

APPENDIX B – 2005 OUTFALL INSPECTIONS CONDITION AND MAINTENANCE STUDY (R1)



THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

2005 OUTFALL CONDITION AND
MAINTENANCE STUDY

D/190

APRIL, 2005

KGS
GROUP

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



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

May 4, 2005

File No. 05-0107-01

The City of Winnipeg
Water and Waste Department
849 Ravelstone Avenue
Winnipeg, Manitoba
R3W 1S8

ATTENTION: Mr. Kas Zurek, P.Eng.
Design and Construction Engineer

RE: City of Winnipeg, Outfall Condition and Maintenance Study
2005 Update

Dear Mr. Zurek:

We are pleased to submit two copies of our Draft Report for the 2005 Update of the City of Winnipeg Outfall Condition and Maintenance Study. In the report we have summarized the findings of the initial 1998 report, reported on the current status of the Outfall Capital Upgrade Program and the Outfall Inspection Program, and made recommendations regarding the continuance of these programs.

We trust this meets your requirements at this time. We are available after your review of the report to discuss any comments or questions you may have and then to finalize the report. If you have any questions concerning this matter, please call me at 896-1209.

Regards,

Roy Houston, P.Eng.
Manager, Civil / Municipal Services

SH/af
Enclosure

cc: Darcy Strandberg, City of Winnipeg

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1.0 INTRODUCTION

In 1996, KGS Group was retained to perform a comprehensive assessment of the existing condition and the required maintenance for all the outfalls within the City of Winnipeg for which the City's Water and Waste Department had responsibility. The results of this study are contained in the Outfall Condition and Maintenance Study – Final Report, issued by KGS in August 1998. The report summarized the inspections and analyses of the outfalls and contained a number of recommendations regarding an immediate 5-year capital upgrade program and future operations and maintenance programs.

Since the 1998 Report, inspections, maintenance, and repairs to outfalls have diverged from the original recommendations. Very few inspections have been conducted since 1998 and approximately half of the original 5-year construction program has not yet been undertaken. In this follow-up report, we revisit the original construction and inspection programs, review the works that have been undertaken since 1998, and provide updates to the programs complete with new estimates for additional inspections. We also discuss the results of the recent inspection of 15 outfalls selected for potential inclusion in this year's phase of the Outfall Rehabilitation Construction Program.

2.0 1998 REPORT

2.1 REPORT DESCRIPTION

2.1.1 Outfall Inventory

As part of the 1998 report, an inventory of all existing outfalls in the City was first established. This inventory recorded basic information concerning each outfall (location, size), and established whether the outfalls were under the jurisdiction of the Water and Waste Department, or were instead "private outfalls". Private outfalls included outfalls under the responsibility of the Parks and Recreation Department, the University of Manitoba, the Manitoba Department of Highways as well as a small number of industrial, commercial and private interests.

A complete set of drawings showing all the outfalls in the inventory are included in Appendix A. Table 1 summarizes the inventory, providing the number of outfalls sorted by owner, size and receiving stream. These drawings and table are duplicated from the 1998 report.

A total of 387 outfalls were identified and included in the inventory. Based on direction from the City, 128 outfalls were excluded from 1996 study: 37 outfalls were "private outfalls", 16 were significant channels or ditches, and 75 were 300 mm or less or less. This left 259 outfalls to be inspected.

2.1.2 Outfall Inspection

Typically, the rivers and streams in Winnipeg experience low flows and water levels during the late fall and winter, particularly after the fall "drawdown" when the gates at Lockport are opened (usually mid-October). However early and record snowfalls in 1996 and high water and ice levels during the winter of 1996/97 hampered the inspections to the point where it was necessary to extend the inspection schedule into the fall of 1997.

The outfall inspection program was completed by December 1997. Inspections consisted of personal "walk-through" inspections for outfalls greater than 1200 mm in diameter, or CCTV inspection for outfalls between 300 and 1200 mm in diameter. Walk-through inspections

included deflection measurements within the CMP portions of the pipe at regular intervals and at locations of noticeable deflection. The vertical, horizontal, and two diagonal diameters were measured. In addition to the internal inspection, outfall inspections also included external inspections of the outfall structure itself, as well as the riverbank in the vicinity of the outfall.

As detailed in the 1998 report, 77 of the 259 outfalls could not be inspected for a variety of reasons (outfalls were submerged, filled with debris, or inaccessible for other reasons). Tables 2 and 3 list the number of outfalls inspected and not inspected respectively, and are duplicated from the 1998 report

2.1.3 Condition Assessments

The 1998 assessments of outfalls were based on three conditions having the most impact on an outfall: the structural, hydraulic and geotechnical conditions. Each condition produced a rating on a scale of 1 (satisfactory) to 5 (failed). These individual ratings were then used to produce an overall condition rating for each outfall, also on a scale of 1 to 5.

Internally, the structural rating evaluated the physical condition of the outfall pipe, including: deformations, cracks, joint separations, mis-aligned pipe, deterioration of pipe material, etc. The internal deflection measurements on the larger diameter CMP outfalls were used to calculate the actual amount of deflection. Outfall pipes with a deflection of greater than 5% were deemed to have failed. Externally, the structural rating evaluated the physical condition of the outfall end-piece, including deformations, corrosion, and evidence of ice damage.

The hydraulic rating evaluated the hydraulic capacity of the outfall pipe, including: partial collapse of the pipe due to movement of the pipe or from impact from ice or debris, sediment and debris deposits within the pipe, and restrictions caused by roots intrusion in the pipe, or by vegetation growth downstream of the outlet.

The geotechnical rating evaluated the condition of the river bank at the outfall, including: erosion features such as toe scouring or undercutting of the bank, and any and all slope failure features such as active or inactive headscarps, tension cracking, and hummocky topography.

In addition to the structural, hydraulic, geotechnical and overall condition rating, three of the specific aspects making up these ratings were deemed important enough to address individually: outfalls requiring rip-rap repairs, outfalls affected by ice damage and outfalls with debris and sediment build-up.

2.1.4 Inventory Database

As part of the Study, a computerized information management system, or database, was developed for all known sewer outfalls within the City of Winnipeg. All information collected as part of the Study was incorporated into the database. This included all "statistical" information such as location, identification references, size, type of sewer, etc.; as well as all condition assessment information recorded during the inspections of the outfalls including both observed characteristics and calculated ratings. The database has the ability to serve many purposes, including:

- Storing and retrieving information concerning each outfall;
- Maintain inspection and maintenance schedules for each outfall;
- Evaluate the change in condition of each outfall over time and determine a schedule for outfall repair

The database has great potential as a tool for managing the outfall infrastructure of the City of Winnipeg. It is our understanding that the database has not been upgraded since 1998 to reflect the outfall construction since that date. By updating the database and embarking on a regular inspection schedule for the City's outfalls, the database will assist the City in providing timely maintenance and rehabilitation to the system in a cost effective manner.

2.2 REPORT FINDINGS AND RECOMMENDATIONS

A total of 182 outfalls were inspected, 71 of which had a failure condition rating of 5 (failed). Of these, 47 had failed structurally, 13 had failed hydraulically, 2 had failed due to unstable riverbanks, and 9 had failed due to two or more of the above conditions.

Fifty-five outfalls were rated as requiring immediate rehabilitation and repair. The remaining outfalls were assessed with a time frame within which future monitoring and re-inspection to

periodically re-assess their condition would be undertaken. The future monitoring would determine when the outfalls deteriorate to the point where rehabilitation will be necessary. Programs for outfall maintenance, inspection, and rehabilitation were developed, consisting of a five year work schedule to repair the outfalls in the worst condition, and for the remaining outfalls a re-inspection schedule of two to ten years depending on the severity of their condition in 1996.

The original recommended 5-year Outfall Capital Upgrade Plan is shown in Figure 1. It consists of 55 outfalls, with a total estimated construction cost of \$2.7 Million in 1996 Dollars. The program was spread over a five year period, with yearly construction values ranging between \$510,000 to \$560,000.

The original recommended outfall re-inspection schedule is shown in Figure 2. This schedule extended over the same five year time frame as the Capital Upgrade Plans. Estimated cost for the reinspections was \$181,000. It was anticipated that these inspections would show deterioration in some outfalls requiring a continuation of both the Reinspection and Capital Upgrade Plans.

3.0 OUTFALL REHABILITATION PROGRAM - 1998 TO 2004/05

3.1 CONSTRUCTION

Based on the recommendations of the 1998 report, the City has embarked on a rehabilitation program for outfalls. The construction program was begun in 1999, however, the construction program has diverged from the original recommended 5-year Outfall Capital Upgrade Plan. A total of 37 outfalls have been repaired or replaced since 1999. Only 26 of these outfalls were included in the 5-year upgrade plan. The other 11 were repaired or replaced due to sudden failure of the outfall requiring immediate repair. One outfall, Galt Avenue FPS, was only rated as a 3, but was included as part of the 2001 construction of Waterfront Drive.

Figure 3 lists all the outfalls repaired since 1999 and the outfalls on the original 5-year Capital Upgrade Plan that have not yet been repaired. Had not other priorities interceded with the program and the original program been adhered to, all of the outfalls included in Figure 3 would have been rehabilitated by 2004. Instead, only half of the outfalls have been addressed.

3.2 RE-INSPECTION

The 1998 report recommended continued inspection and assessment of outfalls to ensure the performance of the outfalls over the long term, and to provide information to the City for the effective maintenance of the outfalls. It was recommended that an outfall be re-inspected after a certain number of years based on the rating of the outfall from the 1996/97 inspections. Outfalls with a rating of five were included in the 5-year Outfall Capital Upgrade Plan. Outfalls with a rating of four were to be re-inspected about 2 years after the previous inspection. Outfalls rated as threes were to be reinspected approximately 5 to 6 years after of the previous inspection. Outfalls rated as one or two were to be re-inspected after a time of approximately 10 years. This criteria allowed for close monitoring of those outfalls approaching a failure condition and maintained a reasonable monitoring level on outfalls in fair to good condition.

4.0 CURRENT STATUS (2005 INSPECTION PROGRAM)

4.1 CONSTRUCTION

The original construction program for the winter of 2004/05 consisted of 11 outfalls, namely:

| | |
|---------------------|---------|
| Pender Street | AS-10 |
| Raquette Street | AS-16.1 |
| Kennedy Street | AS-91 |
| Hargrave Street | AS-93 |
| Cloutier Drive | RR-7 |
| Dowker Avenue | RR-28 |
| Dunkirk Drive | RR-31 |
| Archibald Underpass | RR-68 |
| Larchdale Crescent | RR-96 |
| Valhalla Drive | RR-103 |
| Booth Drive | ST-3 |

Of these, seven were removed from the program. The four remaining outfalls: Larchdale, Raquette, Valhalla and Archibald are currently under construction.

4.2 INSPECTIONS

In 2004, an attempt was made to inspect approximately 40 outfalls that had not been inspected in 1996/97. It was possible to inspect only three of the outfalls, the remainder were still submerged or otherwise inaccessible. Any future attempts to inspect these outfalls are expected to be costly as dewatering and possibly excavation will be required to adequately prepare the outfalls for inspection.

In March, 2005, 15 outfalls were inspected as part of the preparation for the outfall construction for the winter of 2005/06. Ten of these are included in the 5-year upgrade program, while the other five were included at the request of the City. Of the ten outfalls in the 5-year program, six of them were originally in the construction program for 2004/05, but were removed from the program pending a re-inspection. The outfalls in the inspection program were:

| | |
|---------------------|-------|
| Kennedy Street | AS-91 |
| Hargrave Street | AS-93 |
| St. Norbert X-Kalay | RR-3 |

| | |
|-------------------|--------|
| Cloutier Drive | RR-7 |
| Crane Avenue | RR-26 |
| Dowker Avenue | RR-28 |
| Dunkirk Drive | RR-31 |
| Marion Street FPD | RR-51 |
| Marion Street #2 | RR-52 |
| Rue Despins | RR-54 |
| Rue Despins FPD | RR-55 |
| Kildonan Park #1 | RR-97 |
| Hawthorne Avenue | RR-98 |
| Eastwood Drive | RR-108 |
| Booth Drive | ST-3 |

The inspections were conducted by Uni-Jet Industrial Pipe Services Ltd. Their report is attached in attached in Appendix A.

This inspection program is the most extensive outfall inspection program undertaken since 1996/97. It included outfall locations across the City, with piping ranging from 250 mm to 2100 mm in diameter. Outfall piping was televised from the upstream manhole to the downstream outfall. Some general results from the inspections are as follows:

General

- No external inspections of the outfall structures were made. Due to water levels and the amount of snowfall this year, the outfalls were either submerged or buried.
- Cleaning of outfalls is essential for an accurate condition assessment. Root intrusion, sludge layers at the bottom of the pipe and debris caked on the sides of the piping all obstruct the camera and its ability to view the pipe. However, environmental regulations do not allow debris to be flushed into the receiving stream. Outfalls must be back-flushed and the flushing water collected and disposed of. Cleaning of outfalls is therefore an expensive component of the cost of the inspection.
- Inspection of outfalls within the influence of the City's major rivers (Red and Assiniboine) should be conducted in late fall, after the pre-winter drawdown. In late winter, ice can build up in outfalls and in inlets to the outfalls, obstructing the camera.

Specific

- In one outfall (Booth-ST3), ice had formed at the springline of the pipe. Voids in the ice were encountered that could not be traversed. The CMP portion of the outfall could therefore not be televised or measured.
- Two outfalls (Kildonan Park-RR97 and Crane-RR26) were filled with debris. In both cases the camera was only able to traverse about half of the outfall pipe. The CMP

portion of the outfall was not reached in either case. Crane was also televised in 1996/97 and a review of that tape revealed that the run then was stopped at the CMP as the condition of the CMP would not allow for safe passage of the camera.

- In three outfalls (Kennedy-AS91, Hargrave-AS93, Dowker-RR28), the bottom of the CMP portion of the pipe is badly rotted, apparently throughout the length of the CMP. The camera successfully traversed the non-CMP portion of the pipe, but fell through the bottom of the pipe into a void underneath immediately upon entering the CMP.
- In two outfalls (Marion-RR51 and Hawthorne-RR98), a thick layer of mud obscured the bottom of the pipe from view. The camera traveled through some of the CMP portion of the pipe, but could not traverse the entire length. The portions of CMP that were visible showed some discoloration and signs of some corrosion, but not to the extent of Kennedy, Hargrave, or Dowker.
- In one outfall (Dunkirk-RR31), the piping showed strong evidence of discoloration and corrosion. While the camera was able to traverse the length of the outfall pipe, including the CMP portion, it is suspected that the CMP may be approaching failure. Further monitoring of this outfall should continue.
- In one outfall (St. Norbert X-Kalay-RR3), a lengthy portion of the CMP was submerged. The camera was able to navigate and televize both above and below the water. There may be some corrosion of the CMP occurring at this outfall.
- Four outfalls (Cloutier-RR7, Marion-RR52, Rue Despins-RR54, Rue Despins-RR55) were traversed successfully. Some structural problems were noted, however there was no evidence of extensive corrosion in these outfalls.
- In one outfall (Eastwood-RR108) the inspection did not reach the last few meters of the pipe due to a large snow drift. While no concerns were noted, a review of the inspection video from 1996/1997 shows a major joint failure in the CMP beyond the limits reached during the 2005 inspection.

All outfalls had some structure defects to one degree or another. Of more immediate concern is the number of outfalls whose CMP pipe has corroded to the point of failure. In three outfalls, the camera was unable to reach the CMP portion of the pipe. Of the twelve remaining outfalls, only five were relatively corrosion free. Two outfalls displayed some evidence of corrosion, while three had completely failed. The remaining two outfalls had a thick sludge layer that prevented the camera from traversing the length of the pipe or from observing the bottom of the pipe.

Of the twelve outfalls where all or a portion of the CMP pipe was observed, 25% (3) had completely failed. Another 33% (4) either showed some evidence of corrosion or was not completely inspected due to sludge and debris. Only 42% (5) of the outfalls were relatively corrosion free.

