teflon Tape	PVC - PVC Pipe	C3 - Surface Corrosion - Cross section is affected, corrosion is clearly visible.	J3 - Joint seal (solder/cement/teflon/threads) is visibly worn, corroded or damaged, but not leaking
J4 - Joint condition may be the cause of periodic leakage	SOL - Soldered	RR - Red Rubber Hose	C4 - Advanced Surface Corrosion - Cross section is decreasing, structural integrity is still acceptable.	J4 - Joint condition may be the cause of periodic leakage
J5 - Joint has a definite small leak	CEM - PVC Cement		C5 - Heavy Surface Corrosion - Due to loss of base material, structural integrity is questionable.	J5 - Joint has a definite small leak
J6 - Joint has a definite large leak	CLMP - Double Hose Clamp		C6 - Extreme Surface Corrosion - Major corrosive loss with rust-through at a minimum of one location.	J6 - Joint has a definite large leak

ANNEX C16
GEOTECHNICAL
PHOTOS

PHOTO C16-1

JESSIE AVENUE FPS SEPTEMBER 16, 2004 - UPPER BANK AREA LOOKING SOUTH TOWARDS STATION.

PHOTO C16-2

JESSIE AVENUE FPS SEPTEMBER 16, 2004 - UPPER BANK AREA LOOKING WEST.

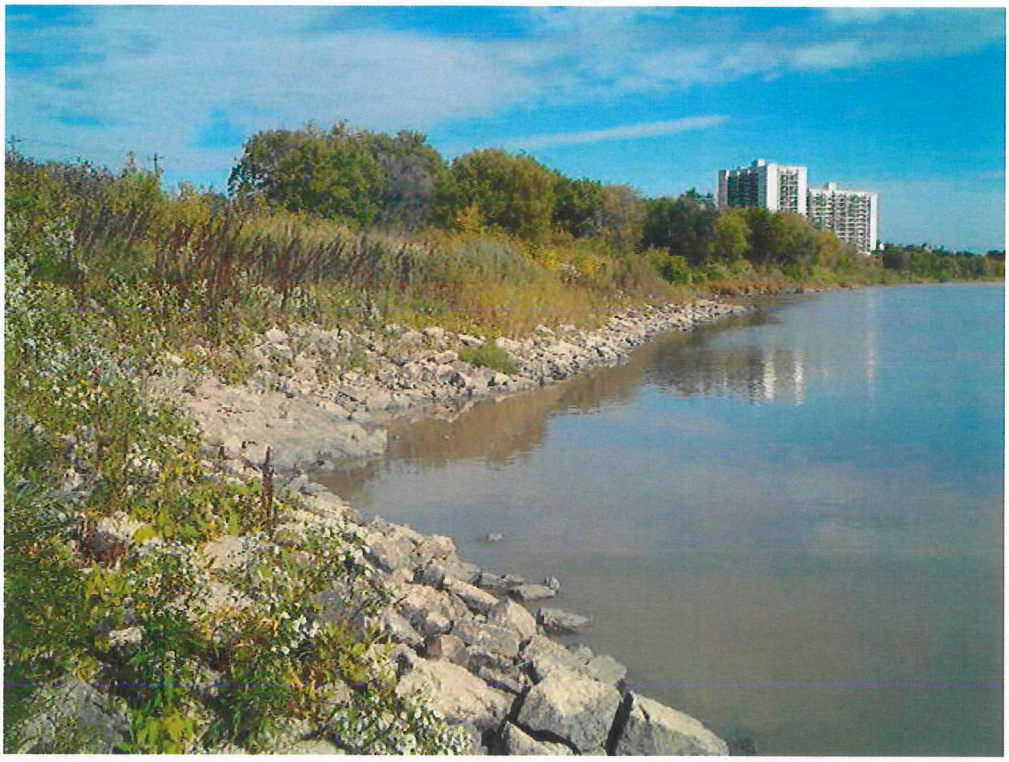

PHOTO C16-3

JESSIE AVENUE FPS SEPTEMBER 16, 2004 - LIMESTONE RIPRAP ALONG SHORELINE LOOKING NORTH.