These 15 outfalls comprise only 4.5% of the 330 outfalls under the jurisdiction of the Water and Waste Department, however they form the most extensive outfall inspection program undertaken since 1996/97. If these results are representative of the remaining outfalls, then there appears to be a significant issue with the integrity of CMP piping in the outfalls throughout the City's river system. This could be due to a number of reasons, such as, chemical attack from within the pipe, impacts from debris inside the pipe damaging the galvanizing process and creating "hot spots" for corrosion attack, or chemically or cathodically corrosive soils possibly acting in tandem with river bank movement.

This matter should be investigated further. An investigation would first inspect a number of additional outfalls throughout the City and of various sizes and ages. If it is confirmed that there is significant corrosion of CMP outfall pipes, the matter would be studied further. A sampling program for chemical analysis would take samples from outfall pipe (both corroded and in good condition), soils, upstream effluent and river water. Results would be correlated against outfall location, size, grade, type of sewer, catchment area information, structural parameters of the CMP (thickness, gauge), bank conditions, etc. These would be correlated with the results of the chemical analysis to determine the cause for the corrosion. The study would also look at improvements to pipe material and installation techniques to provide methods of rectifying existing outfall piping as well as procedures for the design and installation of new outfalls.

4.3 CRITERIA RE-EVALUATIONS

The criteria used in the 1998 report to assess outfall conditions was reviewed. Since the construction phase of the outfall rehabilitation program is proceeding at about half the rate as originally envisioned, it was felt that a prioritization of the remaining outfalls should be developed to ensure that those outfalls in the very worst condition are repaired first.

5% Deflection

In the 1998 report, the pipe was considered to have failed if it had a deflection of more than 5%. This is perhaps somewhat harsh, and a failure at 10% deflection was considered instead. In reviewing the remaining outfalls however, all of those where deflection measurements had been taken still failed, i.e., they all had deflections of greater than 10%. Under this revised deflection

criteria, there are no outfalls that should be removed from the program. Prioritizing outfall repairs according to this criteria should simply be done on the basis of proceeding with the outfalls with the largest deflections first.

Reassess relative weighting of structural, hydraulic and geotechnical ratings

The original 5-year Outfall Capital Upgrade Plan was derived from the overall ratings of the outfalls. The overall ratings were in turn derived from the structural, hydraulic and geotechnical ratings for each outfall. The highest of these three characteristics was assigned as the overall rating.

As has been seen, the original 5-year program has not been followed as originally derived. A number of changes to the program have been made, primarily due to sudden failures on some outfalls requiring immediate repair. These failures have been structural or geotechnical in nature. Therefore, revising the overall rating of the outfalls to give more weight to the structural and geotechnical ratings was considered. While this does not change any of the outfalls deemed to require rehabilitation, it does change their relative priority by advancing those with structural or geotechnical deficiencies to the front of the schedule. In this way, more outfalls under imminent failure condition may be repaired before they actually fail.

5.0 FUTURE DIRECTION

5.1 OUTFALL REHABILITATION PROGRAM

Current Year (2005/06)

The City and KGS conducted a joint review of the video from the March, 2005 outfall inspections. The recommended outfall construction program for the winter of 2005/06 (budget dependent) is as follows:

| | | |
|---------------------|-------|---|
| Dowker | RR28 | Repair/Replace/Reline CMP portion |
| Hargrave | AS93 | Repair/Replace/Reline CMP portion |
| Kennedy | AS91 | Repair/Replace/Reline CMP portion |
| Marion | RR52 | Assess options to correct badly out-of-round pipe |
| Despins | RR55 | Spot repair |
| Despins | RR54 | Check Geotechnical and deflection/slipped joint |
| Kildonan Park | RR97 | Replace pipe |
| Cloutier | RR7 | Slip joint repairs and repair out-of-round portion under road |
| Eastwood | RR108 | Repair failed section identified in 1996/97 video |
| Booth | ST3 | Check in the fall |
| Crane | RR26 | Check in the fall with adjacent outfall RR27 |
| Hawthorne | RR98 | To be included as part of Hawthorne Flood Pumping Station Project |
| St. Norbert X-Kalay | RR3 | Leave for now. Reinspect as per general reinspection program |
| Dunkirk | RR31 | Leave for now. Reinspect as per general reinspection program |
| Marion | RR51 | Leave for now. Reinspect as per general reinspection program |

Preliminary costs for the rehabilitation of the outfalls are:

| | | |
|---------------|------|--------------|
| Dowker | RR28 | \$55,000.00 |
| Hargrave | AS93 | \$75,000.00 |
| Kennedy | AS91 | \$60,000.00 |
| Marion | RR52 | \$90,000.00 |
| Despins | RR55 | \$25,000.00 |
| Despins | RR54 | \$80,000.00 |
| Kildonan Park | RR97 | \$20,000.00 |
| Cloutier | RR7 | \$125,000.00 |

| | | |
|--------------|-------|---------------------|
| Eastwood | RR108 | <u>\$20,000.00</u> |
| Total | | \$550,000.00 |

This total does not include engineering, taxes, or contingency.

Beyond (Current Year 2006 +)

Based on the re-evaluation of the relative weightings of the structural, hydraulic and geotechnical ratings in determining the overall rating for each outfall, we recommend that the continuation of the Outfall Upgrade Plan be conducted according Table 4. This table lists the outfalls from the original Capital Upgrade Program that have not yet been rehabilitated. Preliminary cost estimates are provided for the 2005 works based on the recent video inspections.

Costs have not been provided for outfalls beyond 2005. These “post-2005” outfalls have not been inspected since 1996/97 and it is anticipated that further deterioration has occurred since then. A reinspection of these outfalls should be undertaken this year so as to evaluate their rehabilitation needs in time for 2006 construction. The original cost estimates for these outfalls can be found in Figure 1.

5.2 OUTFALL INSPECTION PROGRAM

A catastrophic failure is a failure whose magnitude is such that the effects of the failure will immediately be known. A complete pipe collapse that backs up flows onto the streets and into basement is an example of such a failure. A yearly inspection program will not identify a catastrophic failure before the failure makes its presence known on its own. The purpose of outfall inspections is to identify severe failures in the outfall. Severe failures are those that leave the outfall capable of performing for a time before finally becoming a catastrophic failure. A partial pipe collapse that still allows flow, or a riverbank shifting that separates a pipe joint but doesn't immediately hinder the flow are examples of severe failures.

Of the fifteen outfalls inspected in March, 2005, four could not be completed because of debris or sludge. Some of the others, while passable, could have used cleaning in order to have a better view of the pipe. Using this program as an approximation for all the outfalls at large, it

should be anticipated that roughly 30 to 40% of the outfalls will require some cleaning for an effective inspection. New environmental regulations will significantly increase the cost of outfall cleaning, thereby significantly increasing the cost of an effective outfall inspection program.

The City's recent approach to the outfall inspection program indicates that there are many other priorities that take precedence. With the added increase in costs for outfall cleaning and the demands on the City's overall maintenance budgets, a sustained outfall inspection program as recommended in the 1998 report, while costly, is still merited and recommended. At present, the scheduling of future outfall repairs is based on the condition assessment of the 1998 report. While this provides some basis to the selection, since 1998 it has been shown that a number of outfalls have deteriorated rapidly to catastrophic failure. A number of outfalls have been advanced in the repair schedule and others have required repair that were not included in the original 5-year plan. It is evident that the degree of deterioration is not uniform in all outfalls across the City. To identify those outfalls that are deteriorating rapidly and perform rehabilitative maintenance or repairs before they reach catastrophic failure requires adherence to the inspection schedule.

Since the original inspections of 1996/97, almost 10 years have passed. We recommend a complete reinspection of all outfalls be undertaken to update the condition assessment of the outfalls and to establish a new baseline from which to establish future inspection schedules. If the costs of the inspections and particularly the cleaning of the outfalls is prohibitive, the time interval between re-inspections can be adjusted. Originally, depending on the severity of the condition of the outfalls in 1996/97, re inspections were scheduled for 2, 5 or 10 year intervals. If necessary for financial reasons, these could be adjusted to say 4, 8 and 12 year intervals instead. While it is preferable to perform re inspections on the shorter time schedule, it is by far more preferable to perform the inspections according to the lengthier time schedule rather than perform no inspections at all. Without regular inspections of the outfalls, the maintenance program becomes one of reacting to emergency situations brought about by unexpected, catastrophic failures. With regular inspections of the outfalls, the maintenance program can be planned in an efficient and cost effective manner and greatly reduce the number of emergency situations. A secondary approach would be to forego a complete reinspection of all outfalls in the next year and instead adopt the originally recommended reinspection schedule. This will result in a complete reinspection of the system within 10 years.

In Table 5 we have listed all the outfalls proposed for reinspection. This table includes outfalls not originally inspected in 1996/97 due to access and dewatering requirements. We have not checked every outfall to determine a cost for inspection, rather we have used costs from the 2005 inspection program to derive an average cost of inspection for a typical outfall. We have discussed typical dewatering requirements for submerged outfalls with Uni-Jet Industrial Pipe Services to derive typical dewatering costs. We have also estimated that 40% of the outfalls will require cleaning (based on the 2005 inspection program) and applied an hourly clearing rate to derive anticipated cleaning costs.

Estimated costs for outfall re-inspections are as follows:

Typical outfall inspection: \$1500/outfall
Typical outfall dewatering: \$30,000 / outfall (between 10-50,000 depending on size)
Typical clearing: \$5,000 / outfall (10 hours @ \$500 / hr)

| | | |
|----|--|-----|
| A. | Number of submerged outfalls: | 77 |
| B. | Number of uninspected outfalls 300 mm diameter or less: | 75 |
| C. | Number of outfalls inspected in 1996/97 and not in Capital Upgrade Plan: | 163 |
| D. | Number of unrepaired outfalls remaining in Capital Upgrade Plan: | 19 |

Cost of A above = \$2,579,500 (77 x (1,500 + 30,000) + 40% x 77 x 5000)

Cost of B above = \$262,500 (75 x 1,500 + 40% x 75 x 5000)

Cost of C above = \$270,500 (163 x 1,500 + 40% x 163 x 5000)

Cost of D above = \$66,500 (19 x 1,500 + 40% x 19 x 5000)

The total cost to inspect all outfalls is \$3,479,000.00. Note that if the 77 submerged outfalls are excluded from the inspection program, the cost to inspect the remaining outfalls becomes \$899,500. We recommend that the outfall inspection program be undertaken but limited to the outfalls listed in items B, C and D above (i.e. exclude the submerged outfalls). For the submerged outfalls it may be more prudent to periodically inspect the river bank and the surface above the outfall pipe for evidence of bank failure or partial pipe collapse and respond to pipe failures.

Eventually the submerged outfalls will require replacement. Long range consideration should be given to either re-directing these systems to nearby lift stations or constructing new lift stations, thereby allowing the outfall pipe to be re-installed at a higher elevation. The alternative is to allow the submerged outfalls to live out their lives to failure, and then repair or replace them on an emergency basis.

5.3 OUTFALL MAINTENANCE PROGRAM

In addition to the Outfall Upgrading Program and the Outfall Reinspection Program, the 1998 Report recommended upgrades for outfalls requiring rip rap repairs, repairs for damage due to ice, and outfalls with debris and sediment build-up. These programs essentially deal with outfalls where rehabilitation of the piping itself is not required, i.e. major excavation would not be required and so could be possibly be done by specialty contractors (rip rap hauling and placing, concrete and corrugated metal outfall abutment repairs, and pipe cleaning). No movement has yet been made by the City to address these particular outfalls. Tables 6 to 10 list these outfalls and provides updated construction costs.

5.4 OUTFALL DATABASE UPDATE

If put to good use, the electronic outfall database can be an invaluable tool in the maintenance of the City's outfall infrastructure. In addition to recording the general, "permanent" information about an outfall (size, name, location, material type, etc.), the database can store all inspection data collected over time, analyze the long-term history of the outfall, monitor its gradual degradation, and schedule inspections, and maintenance to prolong outfall life, and schedule repair or replacement works before the outfall reaches a state of eminent catastrophic failure.

TABLES

**TABLE 1
ORIGINAL OUTFALL INVENTORY SUMMARY
1998 REPORT**

| Stream | City Owned | | | | | Private | Totals |
|-------------------|------------|---------------------|------------|-----------|----------|-----------|------------|
| | ≤300 | > 300 and < 1200 | ≥1200 | Channels | Ditches | All | |
| Red River | 7 | 33 | 60 | 5 | 1 | 13 | 119 |
| Assiniboine River | 23 | 35 | 34 | 4 | 0 | 21 | 117 |
| Seine River | 18 | 31 | 12 | 2 | 1 | 3 | 67 |
| Bunns Creek | 2 | 13 | 9 | 0 | 2 | 0 | 26 |
| Omand's Creek | 21 | 3 | 1 | 1 | 0 | 0 | 26 |
| Sturgeon Creek | 2 | 18 | 6 | 0 | 0 | 0 | 26 |
| La Salle River | 2 | 2 | 0 | 0 | 0 | 0 | 4 |
| Floodway | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| Totals | 75 | 135 | 124 | 12 | 4 | 37 | 387 |

- Notes:
1. RR72 Syndicate is connected to RR71, RR72 was not counted as an outfall in this table, but is included in the database as a connector pipe.
 2. RR70.1, RR70.2 and RR70.3 are connected to RR70 - Watt Street. They are not counted as outfalls in this table, but are included in the database as connector pipes.
 3. RR56.2 - Pioneer Blvd. is not included because it's a new installation 1997-98.

**TABLE 2
ORIGINAL SUMMARY OF OUTFALLS INSPECTED
1998 REPORT**

| Stream | City Owned | | | Private | Totals |
|-------------------|------------|------------------|-------|---------|--------|
| | ≤300 | > 300 and < 1200 | ≥1200 | All | |
| Red River | 3 | 25 | 48 | 2 | 78 |
| Assiniboine River | 6 | 31 | 21 | 5 | 63 |
| Seine River | 0 | 19 | 3 | 0 | 22 |
| Bunns Creek | 0 | 7 | 4 | 0 | 11 |
| Omand's Creek | 0 | 3 | 0 | 0 | 3 |
| Sturgeon Creek | 0 | 14 | 3 | 0 | 17 |
| La Salle River | 0 | 2 | 0 | 0 | 2 |
| Floodway | 0 | 0 | 2 | 0 | 2 |
| Totals | 9 | 101 | 81 | 7 | 198 |

- Notes: 1. RR70.1, RR70.2 and RR70.3 are connected to RR70 - Watt St. All are recorded as one outfall in this table.
2. RR72 is connected to RR71 - Syndicate. These pipes are recorded as one outfall in this table.