ANNEX C16
GEOTECHNICAL
DATA COLLECTION SHEETS
AND TEST RESULTS

FLOOD PUMP STATION SITE INSPECTION
GEOTECHNICAL CONDITIONS
DATA COLLECTION SHEET

FPS NAME:	Jessie
STREAM:	Red River
INSPECTION DATE:	16-Sep-04
INSPECTOR:	C.W. Carroll, KGS Group
WEATHER:	Sunny

GENERAL

APPROX. BANK HEIGHT: 8.3 m (above Regulated Summer River Level)

STATION DIST TO TOP OF BANK: 7 m (at closest point)

Comments

RIVER SECTION: *outside bend*

Comments

APPROX. SLOPE

Shoreline:	6H:1V
Mid bank:	6H:1V
Upper Bank:	6H:1V
Overall :	6H:1V

Comments

DRAINAGE CONDITIONS

Comments
- Good surface drainage to river.

VEGETATION: *mature trees, scrub brush, native grasses*

Comments
- 5 mature trees within right of way.
- Extensive mature trees immediately upstream and starting 50 m downstream of station.

INSTRUMENTATION: *inclinometers*

Comments / Condition Assessment
- Two (2) existing slope inclinometers in place; installed by KGS Group in 1990 and 1992.

FLOOD PUMP STATION SITE INSPECTION
GEOTECHNICAL CONDITIONS
DATA COLLECTION SHEET

FPS NAME:	Jessie
STREAM:	Red River
INSPECTION DATE:	16-Sep-04
INSPECTOR:	C.W. Carroll, KGS Group
WEATHER:	Sunny

STABILITY / EROSION

SLUMP — *inactive, retrogressive*

Comments / Condition Assessment
- Extensive inactive retrogressive slump blocks upstream and downstream of station along mid and upper bank area.
- No evidence of recent slope movements at station.

EROSION — *none*

Comments / Condition Assessment
- None, extensive riprap blanket in place along shoreline.

EXISTING BANK WORKS

Comments / Condition Assessment
- Limestone riprap blanket (50-450 mm diameter, D_{50} 300 mm) in place along shoreline. Extends >100 m upstream and 50 m downstream of outfall pipe.

OTHER

Comments / Condition Assessment
- Low risk of failure.
- Riverbank at station and extending 50 m$\pm$ downstream appears to have been regraded along mid and upper bank areas.

ANNEX D16
SUBSTRUCTURES AND GATES
PHOTOS

PHOTO D16-1

DRY WELL ACCESS STAIR - STEEP AND MISSING MID-RAILS

PHOTO D16-2

SHAFT MOUNTS - MINOR CORROSION ON NUTS AND BASEPLATE EDGES

PHOTO D16-3

INTERMEDIATE BEAMS AND COLUMNS (DRY WELL) - MULTIPLE PATCHED LOCATIONS

PHOTO D16-4

DRY WELL WALLS - WHITE DEPOSITS (EFFLORESCENCE) AND ORANGE STAINS

PHOTO D16-5

DRY WELL WALLS - WHITE DEPOSITS (EFFLORESCENCE) FROM HAIRLINE CRACKS AT CONCRETE INFILLS

PHOTO D16-6

DRY WELL FLOOR SLAB - MINOR CRACKS

PHOTO D16-7

DRY WELL FLOOR SLAB - MULTIPLE MINOR CRACKS

PHOTO D16-8

PUMP BASE - BOTTOM CORNER SPALLED OFF AND EXPOSED REINFORCING STEEL (CORRODED - SECTION LOSS)

PHOTO D16-9

FLAP GATE - MINOR CORROSION

PHOTO D16-10

FLAP GATE - FRAME AND ANCHOR BOLTS - NO CORROSION

PHOTO D16-11

SLIDE GATE - SECTION LOSS

PHOTO D16-12

UNDERSIDE OF SLIDE GATE - HEAVY SECTION LOSS

PHOTO D16-13

EMBEDDED SLIDE GATE THIMBLE - HEAVY CORROSION

PHOTO D16-14

WEDGE BLOCK (SLIDE GATE) - CORRODED (ALL ANCHOR BOLTS IN GOOD CONDITION)

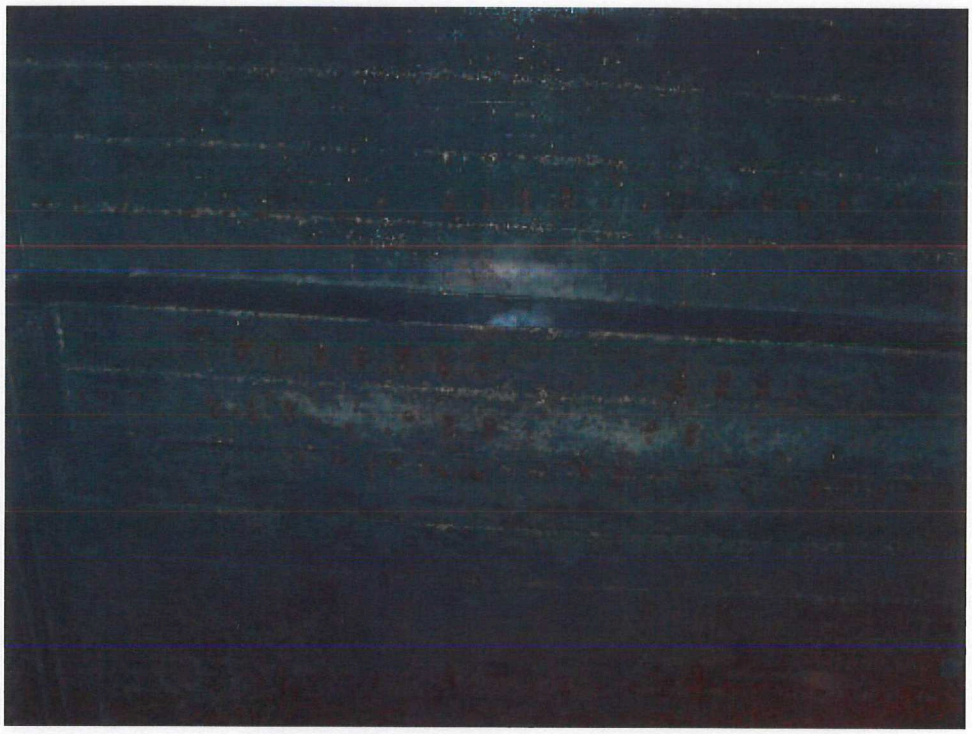

PHOTO D16-15

WET WELL ROOF - EXPOSED REBAR

PHOTO D16-16

WET WELL ROOF - SPALLING WITH EXPOSED REBAR

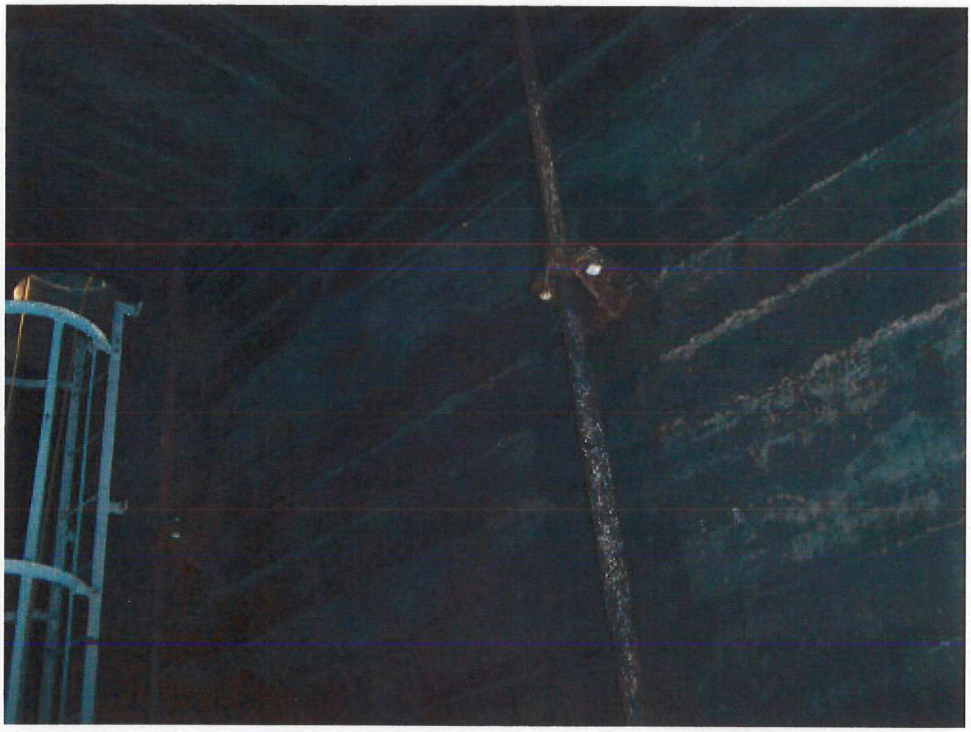

PHOTO D16-17

WET WELL WALLS - GOOD CONDITION

PHOTO D16-18

WET WELL INTERMEDIATE SLAB AND RAILINGS - GOOD CONDITION

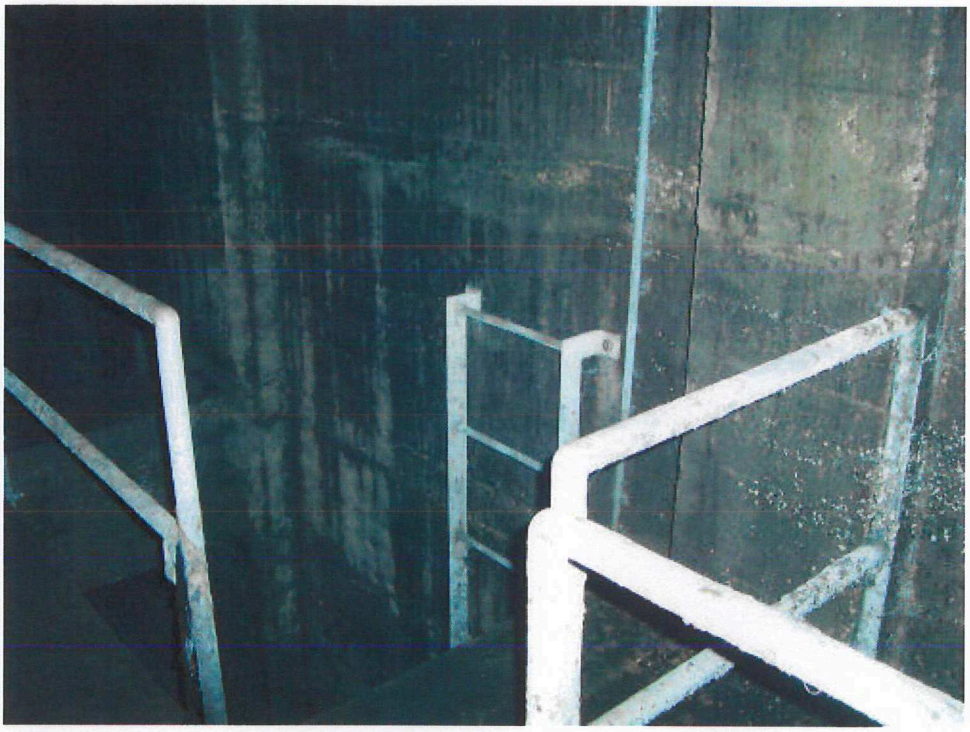

PHOTO D16-19

WET WELL INTERMEDIATE RAILING - SECTION MISSING

PHOTO D16-20

WET WELL LADDER - GOOD CONDITION

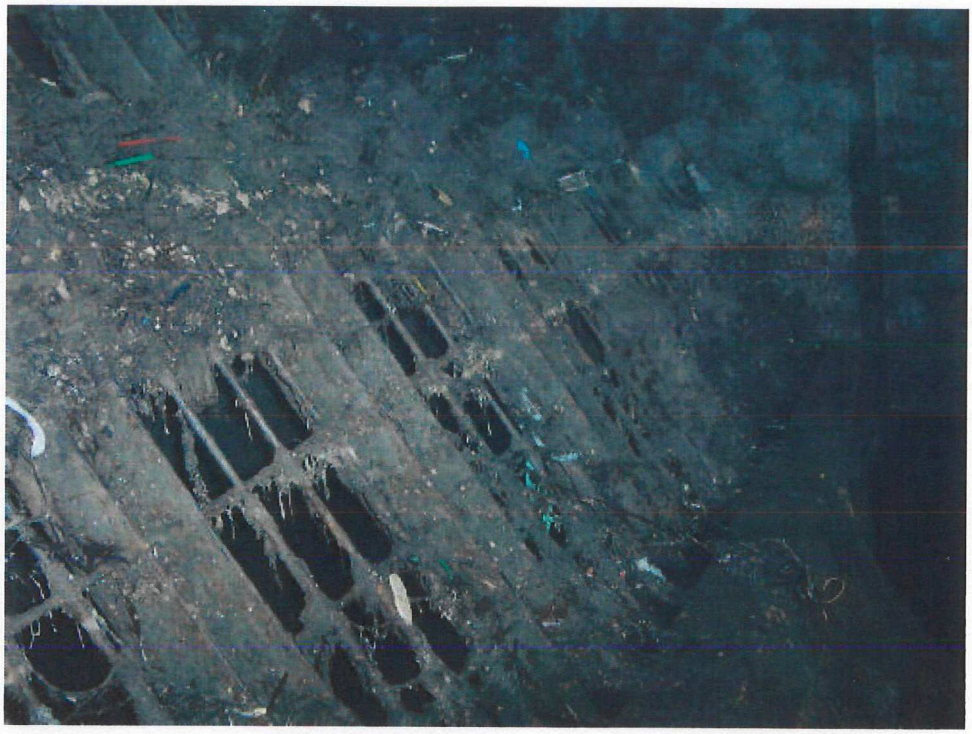

PHOTO D16-21

WET WELL TRASHRACKS - LOTS OF DEBRIS

PHOTO D16-22

WET WELL TRASHRACKS - CORRODED

PHOTO D16-23

SLIDE GATE SHAFTS AND GUIDES - CORRODED

PHOTO D16-24

SLIDE GATE SHAFTS AND GUIDES - CORROSION WITH SECTION LOSS AND DAMAGE