**TABLE 3
ORIGINAL SUMMARY OF OUTFALLS NOT INSPECTED
1998 REPORT**

| Stream | Submerged | | No Access | | Sediment Build-Up | | Totals |
|-------------------|------------------------|-------|------------------------|-------|------------------------|-------|--------|
| | > 300 and < 1200 | ≥1200 | > 300 and < 1200 | ≥1200 | > 300 and < 1200 | ≥1200 | |
| Red River | 3 | 9 | 4 | 2 | 1 | 1 | 20 |
| Assiniboine River | 2 | 12 | 2 | 1 | 0 | 0 | 17 |
| Seine River | 12 | 9 | 0 | 0 | 0 | 0 | 21 |
| Bunns Creek | 6 | 5 | 0 | 0 | 0 | 0 | 11 |
| Omand's Creek | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Sturgeon Creek | 3 | 3 | 0 | 0 | 1 | 0 | 7 |
| La Salle River | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Floodway | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 26 | 39 | 6 | 3 | 2 | 1 | 77 |

**TABLE 4
RECOMMENDED CONTINUATION OF OUTFALL CAPITAL UPGRADES PLAN**

| Outfall ID# | Name | Stream | Pipe Size (mm) | Estimated Cost of Repair |
|--------------------|---|---------------|-----------------------|---------------------------------|
| AS-91 | Kennedy Street ✓ | Assiniboine | 760 | \$60,000 |
| AS-93 | Hargrave Street ✓ | Assiniboine | 700 | \$75,000 |
| RR-7 | Cloutier Drive (Segment 1 & 2) ✓ | Red | 1800 /900 | \$125,000 |
| RR-28 | Dowker Ave. Outfall ✓ | Red | 900 | \$55,000 |
| RR-52 | Marion Street ✓ | Red | 1800 | \$90,000 |
| RR-54 | Rue Despins ✓ | Red | 1400 | \$80,000 |
| RR-55 | Rue Despins FPD ✓ | Red | 1200 | \$25,000 |
| RR-97 | Kildonan Park ✓ | Red | 250 | \$20,000 |
| RR-108 | Eastwood Drive | Red | 525 | \$20,000 |
| AS-27 | Ridgedale Cres | Assiniboine | 450 | 1 |
| AS-38 | Vialoux Drive Cul-de-Sac | Assiniboine | 750 | 1 |
| AS-70 | Empress Street | Assiniboine | 300 | 1 |
| BU-6 | Delbrook Cres. | Bunn's | 400 | 1 |
| FL-2 | Kildare at Floodway | Floodway | 3000 | 1 |
| OM-3 | Empress Street 1 | Omands | 750 | 1 |
| OM-4 | Veledrome 1 | Omands | 380 | 1 |
| RR-8 | Stormont Drive | Red | 400 | 1 |
| RR-30 | Lotus Lane | Red | 600 | 1 |
| RR-34 | Oakcrest Place | Red | 375 | 1 |
| RR-41 | Churchill Drive Undrepass | Red | 525 | 1 |
| RR-59 | Rue La Verendrye | Red | 1200 | 1 |
| RR-104 | Red River Blvd. | Red | 750 | 1 |
| SE-2 | Rue Laverendrye | Seine | 600 | 1 |
| ST-12 | Amarynth Cres. 2 | Sturgeon | 400 | 1 |
| ST-17 | Harvest Lane | Sturgeon | 400 | 1 |
| | | | | |
| RR-31 | Dunkirk Drive | Red | 1400 | 2 |
| RR-51 | Marion Street FPD | Red | 1600 | 2 |
| RR-108 | Eastwood Drive | Red | 525 | 2 |
| RR-3 | St. Norbert X-Kalay Lift Station Overflow | Red | 300 | 2 |
| | | | | |
| RR-26 | Crane Ave. | Red | | 3 |
| ST-3 | Booth Drive | Sturgeon | 1850 | 3 |
| | | | | |
| RR-98 | Hawthorne Ave. | Red | | 4 |

- 1 cost to be determined after inspection of outfall
- 2 no immediate action necessary. Reinspect as per general reinspection plan
- 3 reinspect and evaluate in the fall of 2005
- 4 to be included with Hawthorne Flood Pumping Station Reconstruction

**TABLE 5
OUTFALLS PROPOSED FOR INSPECTION**

| Outfall ID | OutfallName | Sewer Type | Size | Material Type | Category |
|------------|-------------------------------------|----------------|------|---------------------|--------------------------|
| AS-1 | WEWPCC Outfall | Treated Sewer | 1500 | Monolithic Concrete | not inspected in 1996/97 |
| AS-24 | Fairmont Rd. | LDS | 2500 | CMP | not inspected in 1996/97 |
| AS-31 | Oakdale Dr. | LDS | 600 | CMP | not inspected in 1996/97 |
| AS-32 | McQuaker Dr. | LDS | 1050 | CMP | not inspected in 1996/97 |
| AS-34 | Olive St. #2 | LDS | 2200 | CMP | not inspected in 1996/97 |
| AS-59 | Ferry Rd. | Combined Sewer | 1800 | CMP | not inspected in 1996/97 |
| AS-67 | Wellington Cres. at CNR Bridge | LDS | 450 | CMP | not inspected in 1996/97 |
| AS-72 | Renfrew St. | LDS | 2400 | CMP | not inspected in 1996/97 |
| AS-77 | Ash St. | Combined Sewer | 3480 | CMP | not inspected in 1996/97 |
| AS-79 | Aubrey St. | Combined Sewer | 2900 | CMP | not inspected in 1996/97 |
| AS-82 | Ruby St. #2 | Combined Sewer | 2700 | CMP | not inspected in 1996/97 |
| AS-85 | Canora St. | Combined Sewer | 1975 | CMP | not inspected in 1996/97 |
| AS-86B | Maryland St. | Combined Sewer | 600 | CMP | not inspected in 1996/97 |
| AS-89 | Spence St. | Combined Sewer | 2700 | CMP | not inspected in 1996/97 |
| AS-92 | Fort Rouge Park | Combined Sewer | 2400 | CMP | not inspected in 1996/97 |
| AS-97 | The Forks E. of C.N.R. Bridge | LDS | 1200 | CMP | not inspected in 1996/97 |
| AS-99 | Mayfair Ave. | WWS Overflow | 1200 | CMP | not inspected in 1996/97 |
| BU-16 | Gateway Rd. | LDS | 800 | CMP | not inspected in 1996/97 |
| BU-18 | Jim Smith Dr. | LDS | 1390 | CMP | not inspected in 1996/97 |
| BU-20 | Sun Valley Dr. | LDS | 1800 | Precast Concrete | not inspected in 1996/97 |
| BU-21 | Sunny Hills Rd. | LDS | 725 | Precast Concrete | not inspected in 1996/97 |
| BU-22 | Wpg. Hydro Transmission Line | LDS | 2125 | Precast Concrete | not inspected in 1996/97 |
| BU-23 | Mallows Way | LDS | 900 | Precast Concrete | not inspected in 1996/97 |
| BU-4 | Rothsay St. N. | LDS | 1200 | CMP | not inspected in 1996/97 |
| BU-5 | Rothsay St. S. | LDS | 1200 | CMP | not inspected in 1996/97 |
| BU-6.1 | Delbrook Cres. #2 | LDS | 600 | CMP | not inspected in 1996/97 |
| BU-7 | Bonner Ave. #2 | LDS | 400 | CMP | not inspected in 1996/97 |
| BU-8 | Bonner Ave. #3 | LDS | 375 | CMP | not inspected in 1996/97 |
| OM-2 | Clifton St. Overflow | Combined Sewer | 2700 | CMP | not inspected in 1996/97 |
| RR-106 | Summerview Lane | LDS | 1800 | CMP | not inspected in 1996/97 |
| RR-11 | Radcliffe Rd. #2 | WWS Overflow | 760 | CMP | not inspected in 1996/97 |
| RR-14 | SEWPCC Outfall | Treated Sewer | 1800 | CMP | not inspected in 1996/97 |
| RR-16 | St. Mary's Rd. | LDS | 2280 | CMP | not inspected in 1996/97 |
| RR-21.1 | Bishop Grandin Blvd #4 | LDS | 750 | CMP | not inspected in 1996/97 |
| RR-29 | Victoria Cres. #2 | LDS | 750 | CMP | not inspected in 1996/97 |
| RR-32.5 | Fermor Ave | LDS | 1950 | CMP | not inspected in 1996/97 |
| RR-39.7 | St. Vital Bridge | LDS | 1600 | CMP | not inspected in 1996/97 |
| RR-47 | Eccles St. | Combined Sewer | 750 | CMP | not inspected in 1996/97 |
| RR-47.1 | Eccles St. at Churchill Dr. | LDS | 1200 | CMP | not inspected in 1996/97 |
| RR-47.5 | Churchill High School | LDS | 1600 | CMP | not inspected in 1996/97 |
| RR-56 | Water Ave. #1 | Combined Sewer | 457 | CMP | not inspected in 1996/97 |
| RR-56.1 | Water Ave. #2 | Combined Sewer | 450 | Precast Concrete | not inspected in 1996/97 |
| RR-61 | Lombard Ave. | Combined Sewer | 900 | Wood Stave | not inspected in 1996/97 |
| RR-62 | McDermot Ave. | Combined Sewer | 2700 | CMP | not inspected in 1996/97 |
| RR-81 | Elmwood Park | LDS | 900 | CMP | not inspected in 1996/97 |
| RR-85 | Inkster Blvd. | Combined Sewer | 2900 | CMP | not inspected in 1996/97 |
| RR-93 | Rossmere Cres. | LDS | 2900 | CMP | not inspected in 1996/97 |
| RR-99 | NEWPCC Outfall Kildonan Golf Course | Treated Sewer | 3352 | Monolithic Concrete | not inspected in 1996/97 |
| SE-10 | Rue Bourgeault | LDS | 450 | PVC | not inspected in 1996/97 |
| SE-35 | Avondale Rd. | LDS | 750 | CMP | not inspected in 1996/97 |
| SE-40 | Fernwood Ave. | LDS | 750 | CMP | not inspected in 1996/97 |
| SE-41 | Clayton Dr. | LDS | 525 | CMP | not inspected in 1996/97 |
| SE-42 | Berrydale Ave. | LDS | 600 | CMP | not inspected in 1996/97 |
| SE-44 | Sadler Ave. | LDS | 1050 | CMP | not inspected in 1996/97 |
| SE-45 | Hindley Ave. | LDS | 530 | CMP | not inspected in 1996/97 |

**TABLE 5
OUTFALLS PROPOSED FOR INSPECTION**

| Outfall ID | OutfallName | Sewer Type | Size | Material Type | Category |
|------------|---------------------------------|--------------|------|------------------|--------------------------|
| SE-46 | Worthington Ave. | LDS | 750 | Precast Concrete | not inspected in 1996/97 |
| SE-48 | Willowlake Cres. | LDS | 1525 | CMP | not inspected in 1996/97 |
| SE-49 | Beliveau Rd. | LDS | 1050 | CMP | not inspected in 1996/97 |
| SE-50 | N. of Beaverhill Blvd. | LDS | 900 | CMP | not inspected in 1996/97 |
| SE-51 | Lavalee Rd. | LDS | 1200 | CMP | not inspected in 1996/97 |
| SE-52 | Bishop Grandin Blvd. | LDS | 800 | CMP | not inspected in 1996/97 |
| SE-53 | Richfield Ave. | LDS | 1200 | CMP | not inspected in 1996/97 |
| SE-53.1 | Royalwood Subdivision (Phase 1) | LDS | 450 | Precast Concrete | not inspected in 1996/97 |
| SE-54 | Public Lane E. of Meadowood Dr. | LDS | 1200 | CMP | not inspected in 1996/97 |
| SE-55 | N. of John Bruce Rd. | LDS | 1200 | CMP | not inspected in 1996/97 |
| SE-56 | Woodydell Ave. | LDS | 1200 | CMP | not inspected in 1996/97 |
| SE-57 | Compark Rd. | LDS | 1400 | CMP | not inspected in 1996/97 |
| SE-58 | Southglen Dr. | LDS | 1600 | CMP | not inspected in 1996/97 |
| SE-58.1 | St. Annes Rd. | LDS | 1600 | CMP | not inspected in 1996/97 |
| ST-1 | Old Mill Rd. | LDS | 400 | CMP | not inspected in 1996/97 |
| ST-13 | Alcott St. | WWS Overflow | 600 | CMP | not inspected in 1996/97 |
| ST-14 | Ness Ave. | LDS | 1900 | CMP | not inspected in 1996/97 |
| ST-18.1 | Hamilton Ave. #2 | LDS | 400 | CMP | not inspected in 1996/97 |
| ST-4 | Sturgeon Rd. (north) | LDS | 1500 | CMP | not inspected in 1996/97 |
| ST-5 | Sturgeon Rd. (south) | LDS | 1200 | CMP | not inspected in 1996/97 |
| ST-7.1 | Greenway Cres. #2 | LDS | 750 | CMP | not inspected in 1996/97 |

| | | | | | |
|---------|--|----------------|------|------------------|-----------------------------|
| AS-11 | Barker Blvd. | LDS | 1075 | CMP | not in capital upgrade plan |
| AS-13 | Willow Ridge Rd. | LDS | 1800 | CMP | not in capital upgrade plan |
| AS-15 | Paradise Bay | LDS | 600 | CMP | not in capital upgrade plan |
| AS-16.5 | Orchard Park | LDS | 600 | CMP | not in capital upgrade plan |
| AS-2 | P.T.H 100 W. Side #1 | LDS | 1400 | CMP | not in capital upgrade plan |
| AS-20 | Shelmaridine Dr. | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| AS-21.5 | Lannoo Dr. | LDS | 900 | CMP | not in capital upgrade plan |
| AS-22 | Harstone Rd. | LDS | 450 | PVC | not in capital upgrade plan |
| AS-23.1 | Dieppe Rd. #2 | WWS Overflow | 900 | CMP | not in capital upgrade plan |
| AS-28 | Country Club Blvd. | LDS | 900 | CMP | not in capital upgrade plan |
| AS-3 | P.T.H. 100 W. Side #2 | LDS | 1350 | CMP | not in capital upgrade plan |
| AS-32.1 | Assiniboine Cres. | LDS | 300 | CMP | not in capital upgrade plan |
| AS-32.2 | Charleswood Bridge Drain - SW | LDS | 250 | PVC | not in capital upgrade plan |
| AS-32.3 | Charleswood Bridge Drain - SE | LDS | 250 | PVC | not in capital upgrade plan |
| AS-32.4 | Charleswood Bridge Drain - NW | LDS | 250 | PVC | not in capital upgrade plan |
| AS-32.5 | Charleswood Bridge Drain - NE | LDS | 250 | PVC | not in capital upgrade plan |
| AS-33 | Olive St. #1 | Combined Sewer | 750 | Precast Concrete | not in capital upgrade plan |
| AS-35 | Vialoux Dr. | LDS | 1500 | CMP | not in capital upgrade plan |
| AS-36 | Wexford S.P.S. | WWS Overflow | 250 | Not Known | not in capital upgrade plan |
| AS-36A | Wexford Lift Station | WWS Overflow | 250 | CMP | not in capital upgrade plan |
| AS-37B | Strathmillan Gate Chamber | Combined Sewer | 300 | Not Known | not in capital upgrade plan |
| AS-39 | Mount Royal Cres. #1 | LDS | 150 | CMP | not in capital upgrade plan |
| AS-4 | P.T.H 100 E. Side #1 | LDS | 800 | CMP | not in capital upgrade plan |
| AS-40 | Mount Royal Cres. #2 | LDS | 250 | Not Known | not in capital upgrade plan |
| AS-42.5 | Perimeter Drive - Assiniboine Park #2 | Combined Sewer | 300 | CMP | not in capital upgrade plan |
| AS-43 | N. Perimeter Dr. Pumping Station | LDS | 300 | CMP | not in capital upgrade plan |
| AS-43A | Assiniboine Park Ditch Drain | | 400 | Not Known | not in capital upgrade plan |
| AS-44 | N. Perimeter Drive - Assiniboine Park #1 | LDS | 300 | CMP | not in capital upgrade plan |
| AS-45 | N. Perimeter Drive - Assiniboine Park #2 | LDS | 450 | CMP | not in capital upgrade plan |
| AS-46 | Woodlawn St. | LDS | 300 | CMP | not in capital upgrade plan |
| AS-47 | N. Perimeter Drive - Assiniboine Park #3 | LDS | 150 | CMP | not in capital upgrade plan |
| AS-48 | N. Perimeter Drive - Assiniboine Park #4 | LDS | 150 | CMP | not in capital upgrade plan |
| AS-49 | N. Perimeter Drive - Assiniboine Park #5 | LDS | 150 | CMP | not in capital upgrade plan |