PHOTO D16-25

WET WELL FLOOR - GOOD CONDITION

ANNEX D16
SUBSTRUCTURES AND GATES
DATA COLLECTION SHEETS
AND TEST RESULTS

FLOOD PUMP STATION SITE INSPECTION
SUBSTRUCTURE & GATES
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 2-Dec-04
INSPECTOR: Andi Bogdanovic
Jarod Bosco
KGS Group

SUBSTRUCTURE

MAIN FLOOR SLAB

General Description	Concrete
Condition (General)	Good
Cracking	Few minor hairline cracks
Spalling	No
Moisture	Minor
Motor grout	Good condition

Comments

Exterior wall minor hairline cracks - good condition
Interior wall mostly brick (masonry) - good condition
All anchor bolts and washers good condition
Steel baseplate minor surface corrosion

FLOOR HATCH COVER

General Description	Access hatch opening to drywell has a shed enclosure above
Condition (General)	Good
Handles	Good
Accessibility & Safety	No comment

Comments

Pump hatch - precast concrete (4 panels)good condition directly north entrance chips on panel edges

2nd Pump hatch - 1 built up wood hatch cover (2x4 butted up to one another) - 2"x4" wooden panels good condition

STAIRS/LADDERS

Stairs

Condition (General)	Good
Corrosion	Minor
Damage	No
Accessibility & Safety	Steep stairs
Treads (width x depth)	30"x9.5"
Handrail Height	35"
Slope (rise/run)	(12"/7") (59 degrees from horizontal)

Comments

4 levels of stairs with 3 platforms

Mid-rails missing

FLOOD PUMP STATION SITE INSPECTION
SUBSTRUCTURE & GATES
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 2-Dec-04
INSPECTOR: Andi Bogdanovic

DRY WELL CONC. BEAMS

Condition (General)	Good
Cracking	None visible
Spalling	No
Shaft guide bolts	Good condition - minor corrosion on few nuts
Staining	Minor stains - white powder (efflorescence)

Comments

2 levels, 1 bm per level (spanning East -West)
Between E-W bm - 1 level, 2 bm's per level (spanning North-South)
2 columns b/t N-S and E-W beams patched - previour repairs - grout rough around edges
Upper level beam (E-W) sides and underside patched with grout multiple patched locations
Shaft mount plate and grout pad good condition
Baseplate minor edge corrosion

DRY WELL WALLS

Condition (General)	Good
Cracking	No
Spalling	No
Moisture	No
Staining	Yes
Previous repairs	Yes

Comments

Hairline cracks at concrete infills where pipes penetrate walls (grout - patched)
On all sides - patched/grout- minor patch jobs
No signs of injections
Infills where pipes goes through wall - white stains (efflorescence)
Some areas - corner of wall - North wall some stains (Orange/white)
Minor past seepage on walls

DRY WELL FLOOR

Condition (General)	Good
Cracking	Yes, along entire floor in all directions (1/32" gap)
Spalling	No
Moisture	No
Staining	Minor stains
Previous repairs	No
Sump pit	Yes

Comments

Multiple minor cracks

FLOOD PUMP STATION SITE INSPECTION
SUBSTRUCTURE & GATES
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 2-Dec-04
INSPECTOR: Andi Bogdanovic

PUMP BASES

Condition (General)	Good/Fair
Cracking	Yes, pump 1 (from East) - one base vertical crack at top near plate
Spalling	Yes
Anchor bolts	Galvanized - good condition
Staining	Minor
Previous repairs	No
Steel baseplate	Galvanized - minor surface corrosion

Comments: Pump 2 (East) - 2 out of 3 bases bottom edge spalled off and reinforcing steel bars (stirrups) exposed with minor surface corrosion

Other comments: Previous repairs on beams and columns - City staff indicated probably over 30 yrs ago

DISCHARGE BOX WALLS

Condition (General)	Good
Cracking	Minor cracks exterior wall
Spalling	No
Moisture	No
Previous repairs	No comment

Comments:

DISCHARGE BOX FLOOR

Condition (General)	Good
Cracking	No
Spalling	No
Moisture	No
Previous repairs	No comment

Comments:

FLOOD PUMP STATION SITE INSPECTION
SUBSTRUCTURE & GATES
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 2-Dec-04
INSPECTOR: Andi Bogdanovic

DISCHARGE BOX ROOF

Condition (General)	Good
Cracking	No
Spalling	No
Moisture	No
Previous repairs	Yes

Comments: Appears that underside of slab grouted - some locations

DISCHARGE STOPLOGS

Condition (General)	n/a
Timber/Concrete const.	n/a
Present/Removed	No stoplogs used
Moisture	No

Comments: 3 concrete box chambers - opening at top to allow flow

Hilti bolts top of baffle used to secure lids over 20 yrs ago to prevent pipe freeze up - not used anymore

Other comments:

CONTROL GATES

GENERAL DATA

Gate Chamber Height:	ft.
Gate Chamber Length:	ft.
Gate Chamber Width:	ft.
Flap Gate Type: (cast iron / fabricated)	Cast iron
Flap Gate Model (nameplate):	
Flap Gate Opening Height:	7 ft.
Flap Gate Opening Width:	6 ft.
Flap Gate Sill Elevation (above floor):	
Slide Gate Type: (cast iron / fabricated)	Cast iron
Slide Gate Model (nameplate):	
Slide Gate Opening Height:	7 ft.
Slide Gate Opening Width:	6 ft.
Slide Gate Sill Elevation (above floor):	1 ft.

Debris Accumulations:

Silt and mud deposits on floor

FLOOD PUMP STATION SITE INSPECTION
SUBSTRUCTURE & GATES
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 2-Dec-04
INSPECTOR: Andi Bogdanovic

GATE CHAMBER CONC.