**TABLE 5
OUTFALLS PROPOSED FOR INSPECTION**

| Outfall ID | OutfallName | Sewer Type | Size | Material Type | Category |
|------------|--------------------------------------|----------------|------|------------------|-----------------------------|
| AS-5 | P.T.H. 100 E. Side #2 | LDS | 1200 | CMP | not in capital upgrade plan |
| AS-5.1 | P.T.H. 100 E. Side #3 | LDS | 1500 | CMP | not in capital upgrade plan |
| AS-50 | Assiniboine Park West of Foot Bridge | LDS | 150 | CMP | not in capital upgrade plan |
| AS-51 | Overdale St. | LDS | 400 | CMP | not in capital upgrade plan |
| AS-52 | Assiniboine Park #2 | LDS | 200 | CMP | not in capital upgrade plan |
| AS-53 | Deer Lodge Pl. | Combined Sewer | 300 | Precast Concrete | not in capital upgrade plan |
| AS-54 | Assiniboine Park #3 | LDS | 150 | CMP | not in capital upgrade plan |
| AS-56 | Assiniboine Park #4 | LDS | | Ditch | not in capital upgrade plan |
| AS-57 | Douglas Park Rd. | Combined Sewer | 300 | CMP | not in capital upgrade plan |
| AS-58 | Park Blvd. | LDS | 2400 | CMP | not in capital upgrade plan |
| AS-58A | Assiniboine Park Ditch Drain #2 | LDS | | Ditch | not in capital upgrade plan |
| AS-6 | Barker SPS | LDS | 150 | Not Known | not in capital upgrade plan |
| AS-60 | Chataway Blvd. | Combined Sewer | 900 | CMP | not in capital upgrade plan |
| AS-60B | Chataway Blvd. #2 | LDS | 600 | CMP | not in capital upgrade plan |
| AS-61A | Edgeland Blvd. | LDS | 400 | CMP | not in capital upgrade plan |
| AS-62 | Parkside Dr. | Combined Sewer | 750 | Precast Concrete | not in capital upgrade plan |
| AS-63 | Riverbend Cres. | Combined Sewer | 2340 | Precast Concrete | not in capital upgrade plan |
| AS-64 | Wellington Cres. #1 | LDS | 300 | Precast Concrete | not in capital upgrade plan |
| AS-65 | St. James Underpass | LDS | 900 | CMP | not in capital upgrade plan |
| AS-65A | Route 90 Overpass | LDS | 300 | CMP | not in capital upgrade plan |
| AS-66 | King Edward St. | LDS | 650 | CMP | not in capital upgrade plan |
| AS-66.8 | Wellington Cres. #2 | LDS | 450 | CMP | not in capital upgrade plan |
| AS-67A | Route 90 Bridge | LDS | 450 | CMP | not in capital upgrade plan |
| AS-68 | Wellington Cres. #3 | LDS | 500 | CMP | not in capital upgrade plan |
| AS-69 | Tylehurst St. | Combined Sewer | 2300 | CMP | not in capital upgrade plan |
| AS-7 | Caron Park | LDS | 150 | Not Known | not in capital upgrade plan |
| AS-71 | Empress Street #2 | LDS | 300 | CMP | not in capital upgrade plan |
| AS-75 | Clifton St. | Combined Sewer | 2300 | CMP | not in capital upgrade plan |
| AS-76 | Ash St FPS | Combined Sewer | 2100 | CMP | not in capital upgrade plan |
| AS-78 | Elm St. | Combined Sewer | 762 | CMP | not in capital upgrade plan |
| AS-80 | Aubrey St. FPS | Combined Sewer | 2850 | CMP | not in capital upgrade plan |
| AS-86 | Cornish Ave FPS | Combined Sewer | 1600 | CMP | not in capital upgrade plan |
| AS-87 | Arbutnot St. | Combined Sewer | 1400 | CMP | not in capital upgrade plan |
| AS-88 | Cornish Ave. | Combined Sewer | 1500 | CMP | not in capital upgrade plan |
| AS-9 | St. Charles St. #2 | LDS | 900 | CMP | not in capital upgrade plan |
| AS-94 | Donald St. | Combined Sewer | 1900 | CMP | not in capital upgrade plan |
| AS-95 | Assiniboine Ave. - FPD | | 1350 | CMP | not in capital upgrade plan |
| BU-10 | Uxbridge Rd. N. | LDS | 1200 | CMP | not in capital upgrade plan |
| BU-11 | Uxbridge Rd. S. | LDS | 900 | CMP | not in capital upgrade plan |
| BU-12 | Mclvor Ave. | LDS | 400 | CMP | not in capital upgrade plan |
| BU-13 | Raleigh St. #1 | LDS | 400 | CMP | not in capital upgrade plan |
| BU-14 | Raleigh St. #2 | LDS | 750 | CMP | not in capital upgrade plan |
| BU-15 | Raleigh St. #3 | LDS | 750 | CMP | not in capital upgrade plan |
| BU-17 | Regatta Rd. #1 | LDS | 300 | Precast Concrete | not in capital upgrade plan |
| BU-19 | Regatta Rd. #2 | LDS | 300 | CMP | not in capital upgrade plan |
| BU-2 | Henderson Hwy. #2 | LDS | 1200 | CMP | not in capital upgrade plan |
| BU-3 | Bonner Ave. #1 | LDS | 525 | CMP | not in capital upgrade plan |
| BU-9 | Pennefather St. | LDS | 1350 | CMP | not in capital upgrade plan |
| LS-1 | Rue St. Pierre | LDS | 300 | Precast Concrete | not in capital upgrade plan |
| LS-1.1 | Rue Campeau | LDS | 300 | Precast Concrete | not in capital upgrade plan |
| LS-2 | Rue Des Trappistes | LDS | 450 | CMP | not in capital upgrade plan |
| LS-4 | Rue La Maire | LDS | 1000 | Precast Concrete | not in capital upgrade plan |
| OM-1 | Raglan Rd. | LDS | 400 | CMP | not in capital upgrade plan |
| OM-10 | Velodrome Meter Pit | LDS | 100 | CMP | not in capital upgrade plan |
| OM-11 | Velodrome #2 | LDS | 300 | CMP | not in capital upgrade plan |

**TABLE 5
OUTFALLS PROPOSED FOR INSPECTION**

| Outfall ID | OutfallName | Sewer Type | Size | Material Type | Category |
|------------|----------------------------------|----------------|------|---------------|-----------------------------|
| OM-12 | Empress St. #7 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-13 | Empress St. #8 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-14 | Empress St. #9 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-15 | Empress St. #10 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-16 | Empress St. #11 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-17 | Empress St. #12 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-18 | Empress St. #13 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-19 | Empress St. #14 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-21 | Empress St. #15 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-22 | Empress St. #16 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-23 | Empress St. #17 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-24 | Empress St. #18 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-25 | Empress St. #19 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-26 | Empress St. #20 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-5 | Empress St. #2 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-6 | Empress St. #3 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-7 | Empress St. #4 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-8 | Empress St. #5 | LDS | 300 | CMP | not in capital upgrade plan |
| OM-9 | Empress St. #6 | LDS | 300 | CMP | not in capital upgrade plan |
| RR-101 | John Black Ave. | LDS | 1800 | CMP | not in capital upgrade plan |
| RR-105 | Henderson Hwy. (private) | LDS | 600 | CMP | not in capital upgrade plan |
| RR-12 | Kings Dr. | LDS | 1500 | CMP | not in capital upgrade plan |
| RR-14.1 | Freedman Cres. #1 | LDS | | Not Known | not in capital upgrade plan |
| RR-14.2 | Freedman Cres. #2 | Combined Sewer | | CMP | not in capital upgrade plan |
| RR-14.3 | Saunderson St. #1 | LDS | | Not Known | not in capital upgrade plan |
| RR-14.4 | Saunderson St. #2 | LDS | | Not Known | not in capital upgrade plan |
| RR-14.5 | Saunderson St. #3 | LDS | | Not Known | not in capital upgrade plan |
| RR-14.6 | Sifton Rd. #1 | LDS | | Not Known | not in capital upgrade plan |
| RR-14.7 | Sifton Rd. #2 | Combined Sewer | | Not Known | not in capital upgrade plan |
| RR-14.8 | Sifton Rd. #3 | LDS | | Not Known | not in capital upgrade plan |
| RR-14.9 | Sifton Rd. #4 | LDS | | Not Known | not in capital upgrade plan |
| RR-18 | River Pointe Pl. | LDS | 1050 | CMP | not in capital upgrade plan |
| RR-19 | Banning Rd. | LDS | 1370 | CMP | not in capital upgrade plan |
| RR-2 | Lemay Ave. | LDS | 900 | CMP | not in capital upgrade plan |
| RR-20 | Darcy Dr. | Combined Sewer | 2200 | CMP | not in capital upgrade plan |
| RR-21 | Bishop Grandin Blvd. #2 | LDS | 750 | CMP | not in capital upgrade plan |
| RR-22 | Plaza Dr. | LDS | 2400 | CMP | not in capital upgrade plan |
| RR-23 | Riviera Cres. Outfall | LDS | 2000 | CMP | not in capital upgrade plan |
| RR-25 | Moore Ave. | LDS | 1100 | CMP | not in capital upgrade plan |
| RR-32 | Glenview Ave. | LDS | 525 | CMP | not in capital upgrade plan |
| RR-34.1 | Kingston Row | LDS | 300 | PVC | not in capital upgrade plan |
| RR-34.8 | Riverdale Ave. | LDS | 600 | CMP | not in capital upgrade plan |
| RR-36 | Somerset Ave. | Combined Sewer | 1800 | CMP | not in capital upgrade plan |
| RR-37 | Calrossie Blvd. | Combined Sewer | 450 | CMP | not in capital upgrade plan |
| RR-38 | Cockburn St. FPS | Combined Sewer | 1500 | CMP | not in capital upgrade plan |
| RR-39 | Cockburn St. Lift Station | Combined Sewer | 1800 | CMP | not in capital upgrade plan |
| RR-40 | Kingston Row Underpass | LDS | 750 | CMP | not in capital upgrade plan |
| RR-42 | Edinburgh St. | Combined Sewer | 800 | CMP | not in capital upgrade plan |
| RR-43 | Killarney St. | LDS | 1200 | CMP | not in capital upgrade plan |
| RR-44 | Mager Dr. FPS | LDS | 1800 | CMP | not in capital upgrade plan |
| RR-45 | Baltimore St. FPS | Combined Sewer | 1800 | CMP | not in capital upgrade plan |
| RR-46 | Metcalfe Pl. | Combined Sewer | 2000 | CMP | not in capital upgrade plan |
| RR-47.4 | Open Culvert from Football Field | LDS | 300 | CMP | not in capital upgrade plan |
| RR-48 | Glasgow Ave. | LDS | 1200 | CMP | not in capital upgrade plan |
| RR-49 | Jessie Ave | Combined Sewer | 1900 | CMP | not in capital upgrade plan |

**TABLE 5
OUTFALLS PROPOSED FOR INSPECTION**

| Outfall ID | OutfallName | Sewer Type | Size | Material Type | Category |
|------------|--------------------------------------|----------------|------|------------------|-----------------------------|
| RR-50.5 | Park Dr. | LDS | 1200 | CMP | not in capital upgrade plan |
| RR-56.2 | Pioneer Blvd. | LDS | 1400 | CMP | not in capital upgrade plan |
| RR-57 | Rue Dumoulin FPD | Combined Sewer | 1200 | CMP | not in capital upgrade plan |
| RR-6 | Grandmont Blvd. | WWS Overflow | 750 | CMP | not in capital upgrade plan |
| RR-66B | Gateway Industries Process Discharge | WWS Overflow | 200 | Not Known | not in capital upgrade plan |
| RR-70 | Watt St. | Combined Sewer | 3700 | CMP | not in capital upgrade plan |
| RR-70.1 | Watt St. #2 (connector pipe) | Combined Sewer | 1500 | CMP | not in capital upgrade plan |
| RR-70.2 | Watt St. #3 (connector pipe) | Combined Sewer | 1850 | CMP | not in capital upgrade plan |
| RR-70.3 | Watt St. #4 (connector pipe) | Combined Sewer | 1250 | Precast Concrete | not in capital upgrade plan |
| RR-71 | Syndicate St. - FPD | Combined Sewer | 1800 | CMP | not in capital upgrade plan |
| RR-72 | Syndicate St. (connector pipe) | Combined Sewer | 1050 | CMP | not in capital upgrade plan |
| RR-73 | Disraeli Bridge | LDS | 300 | CMP | not in capital upgrade plan |
| RR-74 | Selkirk Ave. | Combined Sewer | 1800 | CMP | not in capital upgrade plan |
| RR-75 | Pritchard Ave. | Combined Sewer | 250 | CMP | not in capital upgrade plan |
| RR-76 | Burrows Ave. | Combined Sewer | 2400 | CMP | not in capital upgrade plan |
| RR-76.5 | Aberdeen Ave. | WWS Overflow | 200 | CMP | not in capital upgrade plan |
| RR-80 | St. John's Park MH | Combined Sewer | 3000 | CMP | not in capital upgrade plan |
| RR-83 | Polson Ave. FPS | Combined Sewer | 1800 | CMP | not in capital upgrade plan |
| RR-84 | Munroe Ave. FPS | Combined Sewer | 2500 | CMP | not in capital upgrade plan |
| RR-87 | Chelsea Pl. | LDS | 2260 | CMP | not in capital upgrade plan |
| RR-88 | Jefferson Ave. | Combined Sewer | 3300 | CMP | not in capital upgrade plan |
| RR-9 | Rice Place | LDS | 1500 | CMP | not in capital upgrade plan |
| RR-91 | Linden Ave. - FPD | Combined Sewer | 1675 | CMP | not in capital upgrade plan |
| RR-94 | Newton Ave. | Combined Sewer | 1850 | CMP | not in capital upgrade plan |
| RR-95 | Armstrong Ave. | Combined Sewer | 2700 | CMP | not in capital upgrade plan |
| RR-97.2 | Kildonan Park #2 | WWS Overflow | 250 | CMP | not in capital upgrade plan |
| RR-9B | Kilkenny Lift Station | Combined Sewer | 100 | Not Known | not in capital upgrade plan |
| SE-1 | Mission FPS | Combined Sewer | 2600 | CMP | not in capital upgrade plan |
| SE-10.1 | Westeel # 1 (Private) | LDS | 400 | CMP | not in capital upgrade plan |
| SE-10.2 | Westeel # 2 (Private) | LDS | 450 | CMP | not in capital upgrade plan |
| SE-10.3 | Westeel # 3 (Private) | LDS | 300 | CMP | not in capital upgrade plan |
| SE-11 | Rue Plinguet | Combined Sewer | 300 | CMP | not in capital upgrade plan |
| SE-12 | Kavanagh St. | LDS | 750 | CMP | not in capital upgrade plan |
| SE-13 | Giroux St. | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-14 | Cherrier St. | Combined Sewer | 300 | CMP | not in capital upgrade plan |
| SE-15 | Doucet St. | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-16 | Marion St. | LDS | 300 | PVC | not in capital upgrade plan |
| SE-17 | Marion St. Bridge Abutment | LDS | 100 | Not Known | not in capital upgrade plan |
| SE-19 | Dugald Ditch S. #1 | LDS | 300 | CMP | not in capital upgrade plan |
| SE-20 | Dugald Ditch S. #2 | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-21 | St. Catherine St. #1 | LDS | 600 | CMP | not in capital upgrade plan |
| SE-22 | St. Catherine St. #2 | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-23 | Tremblay St. | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-24.1 | Deniset St. #1 | Combined Sewer | 300 | CMP | not in capital upgrade plan |
| SE-25 | Dubuc St. | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-26 | Deniset St. #2 | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-27 | Evans Ave. | LDS | 1067 | CMP | not in capital upgrade plan |
| SE-28 | Cote St. | WWS Overflow | 450 | CMP | not in capital upgrade plan |
| SE-29 | Gareau St. | LDS | 800 | CMP | not in capital upgrade plan |
| SE-3 | Rue Notre Dame E. | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-30 | Guay Ave. | LDS | 750 | CMP | not in capital upgrade plan |
| SE-30.1 | Egerton Rd. | LDS | 900 | CMP | not in capital upgrade plan |
| SE-31 | Blenheim Ave. | LDS | 1060 | CMP | not in capital upgrade plan |
| SE-32 | Imperial Ave. | LDS | 750 | CMP | not in capital upgrade plan |
| SE-33 | Humbolt Ave. | LDS | 900 | CMP | not in capital upgrade plan |

**TABLE 5
OUTFALLS PROPOSED FOR INSPECTION**

| Outfall ID | OutfallName | Sewer Type | Size | Material Type | Category |
|------------|--|--------------|------|------------------|-----------------------------|
| SE-34 | Rue Archibald | LDS | 2700 | CMP | not in capital upgrade plan |
| SE-36 | Comanche Rd. | WWS Overflow | 600 | CMP | not in capital upgrade plan |
| SE-37 | Fermor Ave. | LDS | 600 | CMP | not in capital upgrade plan |
| SE-38 | Niakwa Rd. #1 | LDS | 450 | CMP | not in capital upgrade plan |
| SE-38.1 | Niakwa Rd. #2 | LDS | 450 | CMP | not in capital upgrade plan |
| SE-39 | Morrow Ave. | LDS | 750 | CMP | not in capital upgrade plan |
| SE-4 | Rue Notre Dame W. | LDS | 1220 | CMP | not in capital upgrade plan |
| SE-43 | Southbridge Dr. | LDS | 900 | CMP | not in capital upgrade plan |
| SE-47 | Marlene St. | LDS | 530 | CMP | not in capital upgrade plan |
| SE-5 | Rue Dumoulin | WWS Overflow | 600 | CMP | not in capital upgrade plan |
| SE-6 | Provencher Blvd. #1 | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| SE-7 | Provencher Blvd. #2 | LDS | 300 | CMP | not in capital upgrade plan |
| SE-8 | Provencher Blvd. Bridge Drains | LDS | 150 | Not Known | not in capital upgrade plan |
| SE-9 | Provencher Blvd. #3 | LDS | 300 | CMP | not in capital upgrade plan |
| ST-10 | Lonsdale Dr. #2 | WWS Overflow | 300 | CMP | not in capital upgrade plan |
| ST-11 | Kirby Dr. | LDS | 600 | Precast Concrete | not in capital upgrade plan |
| ST-15 | Valleyview Dr. #1 | WWS Overflow | 600 | CMP | not in capital upgrade plan |
| ST-16 | Valleyview Dr. #2 | LDS | 1050 | CMP | not in capital upgrade plan |
| ST-18 | Hamilton Ave. #1 | LDS | 1500 | CMP | not in capital upgrade plan |
| ST-19 | Silver Ave. | WWS Overflow | 525 | CMP | not in capital upgrade plan |
| ST-2 | Oakdean Cres. | LDS | 300 | CMP | not in capital upgrade plan |
| ST-20 | Voyageur Ave. | WWS Overflow | 600 | CMP | not in capital upgrade plan |
| ST-21 | Crestview Park Dr. (retention pond drainage) | LDS | 1676 | CMP | not in capital upgrade plan |
| ST-22 | Crestview Park Dr. | LDS | 762 | CMP | not in capital upgrade plan |
| ST-23 | Acheson Dr. | LDS | 900 | CMP | not in capital upgrade plan |
| ST-24 | Saskatchewan Ave. | LDS | 361 | CMP | not in capital upgrade plan |
| ST-6 | Setter St. | LDS | 600 | CMP | not in capital upgrade plan |
| ST-7 | Greenway Cres. #1 | LDS | 600 | CMP | not in capital upgrade plan |
| ST-8 | Lonsdale Dr. #1 | LDS | 600 | CMP | not in capital upgrade plan |
| ST-9 | Amarynth Cres. #1 | LDS | 525 | CMP | not in capital upgrade plan |

| | | | | | |
|--------|-------------------------|----------------|------|------------------|------------------------------|
| AS-27 | Ridgedale Cres. | LDS | 450 | CMP | included in Capital Upgrades |
| AS-38 | Vialoux Dr. Cul-de-Sac | LDS | 750 | CMP | included in Capital Upgrades |
| AS-42 | Conway CS | Combined Sewer | 2500 | CMP | included in Capital Upgrades |
| AS-70 | Empress Street #1 | LDS | 300 | CMP | included in Capital Upgrades |
| BU-6 | Delbrook Cres. #1 | LDS | 400 | CMP | included in Capital Upgrades |
| FL-2 | Kildare at Floodway | LDS | 3000 | Precast Concrete | included in Capital Upgrades |
| OM-3 | Empress St. #1 | LDS | 750 | CMP | included in Capital Upgrades |
| OM-4 | Velodrome #1 | LDS | 380 | CMP | included in Capital Upgrades |
| RR-104 | Red River Blvd. | LDS | 750 | CMP | included in Capital Upgrades |
| RR-26 | Crane Ave. #1 | Combined Sewer | 600 | CMP | included in Capital Upgrades |
| RR-27 | Crane Ave. #2 | Combined Sewer | 900 | Precast Concrete | included in Capital Upgrades |
| RR-30 | Lotus Lane | LDS | 600 | CMP | included in Capital Upgrades |
| RR-34 | Oakcrest Pl. | LDS | 375 | CMP | included in Capital Upgrades |
| RR-41 | Churchill Dr. Underpass | LDS | 800 | CMP | included in Capital Upgrades |
| RR-59 | Rue La Verendrye | Combined Sewer | 1200 | CMP | included in Capital Upgrades |
| RR-8 | Stormont Dr. | LDS | 400 | CMP | included in Capital Upgrades |
| SE-2 | Rue Laverendrye | LDS | 600 | CMP | included in Capital Upgrades |
| ST-12 | Amarynth Cres. #2 | LDS | 400 | CMP | included in Capital Upgrades |
| ST-17 | Harvest Lane | LDS | 400 | Precast Concrete | included in Capital Upgrades |

TABLE 6
COST ESTIMATE FOR OUTFALLS REQUIRING EROSION PROTECTION MAINTENANCE

| Outfall ID | Name | Type | Size | Geotech CR | Struct CR | Cost Estimate ¹ Erosion Protection |
|--------------|------------------------|------|------|------------|-----------|--|
| RR-19 | Banning Rd. | LDS | 1370 | 1 | 1 | 12,000.00 |
| RR-2 | Lemay Ave. | LDS | 900 | 2 | 1 | 12,000.00 |
| RR-21 | Bishop Grandin Blvd. 2 | LDS | 750 | 1 | 2 | 12,000.00 |
| RR-22 | Plaza Dr. | LDS | 2400 | 1 | 2 | 12,000.00 |
| RR-82 | Bredin Dr. | LDS | 450 | 5 | 4 | 12,000.00 |
| ST-22 | Crestview Park Dr. | LDS | 762 | 2 | 1 | 6,000.00 |
| ST-3 | Booth Dr. | LDS | 1850 | 4 | 5 | 6,000.00 |
| ST-4 | Sturgeon Rd. (north) | LDS | 1500 | 4 | | 15,000.00 |
| ST-7 | Greenway Cres. | LDS | 600 | 3 | 3 | 6,000.00 |
| ST-7.1 | Greenway Cres. 2 | LDS | 750 | 3 | | 6,000.00 |
| ST-8 | Lonsdale Dr. | LDS | 600 | 1 | 3 | 6,000.00 |
| BU-1 | Henderson Hwy. | LDS | 1375 | 1 | 1 | 3,000.00 |
| BU-13 | Raleigh St. 1 | LDS | 400 | 3 | 3 | 3,000.00 |
| BU-2 | Henderson Hwy. 2 | LDS | 1200 | 4 | 1 | 6,000.00 |
| Total | | | | | | 117,000.00 |

Note: ¹ Based on \$600 per lineal meter of rip rap or \$30/m³ and reasonable site access.

**TABLE 7
OUTFALLS WITH MAJOR ICE DAMAGE AT OUTLET**

| Outfall ID No. | Name | Size | Comments | Overall CR | Repair Cost |
|----------------|--------------------------------|-----------|---|------------|--------------------|
| AS-10 | Pender St. | 900 | Outlet bent, opening reduced by 50 %. | 5 | \$1,200.00 |
| AS-13 | Willow Ridge Rd. | 1800 | Outlet bent inwards and torn. Outfall extends from bank and could be trimmed back. | 3 | \$1,200.00 |
| AS-18 | McCallum Cres. | 1350 | CMP bent closed at outlet. Opening reduced by 70%. Outfall extends from bank and could be trimmed back. | 5 | N/A ¹ |
| AS-42 | Conway CS | 2500 | Ice damage upstream side of outlet, top of CMP bent. | 5 | N/A ¹ |
| AS-61 | Doncaster St. | 2250 | CMP bent at outlet. Outfall extends from bank and could be trimmed back. | 5 | N/A ¹ |
| AS-67 | Wellington Cres. at CNR Bridge | 450 | Top of outlet is bent. Outfall extends from bank and could be trimmed back. | 3 | \$1,200.00 |
| AS-78 | Elm St. | 750 | CMP bent at outlet, opening reduced by 25 %. | 4 | \$1,200.00 |
| AS-88 | Cornish St. 2 | 1500 | Grate is bent and twisted. | 4 | \$5,000.00 |
| RR-100 | Whellams Lane | 1200 | Top of outfall flattened at end. | 5 | N/A ¹ |
| RR-59 | Rue La Verendrye | 1200 | Upstream side of outlet pushed in. | 5 | N/A ¹ |
| RR-60 | Rue La Verendrye FPS | 600 | Appears to be bent out of alignment in downstream direction. | 5 | N/A ¹ |
| RR-79 | Hart Ave. | 2850x2130 | Outlet bent and torn open. | 5 | N/A ¹ |
| RR-87 | Chelsea Pl | 2275 | First 1 m of pipe from outlet open and displaced from 3 to 9 o'clock due to ice damage. | 4 | \$2,000.00 |
| ST-16 | Valleyview Dr. 2 | 1050 | Top of outlet bent, grating damaged and hanging open. | 4 | \$1,200.00 |
| TOTAL | | | | | \$13,000.00 |

Notes: 1. Outfall is scheduled for capital upgrading which will account for costs of ice damage repairs.

**TABLE 8
OUTFALLS WITH MINOR ICE DAMAGE AT OUTLET**

| Outfall ID No. | Name | Size | Comments | Overall CR | Repair Cost |
|----------------|-------------------------|------|--|------------|--------------------|
| AS-15 | Paradise Bay | 600 | Outlet was slightly bent at top and side of pipe. Outfall extends from bank and could be trimmed back. | 3 | \$1,000.00 |
| AS-16.5 | Orchard Park | 600 | Outlet is slightly bent. Outfall extends from bank and could be trimmed back. | 3 | \$1,000.00 |
| AS-19 | Carroll Rd. | 1800 | Minor ice damage to outlet. | 5 | N/A ¹ |
| AS-24 | Fairmont | 2500 | Small piece of CMP was missing at outlet. | 2 | \$6,000.00 |
| AS-60 | Chataway Blvd. | 900 | Outlet missing 250 mm piece between 3 and 5 o'clock. | 4 | \$1,500.00 |
| AS-63 | Riverbend Cres. | 2250 | Upstream side of outlet bent. | 4 | \$1,000.00 |
| AS-67A | Route 90 Bridge | 450 | Top of pipe was bent. Opening reduced 10 - 20 %. | 4 | \$1,000.00 |
| AS-69 | Tylehurst St. | 2250 | Ice damage to protective railing around outlet structure. | 2 | \$1,000.00 |
| AS-76 | Ash St FPS | 2100 | Upstream portion of pipe is bent. | 1 | \$1,000.00 |
| BU-2 | Henderson Hwy. 2 | 1200 | Outlet slightly bent. | 5 | N/A ¹ |
| BU-6.1 | Delbrook Cres. 2 | 600 | Top of outlet bent. | 4 | \$1,000.00 |
| FL-2 | Kildare at Floodway | 3000 | Guard rail around outlet bent. | 5 | N/A ¹ |
| LS-2 | Rue Des Trappistes | 450 | Slight damage to top of pipe. | 2 | N/A ¹ |
| OM-2 | Clifton St. Overflow | 2700 | Chainlink fence on wingwall damaged. | 2 | \$1,500.00 |
| RR-10 | Radcliffe 1 | 1200 | Minor denting from 9:00 to 11:00 | 4 | N/A ² |
| RR-2 | Lemay Ave. | 900 | Outlet dented from 6:00 to 2:00. | 5 | N/A ¹ |
| RR-35 | Wildwood Golf Course | 900 | Small dent at top of outlet. | 3 | N/A ² |
| RR-38 | Cockburn St. FPS | 1500 | Outlet slightly bent. | 1 | \$1,000.00 |
| RR-41 | Churchill Dr. Underpass | 800 | Small dents at outlet from 9:00 to 12:00. | 5 | N/A ² |
| RR-62 | McDermot Ave. | 2700 | Tapered end of CMP slightly bent on upstream side. | 4 | \$1,000.00 |
| RR-90 | Linden Ave. | 1800 | Concrete at outlet in poor condition. | 5 | N/A ¹ |
| SE-37 | Fermor Ave. | 600 | Outlet slightly bent. | 4 | \$1,000.00 |
| ST-1 | Old Mill Rd. | 400 | 40 mm dent at 9:00 upstream side. | 3 | N/A ² |
| ST-22 | Crestview Park Dr. | 750 | Small dents at 12:00 and 3:00. | 5 | N/A ² |
| TOTAL | | | | | \$19,000.00 |

Notes: 1. Outfall is scheduled for capital upgrading which will account for costs of ice damage repairs.
2. Insignificant damage. Repair not necessary at this time. Monitor for increased damage in future.

TABLE 9
MAJOR SEDIMENT BUILD-UP IN OUTFALLS

| | Outfall Name | Outfall ID No. | Sewer Type | Size (mm) | Description of Sediment Build up | Condition Rating | Submerged | Difficult Access | Cost |
|--------------|------------------------|----------------|------------|-----------|--|------------------|-----------|------------------|------------------|
| 1 | Lombard Ave. | RR-61 | CSO | 900 | 100% of Pipe Area | 3 | | ✓ | \$12,000 |
| 2 | Water Ave. | RR-56 | CSO | 457 | 100% of Pipe Area | 3 | | | \$2,000 |
| 3 | Rue Plinguet | SE-11 | CSO | 300 | 100% of Pipe Area | 3 | | | \$1,200 |
| 4 | Niakwa Rd. 2 | SE-38.1 | LDS | 450 | 100% of Pipe Area | 1 | | | N/A ¹ |
| 5 | Elmwood Park | RR-81 | LDS | 900 | 95% of Pipe Area | 4 | | ✓ | \$2,800 |
| 6 | Lotus Lane | RR-30 | LDS | 600 | 95% of Pipe Area | 5 | | ✓ | \$2,800 |
| 7 | Setter St. | ST-6 | LDS | 600 | Severe sediment and debris build up from 2.1m to 31.5m. | 2 | | | \$1,500 |
| 8 | Wellington Cres. | AS-64 | LDS | 300 | Severe. | 4 | | ✓ | \$2,200 |
| 9 | Whellams Lane | RR-100 | WWSO | 1200 | 75% of Pipe Area | 5 | | | \$2,400 |
| 10 | Grandmont Blvd. | RR-6 | WWSO | 750 | 70% of Pipe Area | 4 | | | \$1,800 |
| 11 | Cote St. | SE-28 | WWSO | 450 | 75% of Pipe Area | 4 | | ✓ | \$2,200 |
| 12 | Burrows Ave. | RR-76 | CSO | 2400 | 70% of Pipe Area | 3 | | | \$4,000 |
| 13 | Eccles St. | RR-47 | CSO | 750 | 80% of Pipe Area | 3 | ✓ | | \$7,800 |
| 14 | Douglas Park Rd. | AS-57 | CSO | 300 | 75% of Pipe Area | 2 | | ✓ | \$2,200 |
| 15 | Rossmere Cres. | RR-93 | LDS | 2900 | 70% of Pipe Area | 3 | ✓ | | \$13,500 |
| 16 | St. Vital Bridge | RR-39.7 | LDS | 1600 | 80% of Pipe Area | 2 | ✓ | | \$11,900 |
| 17 | The Forks E. of CNR | AS-97 | LDS | 1200 | 75% of Pipe Area | 2 | | | \$2,500 |
| 18 | Eccles St. 2 | RR-47.1 | LDS | 1200 | 70% of Pipe Area | 2 | | | \$2,400 |
| 19 | Vialoux Dr. Cul-de-Sac | AS-38 | LDS | 750 | Major build up 13.5 m to 18 m. Minor build up 23 m to 33 m and 59.5 m to 64.2 m. | 5 | | ✓ | \$3,000 |
| 20 | Rue St. Pierre | LS-1 | LDS | 300 | 75% of Pipe Area | 4 | | ✓ | \$3,000 |
| 21 | Radcliffe | RR-11 | WWSO | 760 | 50% of Pipe Area | 4 | | ✓ | \$2,500 |
| 22 | Alcott | ST-13 | WWSO | 600 | 50% of Pipe Area | 3 | | | N/A ¹ |
| 23 | Crane Ave. Outfall | RR-27 | CSO | 900 | 50% of Pipe Area | 4 | | | \$1,800 |
| 24 | Fermor Ave | RR-32.5 | LDS | 1950 | 50% of Pipe Area | 3 | ✓ | | \$13,400 |
| 25 | Summerview Lane | RR-106 | LDS | 1800 | 50% of Pipe Area | 3 | ✓ | | \$11,900 |
| 26 | Churchill High School | RR-47.5 | LDS | 1600 | 50% of Pipe Area | 2 | ✓ | | \$9,300 |
| 27 | Rateigh St. 3 | BU-15 | LDS | 750 | 50% of Pipe Area | 3 | | | \$1,500 |
| 28 | Bonner Ave. | BU-3 | LDS | 525 | 50% of Pipe Area | 2 | | | \$1,200 |
| 29 | Rue Bourgeault | SE-10 | LDS | 450 | 50% of Pipe Area | 4 | | | \$1,200 |
| 30 | Amarynth Cres. 2 | ST-12 | LDS | 400 | 50% of Pipe Area | 5 | | | N/A ² |
| 31 | Ridgedale S.P.S. | AS-26 | WWSO | 250 | Infilled at outlet. | 5 | | | N/A ² |
| 32 | Chataway Blvd. | AS-60 | CSO | 900 | Infilled from 8 to 11.5 m and 14.6 to 16.9 m. | 4 | | | \$1,800 |
| 33 | Hargrave St. | AS-93 | CSO | 700 | Infilled causing water backup at 10.6 m. | 5 | | | N/A ² |
| 34 | Empress Street 2 | AS-71 | LDS | 300 | Infilled at 58.6 m. | 3 | | | \$1,200 |
| Total | | | | | | | | | \$127,000 |