Condition (General)	Good

6 yrs ago re-built new chamber
City workers indicated that sluice gate was re-used 5 yrs ago

FLAP GATE

Condition (General)	Good
Hinges	Minor corrosion
Lifting cable	Yes
Seating face	Bronze

Comments: Stiffeners on gate minor corrosion - no section loss

FLAP GATE FRAME

Condition (General)	Good
Seat	Minor corrosion- along perimeter of washers-Bronze
Thread Studs/bolts	No corrosion
Link (pivot arm)	Minor corrosion
Pivot Lugs	Corrosion - minor section loss along perimeter of nuts
Seating face	Couldn' t get access - gate to large

Comments:
Interface of frame and concrete - minor corrosion
Anchor bolts on frame good condition

FLAP GATE THIMBLE

Condition (General)	Good

Comments: Thimble (couldn't inspect thoroughly) - appears to be good condition

FLOOD PUMP STATION SITE INSPECTION
SUBSTRUCTURE & GATES
DATA COLLECTION SHEET

FPS NAME: Jessie
INSPECTION DATE: 2-Dec-04
INSPECTOR: Andi Bogdanovic

SLIDE GATE

Condition (General)	Poor
Stem block pocket	Heavy corrosion
Wedge	Side and bottom - heavy surface corrosion
Seating face	Appears smooth - fair condition-Bronze

Comments

Gate and stiffeners heavy corrosion - 5% section loss
All bolts good condition
Gate needs attention - heavy corrosion/section loss

SLIDE GATE FRAME

Condition (General)	Fair
Wedge block	Heavy surface corrosion - early section loss
Frame flange	Heavy surface corrosion - early section loss
Anchor bolts	Good condition - no corrosion
Seating face	Appears to be bronze seating - fair condition -smooth

Comments

Thimble heavy corrosion - no section loss
Top wedge block south- bolt sheared off
Frame needs attention - heavy corrosion/section loss
All bolts good condition - appears that 5 yrs ago re-used sluice gate , but installed new bolts and anchor bolts

SLIDE GATE THIMBLE

Condition (General) Fair/Poor

Comments

Thimble heavy corrosion - no section loss
Thimble needs attention - heavy corrosion

SLIDE OPERATOR

Condition (General)	Good
Shaft	Minor corrosion- greasy
Stem guide	Surface corrosion

Comments

No operation b/c City workers indicated 2.5 hours to operate

FLOOD PUMP STATION SITE INSPECTION
WETWELL
DATA COLLECTION SHEET

FPS NAME: JESSIE
INSPECTION DATE: 9-Nov-05
INSPECTOR: A. Bogdanovic
T.Froehlich
KGS Group

SUBSTRUCTURE

WETWELL ROOF CONCRETE BEAM

Condition (General)	Good to Fair
Cracking	None Visible
Spalling	Yes
Moisture	Yes
Staining	None Visible
Previous Repairs	None Visible

Comments

Far west beam has segregation & exposed rebar
Entire beam wet
Entire underside of beam chair rebar exposed & corroding, but no spalling yet

WETWELL INTERMEDIATE CONCRETE BEAM

Condition (General)	Good
Cracking	None Visible
Spalling	None Visible
Moisture	Yes
Staining	Yes
Previous Repairs	None Visible

Comments

Lots of white staining on underside

WETWELL WALLS

Condition (General)	Good
Cracking	None Visible
Spalling	None Visible
Moisture	Entire walls wet
Staining	None Visible
Previous Repairs	None Visible

Comments

Pipe going through west wall has a lot of staining and liquid running down side of wall
Lots of segregation occurring at construction joints

FLOOD PUMP STATION SITE INSPECTION
WETWELL
DATA COLLECTION SHEET

FPS NAME:	JESSIE
INSPECTION DATE:	9-Nov-05
INSPECTOR:	A. Bogdanovic
	T.Froehlich
	KGS Group

SUBSTRUCTURE

WETWELL FLOOR

Condition (General)	Good
Cracking	None Visible
Spalling	None Visible
Moisture	Entire floor wet
Staining	None Visible
Previous repairs	None Visible

Comments: Floor has a very rough surface

WETWELL ROOF

Condition (General)	Good to Fair
Cracking	None Visible
Spalling	Yes
Moisture	Yes
Staining	None Visible
Previous repairs	None Visible