Notes: 1. Outfall scheduled to be cleaned in 1998

2. Outfall is scheduled for capital upgrading which will account for costs associated with sediment buildup

TABLE 10
MINOR SEDIMENT BUILD-UP OUTFALLS

| Outfall Name | Outfall ID No. | Sewer Type | Size (mm) | Description of Sediment Build up | Condition Rating | Submerged | Difficult Access | Cost |
|-------------------------|----------------|------------|-----------|---|------------------|-----------|------------------|------------------|
| Valleyview Dr. 1 | ST-15 | WWSO | 600 | 35% of Pipe Area | 4 | | | \$1,800 |
| Selkirk Ave. | RR-74 | CSO | 1800 | 35% of Pipe Area | 3 | | | \$1,200 |
| Killamey St. | RR-43 | LDS | 1200 | 40% of Pipe Area | 2 | | | \$1,200 |
| Larchdale Cres. SPS | RR-96 | LDS | 1050 | 40% of Pipe Area | 5 | | | N/A ² |
| Churchill Dr. Underpass | RR-41 | LDS | 800 | 35% of Pipe Area | 5 | | | N/A ² |
| Silver Ave. | ST-19 | WWSO | 525 | Moderate sediment build up from 0m to 5m and from 73m to 80m. | 4 | | | \$1,200 |
| McDermot Ave. | RR-62 | CSO | 2700 | 25% of Pipe Area | 4 | | | \$2,000 |
| Riverbend Cres. | AS-63 | CSO | 2300 | Sediment is considerable towards end of pipe. | 4 | | | \$1,800 |
| Colony St. | AS-90 | CSO | 1800 | 25% of Pipe Area | 5 | | | N/A ² |
| Wildwood Golf Course | RR-35 | CSO | 900 | Moderate throughout entire length. | 3 | | | \$1,500 |
| Crane Ave. | RR-26 | CSO | 600 | Moderate sediment build up in pipe from 55 m to 89 m. | 4 | | | \$1,200 |
| Pritchard Ave. | RR-75 | CSO | 250 | 25% of Pipe Area | 4 | | | \$1,200 |
| Chelsea Pl | RR-87 | LDS | 2260 | Measurement L3 to water in pipe. Moderate sediment build up in pipe | 4 | | | \$1,800 |
| John Black Ave. | RR-101 | LDS | 1800 | 30% of Pipe Area | 2 | | | \$1,800 |
| Valleyview Dr. 2 | ST-16 | LDS | 1050 | Some moderate sediment build up in concrete portion of pipe and at pipe outlet. | 4 | | | \$1,200 |
| La Maire Ave. | LS-4 | LDS | 1000 | 25% of Pipe Area | 2 | | | \$1,200 |
| Bishop Grandin Blvd. 2 | RR-21 | LDS | 750 | Moderate build up from 54 m to outlet. | 5 | | | N/A ² |
| Victoria Cres. 2 | RR-29 | LDS | 750 | 30% of Pipe Area | 4 | ✓ | | \$6,800 |
| Kingston Row Underpass | RR-40 | LDS | 750 | 30% of Pipe Area | 4 | | | \$1,200 |
| Riverdale Ave. | RR-34.8 | LDS | 600 | 25% of Pipe Area | 3 | | | \$1,200 |
| Delbrook Cres. | BU-6 | LDS | 400 | 25% of Pipe Area | 5 | | | N/A ² |
| Metcalfe Pl. | RR-46 | CSO | 2000 | 15% of Pipe Area | 4 | | | \$1,800 |
| Newton Ave. | RR-94 | CSO | 1850 | 20% of Pipe Area | 2 | | | \$1,800 |
| Baltimore St. FPS | RR-45 | CSO | 1800 | 20% of Pipe Area | 4 | | | \$1,800 |
| Linden Ave. | RR-90 | CSO | 1800 | Up to 300 mm of sediment build up. | 5 | | | N/A ² |
| Arbuthnot | AS-87 | CSO | 1400 | 15% of Pipe Area | 3 | | | \$1,500 |
| Park Blvd. | AS-58 | LDS | 2400 | Some sediment at 13m from outlet. | 3 | | | \$1,800 |
| Renfrew St. | AS-72 | LDS | 2400 | 20% of Pipe Area | 2 | ✓ | | \$10,500 |
| Dunham Rd. Outfall | RR-33 | LDS | 1200 | 20% of Pipe Area | 3 | ✓ | | \$6,500 |
| St. Charles St. 2 | AS-9 | LDS | 900 | Some debris in line from 27.2 m to 41.9 m and 49.3 m to 53.7 m. | 3 | | | \$1,200 |
| Dowker Ave. Outfall | RR-28 | LDS | 900 | 15% of Pipe Area | 5 | | | N/A ² |
| Guay Ave. | SE-30 | LDS | 750 | Some debris in pipe and debris build up on grating. | 4 | | | \$1,200 |
| Fermor Ave. | SE-37 | LDS | 600 | Some debris build up in pipe. | 4 | | | \$1,200 |
| Lonsdale Dr. | ST-8 | LDS | 600 | Some sediment build up in concrete pipe. | 5 | | | N/A ² |
| Bredin Dr. | RR-82 | LDS | 450 | 20% of Pipe Area | 5 | | | N/A ² |
| Harvest Lane | ST-17 | LDS | 400 | Some sediment build up from 16.6m to 18m. | 5 | | | N/A ² |
| Hart Ave. | RR-79 | CSO | 2850 | Minor sediment build up in pipe | 5 | | | N/A ² |
| Clifton St. FPD | AS-74 | CSO | 2100 | Sediment build up at outlet. | 5 | | | N/A ² |
| Donald St. | AS-94 | CSO | 1900 | 10% of Pipe Area | 3 | | | \$1,800 |
| Rue Despins | RR-54 | CSO | 1400 | 10% of Pipe Area | 5 | | | N/A ² |
| Rue La Verendrye | RR-59 | CSO | 1200 | Minor sediment build up in pipe. | 5 | | | N/A ² |
| Strathmillan Rd. | AS-37 | CSO | 900 | Minor vegetation and sedimentation | 5 | ✓ | | N/A ² |
| Maryland St. | AS-86B | CSO | 600 | Minor sediment build up in pipe | 3 | ✓ | | \$5,200 |
| Rue La Verendrye FPS | RR-60 | CSO | 600 | Minor sediment from 3 m to 6.5 m. Moderate debris in pipe from 20.5 m to 34 m. | 5 | | | N/A ² |
| Booth Dr. | ST-3 | LDS | 1850 | Minor sediment build up in pipe | 5 | | | N/A ² |

TABLE 10
MINOR SEDIMENT BUILD-UP OUTFALLS

| Outfall Name | Outfall ID No. | Sewer Type | Size (mm) | Description of Sediment Build up | Condition Rating | Submerged | Difficult Access | Cost |
|--|----------------|------------|-----------|---|------------------|-----------|------------------|------------------|
| Crestview Park Dr. | ST-21 | LDS | 1676 | Minor sediment build up | 4 | | | \$1,500 |
| Hamilton Ave. | ST-18 | LDS | 1500 | Minor sediment build up in pipe | 4 | | | \$1,500 |
| Radcliffe 1 | RR-10 | LDS | 1200 | 10% of Pipe Area | 4 | | | \$1,500 |
| Southbridge Dr. | SE-43 | LDS | 900 | Some minor sediment build up in conc. portion of pipe. | 1 | | ✓ | \$2,200 |
| Archibald Underpass | RR-68 | LDS | 750 | Debris in pipe at 4.6 m | 5 | ✓ | | N/A ² |
| Niakwa Rd. 1 | SE-38 | LDS | 450 | Minor sediment and debris build up in pipe. | 1 | | | \$1,200 |
| Ash St FPS | AS-76 | CSO | 2100 | > 5% of Pipe Area | 1 | | | \$1,800 |
| Rue Dumoulin 3 | RR-58 | CSO | 1060 | > 5% of Pipe Area | 5 | | | N/A ² |
| Plaza Dr. | RR-22 | LDS | 2400 | > 5% of Pipe Area | 5 | | | N/A ² |
| Glasgow Ave. | RR-48 | LDS | 1200 | 5% of Pipe Area | 4 | | | \$1,500 |
| Ruby St. 1 | AS-81 | CSO | 2100 | Sediment build up from outlet to 10 m in pipe. | 5 | | | N/A ² |
| Poison Ave. FPS | RR-83 | CSO | 1800 | Measurement L3 affected by ice in pipe. | 3 | | | N/A ¹ |
| Linden Ave. - Flood Pump | RR-91 | CSO | 1675 | Sediment and debris build up in pipe. | 3 | | | \$1,500 |
| Kennedy St. | AS-91 | CSO | 760 | From 85m to 92 m. | 5 | | | N/A ² |
| Park Dr. | RR-50.5 | LDS | 1200 | Sediment and debris build up throughout length of pipe. | 3 | | | N/A ¹ |
| River Pointe Pl. | RR-18 | LDS | 1050 | Stone in end of outfall | 4 | | | \$1,200 |
| Lanoo Dr. | AS-21.5 | LDS | 900 | Sediment and debris from 7.4 m to 31.1 m. | 3 | ✓ | | \$7,500 |
| Wellington Cres. 2 | AS-66.8 | LDS | 450 | Debris in pipe 1.5 m to 3.8 m. | 2 | | | \$1,200 |
| Empress Street | AS-70 | LDS | 300 | Sediment build up at outlet. | 5 | | | N/A ² |
| Subtotal | | | | | | | | \$87,200 |
| Total (rounded to nearest \$1000) | | | | | | | | \$87,000 |

- Notes: 1. Outfall scheduled to be cleaned in 1998
2. Outfall is scheduled for capital upgrading which will account for costs associated with sediment buildup

FIGURES

**FIGURE 1
ORIGINAL RECOMMENDED 5 YEAR OUTFALL CAPITAL UPGRADES PLAN
1998 REPORT**

| Outfall ID# | NAME | Stream | Pipe size (mm) | Total Estimated Cost For Pipe Repairs | Total Estimated Cost For Erosion Protection | Total Estimated Cost | Year of Repair |
|-------------|---|-------------|----------------|---------------------------------------|---|----------------------|----------------|
| AS 74 | Clifton Street FPD | Assiniboine | 2100 | \$ 62,000 | \$ 10,000 | \$ 72,000 | 1 |
| RR 60 | Rue La Verendrye | Red | 600 | \$ 10,000 | \$ 25,000 | \$ 35,000 | 1 |
| RR 100 | Whellams Lane | Red | 1200 | \$ 10,000 | \$ 10,000 | \$ 20,000 | 1 |
| AS 23 | Dieppe Road | Assiniboine | 650 | \$ 7,000 | \$ 5,000 | \$ 12,000 | 1 |
| RR 3 | St. Norbert X-Kalay Lift Station Overflow | Red | 300 | \$ 15,000 | \$ 10,000 | \$ 25,000 | 1 |
| AS 9.9 | Sheir Dr. | Assiniboine | 250 | \$ 7,000 | | \$ 7,000 | 1 |
| AS 26 | Ridgedale S.P.S. | Assiniboine | 250 | \$ 11,000 | | \$ 11,000 | 1 |
| RR 79 | Hart Ave | Red | 2850 | \$ 78,000 | \$ 25,000 | \$ 103,000 | 1 |
| AS 61 | Doncastor Street | Assiniboine | 2250 | \$ 145,000 | \$ 25,000 | \$ 170,000 | 1 |
| AS 81 | Ruby St. #1 | Assiniboine | 2100 | \$ 51,000 | \$ 10,000 | \$ 61,000 | 1 |
| RR 90 | Linden Ave. | Red | 1800 | \$ 30,000 | \$ 5,000 | \$ 35,000 | 1 |
| | Subtotal | | | \$ 426,000 | \$ 125,000 | \$ 551,000 | |
| RR 51 | Marion Street EPD ¹ | Red | 1600 | \$ 47,000 | \$ 10,000 | \$ 57,000 | 2 |
| AS 42 | Conway CS | Assiniboine | 2500 | \$ 282,000 | \$ 50,000 | \$ 332,000 | 2 |
| RR 52 | Marion Street ¹ | Red | 1800 | \$ 60,000 | \$ 10,000 | \$ 70,000 | 2 |
| AS 90 | Colony Street | Assiniboine | 1800 | \$ 76,000 | \$ 25,000 | \$ 101,000 | 2 |
| | Subtotal | | | \$ 465,000 | \$ 95,000 | \$ 560,000 | |
| AS 8 | St. Charles Street #1 | Assiniboine | 250 | \$ 8,000 | | \$ 8,000 | 3 |
| RR 55 | Rue Despins EPD ¹ | Red | 1200 | \$ 37,000 | \$ 10,000 | \$ 47,000 | 3 |
| RR 96 | Larchdale Cres. SPS | Red | 1050 | \$ 19,000 | \$ 10,000 | \$ 29,000 | 3 |
| AS 37 | Strathmillan Road | Assiniboine | 900 | \$ 23,000 | \$ 25,000 | \$ 48,000 | 3 |
| AS 91 | Kennedy Street | Assiniboine | 760 | \$ 36,000 | | \$ 36,000 | 3 |
| AS 93 | Hargrave Street | Assiniboine | 700 | \$ 24,000 | | \$ 24,000 | 3 |
| AS 29 | Woodhaven Blvd. | Assiniboine | 450 | \$ 38,000 | \$ 5,000 | \$ 43,000 | 3 |
| RR 37 | Calrossie Blvd | Red | 450 | \$ 14,000 | \$ 10,000 | \$ 24,000 | 3 |
| AS 83 | Arlington Street 1 | Assiniboine | 375 | \$ 12,000 | | \$ 12,000 | 3 |
| ST 3 | Booth Drive | Sturgeon | 1850 | \$ 28,000 | \$ 5,000 | \$ 33,000 | 3 |
| AS 16.1 | Raquette street 2 | Assiniboine | 1800 | \$ 51,000 | \$ 5,000 | \$ 56,000 | 3 |
| AS 19 | Carroll Road | Assiniboine | 1800 | \$ 105,000 | \$ 30,000 | \$ 135,000 | 3 |
| FL 1 | Deacon Reservoir | Floodway | 1500 | \$ 29,000 | | \$ 29,000 | 3 |
| AS 18 | McCallum Cres. | Assiniboine | 1350 | \$ 12,000 | | \$ 12,000 | 3 |
| AS 10 | Pender Street | Assiniboine | 900 | \$ 12,000 | | \$ 12,000 | 3 |
| | Subtotal | | | \$ 448,000 | \$ 100,000 | \$ 548,000 | |
| RR 54 | Rue Despins ¹ | Red | 1400 | \$ 41,000 | \$ 5,000 | \$ 46,000 | 4 |
| FL 2 | Kildare at Floodway | Floodway | 3000 | \$ 257,000 | \$ 25,000 | \$ 282,000 | 4 |
| RR 7 | Cloutier Drive (Segment 1 & 2) | Red | 1800/900 | \$ 48,000 | \$ 10,000 | \$ 58,000 | 4 |
| RR 103 | Valhalla Drive | Red | 1675 | \$ 50,000 | \$ 10,000 | \$ 60,000 | 4 |
| RR 31 | Dunkirk Drive | Red | 1400 | \$ 23,000 | \$ 20,000 | \$ 43,000 | 4 |
| RR 28 | Dowker Ave. Outfall | Red | 900 | \$ 13,000 | \$ 10,000 | \$ 23,000 | 4 |
| RR 68 | Archibald Underpass | Red | 750 | \$ 23,000 | | \$ 23,000 | 4 |
| | Subtotal | | | \$ 455,000 | \$ 80,000 | \$ 535,000 | |
| RR 58 | Rue Doumoulin ¹ | Red | 1060 | \$ 29,000 | \$ 5,000 | \$ 34,000 | 5 |
| RR 59 | Rue La Verendrye | Red | 1200 | \$ 35,000 | \$ 25,000 | \$ 60,000 | 5 |
| AS 38 | Vialoux Drive Cul-de-Sac | Assiniboine | 750 | \$ 28,000 | | \$ 28,000 | 5 |
| OM 3 | Empress Street 1 | Omands | 750 | \$ 24,000 | | \$ 24,000 | 5 |
| RR 104 | Red River Blvd. | Red | 750 | \$ 34,000 | | \$ 34,000 | 5 |
| RR 30 | Lotus lane | Red | 600 | \$ 10,000 | \$ 10,000 | \$ 20,000 | 5 |
| SE 2 | Rue Laverendrye | Seine | 600 | \$ 9,000 | | \$ 9,000 | 5 |
| RR 41 | Churchill Drive Underpass | Red | 525 | \$ 14,000 | \$ 5,000 | \$ 19,000 | 5 |
| RR 108 | Eastwood Drive | Red | 525 | \$ 28,000 | \$ 25,000 | \$ 53,000 | 5 |
| AS 25 | Shenfield Road | Assiniboine | 450 | \$ 28,000 | \$ 5,000 | \$ 33,000 | 5 |
| AS 27 | Ridgedale Cres | Assiniboine | 450 | \$ 12,000 | | \$ 12,000 | 5 |
| BU 6 | Delbrook Cres. | Bunn's | 400 | \$ 11,000 | | \$ 11,000 | 5 |
| RR 8 | Stormont Drive | Red | 400 | \$ 9,000 | \$ 10,000 | \$ 19,000 | 5 |
| ST 12 | Amarynth Cres. 2 | Sturgeon | 400 | \$ 13,000 | | \$ 13,000 | 5 |
| ST 17 | Harvest Lane | Sturgeon | 400 | \$ 17,000 | \$ 5,000 | \$ 22,000 | 5 |
| OM 4 | Veledrome 1 | Omands | 380 | \$ 8,000 | \$ 25,000 | \$ 33,000 | 5 |
| RR 34 | Oakcrest Place | Red | 375 | \$ 19,000 | \$ 50,000 | \$ 69,000 | 5 |
| AS 70 | Empress Street | Assiniboine | 300 | \$ 16,000 | | \$ 16,000 | 5 |
| | Subtotal | | | \$ 344,000 | \$ 165,000 | \$ 509,000 | |
| | TOTAL | | | \$ 2,138,000 | \$ 565,000 | \$ 2,703,000 | |

**FIGURE 2
ORIGINAL FIVE YEAR PLAN FOR FUTURE INSPECTIONS
1998 REPORT**

| Description | Number of Inspections Required | | Estimated Cost |
|---|--------------------------------|----------------|------------------|
| | Televised | "Walk-Through" | |
| Year 1 (1999) | | | |
| Overall Condition Rating of 4 from 96-97 | 31 | 21 | \$28,000 |
| Not Inspected 96-97 (approx. ½) ¹ | 17 | 21 | \$23,000 |
| Outfall not inspected < 300 mm dia. (approx. ½) | 28 | 0 | \$10,000 |
| <i>Subtotal</i> | 76 | 42 | \$61,000 |
| Year 2 (2000) | | | |
| Not Inspected 96-97 (approx. ½) ¹ | 17 | 22 | \$24,000 |
| Outfall not inspected < 300 mm dia. (approx. ½) | 28 | 0 | \$10,000 |
| <i>Subtotal</i> | 45 | 22 | \$34,000 |
| Year 3 (2001) | | | |
| Overall Condition Rating of 4, Last inspection dated earlier than Year 1 ² | 40 | 25 | \$30,000 |
| <i>Subtotal</i> | 40 | 25 | \$30,000 |
| Year 4 (2002) | | | |
| Overall Condition Rating of 4, Last inspection dated earlier than Year 2 ² | 9 | 4 | \$7,000 |
| <i>Subtotal</i> | 9 | 4 | \$7,000 |
| Year 5 (2003) | | | |
| Overall Condition Rating of 3 from 96-97 | 16 | 17 | \$19,000 |
| Overall Condition Rating of 4, Last inspection dated earlier than Year 3 ² | 35 | 22 | \$30,000 |
| <i>Subtotal</i> | 51 | 39 | \$49,000 |
| Total³ | | | \$181,000 |

- Notes:
1. Estimate does not include costs to dewater those outfalls which are submerged
 2. Estimate only based upon previous number of outfalls with an overall rating of 4 or 3, and a 20% chance that outfalls not inspected would be rated 4 or 3
 3. Rounded to the nearest \$1000

FIGURE 3
STATUS OF RECOMMENDED 5 YEAR OUTFALL CAPITAL UPGRADES PLAN, 1998 REPORT

| Outfall ID# | Name | Stream | Pipe Size (mm) | Year of Repair |
|-------------|---|-------------|----------------|----------------|
| AS-12 | Galsworthy Place | Assiniboine | 450 | 1998 |
| RR-17 | Minnetonka | Red | 2100 | 1998 |
| RR-24 | Falconer Bay | Red | 1200 | 1998 |
| AS-9.9 | Sheir Dr. | Assiniboine | 250 | 1999 |
| AS-10 | Pender Street | Assiniboine | 900 | 1999 |
| AS-14 | Coleridge Park Drive | Assiniboine | 450 | 1999 |
| AS-23 | Dieppe Road | Assiniboine | 650 | 1999 |
| AS-26 | Ridgedale S.P.S. | Assiniboine | 250 | 1999 |
| AS-61 | Doncastor Street | Assiniboine | 2250 | 1999 |
| AS-74 | Clifton Street FPD | Assiniboine | 2100 | 1999 |
| RR-60 | Rue La Verendrye | Red | 600 | 1999 |
| RR-79 | Hart Ave | Red | 2850 | 1999 |
| RR-100 | Whellams Lane | Red | 1200 | 1999 |
| AS-21 | Carroll Road #2 | Assiniboine | 300 | 2000 |
| AS-18 | McCallum Cres. | Assiniboine | 1350 | 2000 |
| AS-19 | Carroll Road | Assiniboine | 1800 | 2000 |
| AS-81 | Ruby St #1 | Assiniboine | 2100 | 2000 |
| RR-64 | Galt Avenue FPS | Red | 1500 | 2001 |
| AS-8 | St. Charles Street #1 | Assiniboine | 250 | 2002 |
| AS-29 | Woodhaven Blvd. | Assiniboine | 450 | 2002 |
| AS-83 | Arlington Street 1 | Assiniboine | 375 | 2002 |
| AS-90 | Colony Street | Assiniboine | 1800 | 2002 |
| RR-15 | Rivergate Drive | Red | 1350 | 2002 |
| RR-35 | Wildwood Golf Course | Red | 900 | 2002 |
| RR-37 | Calrossie Blvd | Red | 450 | 2002 |
| RR-63 | Bannatyne Avenue | Red | 1500 | 2002 |
| RR-82 | Bredin Drive | Red | 450 | 2002 |
| RR-90 | Linden Ave. | Red | 1800 | 2002 |
| AS-25 | Shenfield Road | Assiniboine | 450 | 2003 |
| RR-10 | Radcliffe Road | Red | 1200 | 2003 |
| RR-58 | Rue Doumoulin ¹ | Red | 1060 | 2003 |
| AS-16.1 | Raquette Street 2 | Assiniboine | 1800 | 2004 |
| RR-68 | Archibald Underpass | Red | 750 | 2004/05 |
| RR-96 | Larchdale Cres. SPS | Red | 1050 | 2004/05 |
| RR-103 | Valhalla Drive | Red | 1675 | 2004/05 |
| AS-37 | Strathmillan Road | Assiniboine | 900 | uma |
| FL-1 | Deacon Reservoir | Floodway | 1500 | uma |
| AS-91 | Kennedy Street | Assiniboine | 760 | inspected 2005 |
| AS-93 | Hargrave Street | Assiniboine | 700 | inspected 2005 |
| RR-3 | St. Norbert X-Kalay Lift Station Overflow | Red | 300 | inspected 2005 |
| RR-7 | Cloutier Drive (Segment 1 & 2) | Red | 1800 /900 | inspected 2005 |
| RR-26 | Crane Ave. | Red | | inspected 2005 |
| RR-28 | Dowker Ave. Outfall | Red | 900 | inspected 2005 |
| RR-31 | Dunkirk Drive | Red | 1400 | inspected 2005 |
| RR-51 | Marion Street FPD | Red | 1600 | inspected 2005 |
| RR-52 | Marion Street ¹ | Red | 1800 | inspected 2005 |
| RR-54 | Rue Despins ¹ | Red | 1400 | inspected 2005 |
| RR-55 | Rue Despins FPD ¹ | Red | 1200 | inspected 2005 |
| RR-97 | Kildonan Park | Red | | inspected 2005 |
| RR-98 | Hawthorne Ave. | Red | | inspected 2005 |
| RR-108 | Eastwood Drive | Red | 525 | inspected 2005 |
| ST-3 | Booth Drive | Sturgeon | 1850 | inspected 2005 |
| AS-27 | Ridgedale Cres | Assiniboine | 450 | unconstructed |
| AS-38 | Vialoux Drive Cul-de-Sac | Assiniboine | 750 | unconstructed |
| AS-42 | Conway CS | Assiniboine | 2500 | unconstructed |
| AS-70 | Empress Street | Assiniboine | 300 | unconstructed |
| BU-6 | Delbrook Cres. | Bunn's | 400 | unconstructed |
| FL-2 | Kildare at Floodway | Floodway | 3000 | unconstructed |

**FIGURE 3
STATUS OF RECOMMENDED 5 YEAR OUTFALL CAPITAL UPGRADES PLAN, 1998 REPORT**

| Outfall ID# | Name | Stream | Pipe Size (mm) | Year of Repair |
|-------------|---------------------------|----------|----------------|----------------|
| OM-3 | Empress Street 1 | Omands | 750 | unconstructed |
| OM-4 | Veledrome 1 | Omands | 380 | unconstructed |
| RR-104 | Red River Blvd. | Red | 750 | unconstructed |
| RR-30 | Lotus Lane | Red | 600 | unconstructed |
| RR-34 | Oakcrest Place | Red | 375 | unconstructed |
| RR-41 | Churchill Drive Undrepass | Red | 525 | unconstructed |
| RR-59 | Rue La Verendrye | Red | 1200 | unconstructed |
| RR-8 | Stormont Drive | Red | 400 | unconstructed |
| SE-2 | Rue Laverendrye | Seine | 600 | unconstructed |
| ST-12 | Amarynth Cres. 2 | Sturgeon | 400 | unconstructed |
| ST-17 | Harvest Lane | Sturgeon | 400 | unconstructed |

ID# on left = part of original 5-year capital upgrade plan
 ID# on right = not part of original 5-year capital upgrade plan

APPENDIX A



INDUSTRIAL PIPE SERVICES LTD.

KGS GROUP

2005 OUTFALL PROGRAM

**TAPE # KGS-05-01 &
KGS-05-02**

Sewer Inspection Report

Sewer ID: RR-26

Date: Feb. 2~~4~~⁵, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 0:00 - 15:10

Street Location: Crane Avenue

Direction of Flow: Downstream

Type of Sewer:

Line Size: 600mm

Material: VC

Start Manhole: MH-01

End Manhole: Outfall

Video Tape distance: 50.0

Location Description: 2nd MH E of S. Dr-Outfall @ Red River

0 Meters M.H. #01

0.3 - 50.0 Calcite

1.8 - 50.0 Debris - River mud)

10.9 - 21.6 Roots at joint

16.9 Crack @ T

18.1 - 20.6 Crack @ T

20.0 Crack @ L

26.2 Crack @ L

27.0 Crack @ T

27.9 Crack @ R

27.8 Crack @ L

29.1 Crack @ T

31.2 Crack @ T

31.5 Crack @ T

31.5 Crack @ L

31.5 Crack @ R

32.0 Broken T
32.6 Crack @ T
32.8 - 40.4 Crack @ T
41.3 Roots @ joint
43.4 - 50.0 Crack @ T
46.4 Broken bottom
46.7 Crack @ L
47.1 Broken @ R
50.0 Debris (River mud), camera - cannot pass
50.0 M.H. # Outfall

Sewer Inspection Report

Sewer ID: RR-3

Date: Feb. 24, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 15:11 - 24:56

Street Location: St. Norbert

Direction of Flow: Downstream

Type of Sewer:

Line Size: 300mm

Material: Co. Comp.

Start Manhole: MH-02

Video Tape Distance: 44.1

End Manhole: Outfall

Location Description: MH @ X-Kalay

Note: Camera under water & dirty @ 44.1
Material is corrugated metal pipe

0 Meters M.H. #02

0.3 - 20.1 Calcite

3.6 - 18.0 Debris (River mud)

18.8 - 25.2 Debris (River mud)

21.7 - 33.3 Calcite

28.2 - 29.2 Debris (River mud)

34.3 Calcite

34.9 - 36.1 Camera into water

36.2 - 44.1 Camera under water

37.3 Calcite

38.1 Calcite

39.2 - 44.1 Calcite

42.3 - 44.1 Debris (River mud)

Sewer Inspection Report

Sewer ID: A5-92

Date: Feb. 24, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 24:57 - 38:24

Street Location: Kennedy Street

Direction of Flow: Downstream

Type of Sewer:

Line Size: 600mm

Material: VC

Start Manhole: MH - 03

Video tape distance: 66.6

End Manhole: Outfall

Location Description: 1st MH S of Assiniboine Ave-Outfall @ Assiniboine River

Note: Video reads: MH @ Assiniboine Avenue

0 Meters M.H. #MH-03

0.4 - 61.9 Light calcite

13.6 Crack @ T

53.1 Crack @ T

55.4 Repaired hole @ L

56.8 Crack @ R

60.4 Hole @ Bottom

60.9 Roots

62.8 Hole @ Bottom

64.6 - 66.6 Hole @ Bottom

66.6 Hole @ Bottom, camera cannot pass

66.6 Outfall

Sewer Inspection Report

Sewer ID: RR-28

Date: Feb. 25, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 38:25 - 53:03

Street Location: Dowker Avenue

Direction of Flow: Downstream

Type of Sewer:

Line Size: 900mm

Material: Co.