Comments:
Minor spalling along edges of walls and beams
Exposed reinforcing chairs all over underside of roof rusting but not yet spalling
Four large spalls approximately 8-10" square
Roof entirely wet

WETWELL INTERMEDIATE SLAB

Condition (General)	Good
Cracking	None Visible
Spalling	None Visible
Moisture	Yes
Staining	Yes
Previous repairs	None Visible

Comments:
Slab entirely wet
Lots of exposed reinforcing chairs but not yet spalling
Lots of white staining

FLOOD PUMP STATION SITE INSPECTION
WETWELL
DATA COLLECTION SHEET

FPS NAME: JESSIE
INSPECTION DATE: 9-Nov-05
INSPECTOR: A. Bogdanovic
T.Froehlich
KGS Group

SUBSTRUCTURE

INLET CULVERT

Condition (General)	Good
Cracking	None Visible
Spalling	None Visible
Moisture	Yes
Previous repairs	None Visible
Staining	None Visible

Comments

OUTLET CULVERT

Condition (General)	Good
Cracking	None Visible
Spalling	None Visible
Moisture	Yes
Previous repairs	None Visible
Staining	None Visible

Comments

FLAP GATE THIMBLE (SEWER)

Condition (General)	Good
Seat	Good
Embedment in concrete	Good

Comments

Visual inspection only couldn't access up close

FLOOD PUMP STATION SITE INSPECTION
WETWELL
DATA COLLECTION SHEET

FPS NAME:	JESSIE
INSPECTION DATE:	9-Nov-05
INSPECTOR:	A. Bogdanovic T.Froehlich KGS Group

SUBSTRUCTURE

FLAP GATE (SEWER)

Condition (General)	Good
Seating face	Good
Comments	Visual inspection only couldn't access up close

FLAP GATE FRAME (SEWER)

Condition (General)	Good
Comments	Visual inspection only couldn't access up close

STAIRS/LADDERS

Condition (General)	Good
Corrosion	None Visible
Damage	None Visible
Accessibility & Safety	Has Cage
Debris	Yes
Comments	Ladders in good shape with no rust

FLOOD PUMP STATION SITE INSPECTION
WETWELL
DATA COLLECTION SHEET

FPS NAME:	JESSIE
INSPECTION DATE:	9-Nov-05
INSPECTOR:	A. Bogdanovic T.Froehlich KGS Group

SUBSTRUCTURE

INTERMEDIATE RAILINGS

Condition (General)	Good
Corrosion	None Visible
Damage	None Visible
Accessibility & Safety	Not Safe
Debris	Yes

Comments

Railings have debris on them
Railings need a section near access to lower level ladder (To large a gap and is a safety concern)

PIPES

Condition (General)	Good
Corrosion	Yes
Damage	None Visible
Hangars & Bolts	Good

Comments

Two pipes one on north wall and one on south wall
Pipes are heavily corroded with section loss

WETWELL SLIDE GATE OPERATOR SHAFTS

Condition (General)	Poor
Corrosion	Yes
Damage	None Visible
Hangars & Bolts	Corroded and broken

Comments

Two shafts on north wall have heavy corrosion and major section loss
One shaft guide for each shaft is broken and not holding the shaft in place
Shaft guides and bolts have heavy corrosion with major section loss

Gates unaccessible (submerged)

FLOOD PUMP STATION SITE INSPECTION
WETWELL
DATA COLLECTION SHEET

FPS NAME:	JESSIE
INSPECTION DATE:	9-Nov-05
INSPECTOR:	A. Bogdanovic T.Froehlich KGS Group

SUBSTRUCTURE

TRASHRACKS

Condition (General)	Good
Corrosion	Yes
Damage	None Visible
Bolts	Good
Hinges	Good
Round Bars	Good
Flat Bars	Good
Exterior Frame	Good
Exterior Angle Seats	N/A
Intermediate Sept'n Wall	N/A
Debris	Yes

Comments

Trashracks have a lot of debris covering almost entire surface
Minor corrosion with no section loss

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