Start Manhole: MH # 04

Video tape distance: 105.0

End Manhole: 5

Location Description: MH @ S. Drive-1st MH E of South Drive

Note: Video description reads "Red River" & End node reads "OUTFALL"

0 Meters M.H. #04

2.4 Service @ L

2.4 Calcite

2.4 Line turns L

2.9 Lift holes @ T in each pipe section

21.6 Roots @ joint

25.3 Calcite @ joint

27.2 Calcite @ joint

29.1 Roots @ joint

31.1 Roots @ joint

46.8 Service @ T

77.1 Calcite @ light
79.9 Calcite @ light
83.6 Calcite @ light
85.5 Calcite @ light
87.1 Calcite @ light
101.1 Calcite @ light
105.0 M.H. # 05

Sewer Inspection Report

Sewer ID: RR-28-~~2~~

Date: Feb. 25, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 53:04 - 56:04

Street Location: Dowker Avenue

Direction of Flow: Downstream

Type of Sewer:

Line Size: 900mm

Material: CMP

Start Manhole: MH #05

Video Tape Distance: 1.8

End Manhole: Outfall

Location Description: 1st MH E of S. Dr - Outfall @ Red River

Note: Material is corrugated metal pipe

0 Meters M.H. #MH #05

0.3 Hole @ bottom

1.8 Hole @ bottom, camera cannot pass

1.8 Outfall

Sewer Inspection Report

Sewer ID: A5-93

Date: Feb. 25, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 56:05 - 1:06:13

Street Location: Hargrave Street

Direction of Flow: Downstream

Type of Sewer:

Line Size: 900mm

Material: CO

Start Manhole: MH # 06

Video Tape Distance: 46.0

End Manhole: Outfall

Location Description: 1st MH S of Assiniboine Ave - Outfall @ Assiniboine River

Note: Line size reads 700mm on video
CMP rotten - no invert

0 Meters M.H. # 06

0.3 - 1.4 Calcite

4.1 - 11.4 Calcite

16.1 Calcite

18.2 Calcite

21.1 Calcite

23.5 Calcite

25.3 Calcite

28.4 Calcite

32.1 Calcite

36.4 - 44.1 Calcite

46.0 Hole @ bottom - camera cannot pass

46.0 Outfall

Sewer Inspection Report

Sewer ID: RR-51

Date: Feb. 28, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 1:06:14-1:10:57

Street Location: Marion Pl.

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1600mm

Material: CMP

Start Manhole: G.C - 01

Video tape distance: 13.7

End Manhole: Outfall

Location Description: Gate Chamber @ Lyndale Drive to Red River

Note: Survey abandoned @ 13.7

0 Meters M.H. # Gate Chamber 01

5.0 - 13.7 Debris (River mud)

13.7 Debris, camera cannot pass

13.7 Outfall

Sewer Inspection Report

Sewer ID: RR-52

Date: Feb. 28, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 1:10:58-1:16:55

Street Location: Marion Place

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1800mm

Material: CMP

Start Manhole: P.H. #01

Video tape distance: 38.6

End Manhole: Outfall

Location Description: Pump house @ Lyndale Dr. -Outfall @ Red River

0 Meters M.H. P.H. #01

4.8 - 23.6 Pipe deformed

5.6 Service @ T

24.0 Roots

38.1 Sticks/roots/snow at outfall

38.6 Outfall

Sewer Inspection Report

Sewer ID: RR - 54

Date: Feb. 28, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 1:16:56-1:20:59

Street Location: Rue Despins

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1400mm

Material: CO

Start Manhole: MH - 07

Video tape distance: 11.3

End Manhole: Outfall

Location Description: 1st MH W of Tache Ave. - Outfall @ Red River

0 Meters M.H. # 07

1.5 Calcite light

4.3 Line turns R

11.3 Camera into water, cannot pass

11.3 Outfall

Sewer Inspection Report

Sewer ID: RR-55

Date: Feb. 28, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 1:21:00-1:27:24

Street Location: Rue Despins

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1200mm

Material: CMP

Start Manhole: PH

Video tape distance 24.4

End Manhole: Outfall

Location Description: Pump House @ Tache Avenue - Outfall @ Red River

0 Meters M.H. #PH

3.7 Calcite

5.6 Calcite

8.4 Calcite

11.3 Line turns down

16 - 24.4 Ice

24.4 Outfall

Sewer Inspection Report

Sewer ID: RR-98

Date: Mar. 1, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 44.2

Street Location: Hawthorne Avenue

Direction of Flow: Downstream

Type of Sewer:

Line Size: 2200mm

Material: C.M.P.

Start Manhole: G.C.

Video tape distance: 44,2

End Manhole: Outfall

Location Description: Gate Chamber @ Kildonan Drive-Outfall @ Red River

0 Meters Gate Chamber

26.5 - 44.2 Debris (River mud)

44.2 Debris (River mud), camera cannot pass

44.2 Outfall

Sewer Inspection Report

Sewer ID: RR-108

Date: Mar. 1, 2005

Video Tape No: KGS-05-01

Customer: KGS Group

P.O. #

Counter No: 1:34:00-1:44:59

Street Location: Eastwood Drive

Direction of Flow: Downstream

Type of Sewer:

Line Size: 525mm

Material: CO

Start Manhole: MH #08

Measured Length: 86.3

End Manhole: Outfall

Location Description: MH @ Glenway Avenue - Outfall @ Red River

0 Meters M.H. #08

2.1 Broken Top @ joint

2.1 - 11.3 Calcite light

3.6 Crack @ T

4.0 Broken Top to R @ joint

12.8 Calcite

14.9 Crack @ R

15.3 Crack @ L

26.1 Chipped @ joint

26.4 Crack @ T & R

33.7 Crack @ L

36.8 Crack @ R

46.8 - 48.3 Calcite Light
50.5 - 52.0 Calcite L
54.0 Calcite L
55.2 Calcite L
55.6 Calcite L
56.0 Crack @ T
57.4 - 59.5 Calcite L
57.7 Chip at joint Left
62.6 Calcite L
67.6 Calcite L
68.0 Calcite L
74.0 Tree branch in line
81.9 Calcite L
85.0 - 86.3 Ice
86.3 Ice, camera cannot pass
86.3 Outfall

Sewer Inspection Report

Sewer ID: RR-97

Date: Mar. 1, 2005

Video Tape No: KGS-05-02

Customer: KGS Group

P.O. #

Counter No: 01:26 - 07:00

Street Location: Kildonan Park

Direction of Flow: Downstream

Type of Sewer:

Line Size: 250mm

Material: VC

Start Manhole: MH #09

End Manhole: Outfall

Video Tape distance: 19.7

Location Description: MH @ Park Rd - Outfall @ Red River

Note: Video reads CO but should read VC

0 Meters M.H. #09

1.3 Joint shifted - Large

1.3 Roots @ joint

2.0 - 8.2 Camera into water

3.7 Roots @ joint

5.0 Roots @ joint

5.5 Roots @ joint

6.6 Roots @ joint

7.6 Roots @ joint

7.6 Crack @ T @ joint

9.1 Crack @ T @ joint

9.7 Debris

10.3 Roots @ joint
11.7 - 14.0 Debris
12.9 Roots @ joint
13.4 Roots @ joint
14.7 Roots @ joint
15.0 - 19.6 Debris
16.0 Roots @ joint
16.0 Calcite @ joint
16.5 Roots @ joint
17.2 Roots @ joint
18.5 - 19.6 Roots @ joint
19.6 Debris, camera cannot pass
19.7 Outfall

Sewer Inspection Report

Sewer ID: RR-7-B

Date: Mar. 2, 2005

Video Tape No: KGS-05-02

Customer: KGS Group

P.O. #

Counter No: 07:01 - 16:24

Street Location: Cloutier Drive

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1800mm

Material: CMP

Start Manhole: MH # 10

Video Tape Distance: 79.8

End Manhole: Outfall

Location Description: 1st MH S of Cloutier Dr - Outfall @ Red River

0 Meters M.H. #10

0.1 - 79.8 Ice

3.0 Wooden bracing

6.0 Service Right with ice

79.8 Ice,-camera cannot pass

79.8 Outfall

Sewer Inspection Report

Sewer ID: RR-7-A

Date: Mar. 2, 2005

Video Tape No: KGS-05-02

Customer: KGS Group

P.O. #

Counter No: 16:25 - 29:55

Street Location: Cloutier Drive

Direction of Flow: Upstream

Type of Sewer:

Line Size: 1800mm

Material: CMP

Start Manhole: M.H. #10

Video tape distance: 73.0

End Manhole: Inlet

Location Description: 1st MH S of Cloutier Dr - Inlet N of Cloutier Drive

0 Meters M.H. #10

0.3 - 73.0 Ice

3.5 Wooden bracing

8.3 Wooden bracing

11.4 Service @ L with ice

12.5 Wooden bracing

14.9 - 24.9 Wooden bracing

18.7 - 26.8 Pipe deformed

26.8 Ice Left @ Joint

35.5 Line turns Right

40.7 Line turns Right

73.0 Inlet

Sewer Inspection Report

Sewer ID: RR-31

Date: Mar. 2, 2005

Video Tape No: KGS-05-02

Customer: KGS Group

P.O. #

Counter No: 29:56 - 36:06

Street Location: Dunkirk Drive

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1400mm

Material: Co.

Start Manhole: M.H. #11

Video tape distance: 27.0

End Manhole: Outfall

Location Description: 2nd M.H. N of St Vital Rd to Outfall @ Red River

0 Meters M.H. #11

18.0 Roots

24.7 - 27.0 Camera into water

27.0 Outfall

Sewer Inspection Report

Sewer ID: ST. #3

Date: Mar. 3, 2005

Video Tape No: KGS-05-02

Customer: KGS Group

P.O. #

Counter No: 36:07 - 50:08

Street Location: Booth Drive

Direction of Flow: Downstream

Type of Sewer:

Line Size: 1850mm

Material: CO

Start Manhole: M.H. #12

Video Tape Distance: 78.7

End Manhole: Outfall

Location Description: MH @ Lodge Avenue to Outfall @ Sturgeon Creek

0 Meters M.H. #12

0.3 - 78.7 Ice

3.4 - 68.8 Calcite light

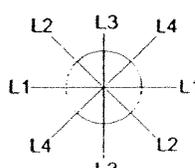
5.6 Partially capped service @ Right

6.6 Service @ L

78.7 Hole in ice, camera cannot pass

78.7 Outfall

**Water and Waste Department
Outfall Condition and Maintenance Study
INSPECTION FORM¹**

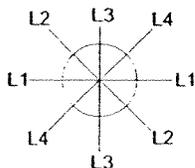
| | | | | | | | |
|---|---|--|---|--|--------------------------------------|----------------------------|--|
| Inspector: | | | | Date: <u>02/28/05</u> | | | |
| Party Members: | | | | | | | |
| Temp. <u>-21</u> | | Weather: <u>CLEAR.</u> | | | | | |
| Outfall ID No: <u>RR-52</u> | | Location: <u>MARION PL-</u> | | | Owner: | | |
| Type: <u>LDS</u> <input checked="" type="radio"/> <u>CS</u> <input type="radio"/> <u>SO</u> <input type="radio"/> <u>TS</u> <input type="radio"/> | | Stream: | | | | | |
| Segment No. | LBIS No. | Shape | D ₁ or W | D ₂ or H | Length | Material | |
| 1 | | <u>C</u> | | | | <u>CMP.</u> | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| Invert of outfall (m): | | Sag depth (m): | | Grates: Y N | | | |
| Deformation (mm)  | | Sta. <u>5-0</u> | Sta. <u>6-0</u> | Sta. <u>8-5</u> | Sta. <u>13-7</u> | | |
| | | L1 | <u>1860</u> | <u>2030</u> | <u>2010</u> | <u>2170</u> | |
| | | L2 | <u>1730</u> | <u>1810</u> | <u>1870</u> | <u>1790</u> | |
| | | L3 | <u>1500</u> | <u>1470</u> | <u>1520</u> | <u>1340</u> | |
| | | L4 | <u>1700</u> | <u>1700</u> | <u>1740</u> | <u>1930</u> | |
| Ice Damage: Y N | | Description: | | | | | |
| Hydraulic restrictions: | | 1. - <i>partial collapse of the pipe</i> 2. - <i>sediment built up in the pipe</i> 3. - <i>severe restriction - vegetation</i> | | | | | |
| Geotechnical Features | | | | | | | |
| Bank Height | River Section | Slope | Slump | Erosion | Vegetation | Instrumentation | |
| | Straight Outside Bend Inside Bend | 1V:2H 1V:3H 1V:4H 1V:5H | Deep Seated Active Inactive Shallow Hummocky Stable Retrogressive | Toe Scour Undercutting Slope Rills | Mature Trees Scrub Brush Grass | Inclinometer Piezometer | |
| COMMENTS OR DESCRIPTION: | | | | | | | |
| Structure CR | | Geotechnical CR | | Stream CR | | | |

LEGEND:

| | |
|----------------------------|------------------------------------|
| LDS Land Drainage Sewer | Conc Concrete Pipe |
| CS Combined Sewer | CMP Corrugated Metal Pipe |
| SO Sanitary Overflow | Comp Composite (Concrete & CMP) |
| TS Treated Sewage | WS Wood Stave Pipe |

¹ For larger outfalls where significant deterioration is noted, a detailed inspection will be required to document the pipe distress related to station and circumferential location.

**Water and Waste Department
Outfall Condition and Maintenance Study
INSPECTION FORM¹**

| Inspector: | | | | Date: <u>03/01/05</u> | | | |
|---|---|----------------------------------|---|--|--------------------------------------|----------------------------|--|
| Party Members: | | | | | | | |
| Temp: <u>-15</u> | | Weather: <u>CLEAR</u> | | | | | |
| Outfall ID No: <u>RM-98</u> | | | Location: | | Owner: | | |
| Type: <u>LDS CS SO TS</u> | | | Stream: | | | | |
| Segment No. | LBIS No. | Shape | D ₁ or W | D ₂ or H | Length | Material | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| Invert of outfall (m): | | | Sag depth (m): | | Grates: Y N | | |
| Deformation (mm)  | | | Sta. <u>15.0</u> | Sta. <u>30.0</u> | Sta. <u>45.0</u> | Sta. <u>53.0</u> | |
| | | | L1 | <u>2300</u> | <u>2370</u> | | |
| | | | L2 | <u>2100</u> | <u>2150</u> | | |
| | | | L3 | <u>2000</u> | <u>1940</u> | | |
| | | | L4 | <u>2150</u> | <u>2080</u> | | |
| Ice Damage: Y N | | | Description: | | | | |
| Hydraulic restrictions: | | | 1. - <i>partial collapse of the pipe</i> | | | | |
| | | | 2. - <i>sediment built up in the pipe</i> | | | | |
| | | | 3. - <i>severe restriction - vegetation</i> | | | | |
| Geotechnical Features | | | | | | | |
| Bank Height | River Section | Slope | Slump | Erosion | Vegetation | Instrumentation | |
| | Straight Outside Bend Inside Bend | 1V:2H 1V:3H 1V:4H 1V:5H | Deep Seated Active Inactive Shallow Hummocky Stable Retrogressive | Toe Scour Undercutting Slope Rills | Mature Trees Scrub Brush Grass | Inclinometer Piezometer | |
| COMMENTS OR DESCRIPTION: | | | | | | | |
| Structure CR | | Geotechnical CR | | Stream CR | | | |

LDS Land Drainage Sewer
 CS Combined Sewer
 SO Sanitary Overflow
 TS Treated Sewage

LEGEND:

Conc Concrete Pipe
 CMP Corrugated Metal Pipe
 Comp Composite (Concrete & CMP)
 WS Wood Stave Pipe

¹ For larger outfalls where significant deterioration is noted, a detailed inspection will required to document the pipe distress related to station and circumferential location.