APPENDIX A

CONSTRUCTION PLAN

Replacement of Raw Sewage Pump P3
Perimeter Road Pumping Station

Construction Plan

FINAL – Rev 1

October 2011

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1.0 INTRODUCTION

The Perimeter Road pumping station is the only pumping station receiving wastewater flow from a significant part of west Winnipeg. Interruption of service at this station can quickly affect upstream sewer levels. This can result in overflows to the river or basement flooding. Therefore any work taking place at this station must take care to minimize the risk of service interruptions.

The intent of this construction plan is to plan in advance and to organize project work in an efficient way that will minimize disruption to station operation and reduce capital costs where appropriate. Work would also be organized such that the risk to providing reliable service is minimized. This will involve working to minimize the duration of each process equipment shutdown and to anticipate unexpected issues that could arise and to prepare corresponding contingency plans to address them.

Contingency plans developed would be tempered by the degree of risk involved in each event so as to contain project capital costs to reasonable levels. That is the construction plan should also take into consideration the costs involved in project work and shutdown precautions called for.

This construction plan can be used as a road map as to how to complete project work in an efficient way and in a way that will minimize the risk of service interruption. The following sections of this report provide a project personnel table along with contact information (which will be filled out as the project progresses), and an overview of how the proposed construction schedule was developed and why. This is followed by a section outlining the details of each shutdown required and the roles and responsibilities of the various parties involved.

2.0 PROJECT CONTACT PERSONNEL

Communications during construction will involve coordination with various personnel from several different organizations within W&W, along with personnel from KGS, and the successful contractor. To facilitate this communication a Table listing personnel that would be involved in the project construction phase, has been attached as Table 2.1. Specific personnel names and contact information will be filled in once the construction phase gets underway.

Replacement of Raw Sewage Pump P3
Perimeter Road Pumping Station
Responsibility Matrix / Phone List

September 2011

Title	Name	Office	Cell
Water and Waste Department (WWD):			
MCPHILLIPS CONTROL CENTRE		986-4781	
POLICE / FIRE / AMBULANCE		911	
POLICE NON-EMERGENCY		986-6222	
EMERGENCY SERVICES		986-2626	
CUSTOMER SERVICES – WWD		311	
W&W Project Engineer			
City Site Representative			
Technical Advisor, Operational Protocol Review			
Process Control Analysis			
Superintendent of Wastewater Treatment Plants			
Plant Supervisor - WEWPCC			
Senior Plant Operator			
Operator In Charge - Treatment Plants			
Superintendent of Collections			
Supervisor of Regional Wastewater			
Collection Foreman			
Operator In Charge - Collections			
KGS Group			
Project and Mechanical Engineer	Rudy Derksen	478-3246	793-1862
Electrical Engineer			
Structural Engineer			
Contractor			
Site Superintendent			
Office Contact			

3.0 CONSTRUCTION SCHEDULE OVERVIEW

3.1 GENERAL

The overall project schedule currently indicates the construction contract award is scheduled for January 3, 2012. A copy of the construction schedule based on this start date is attached as Figure 3.1.

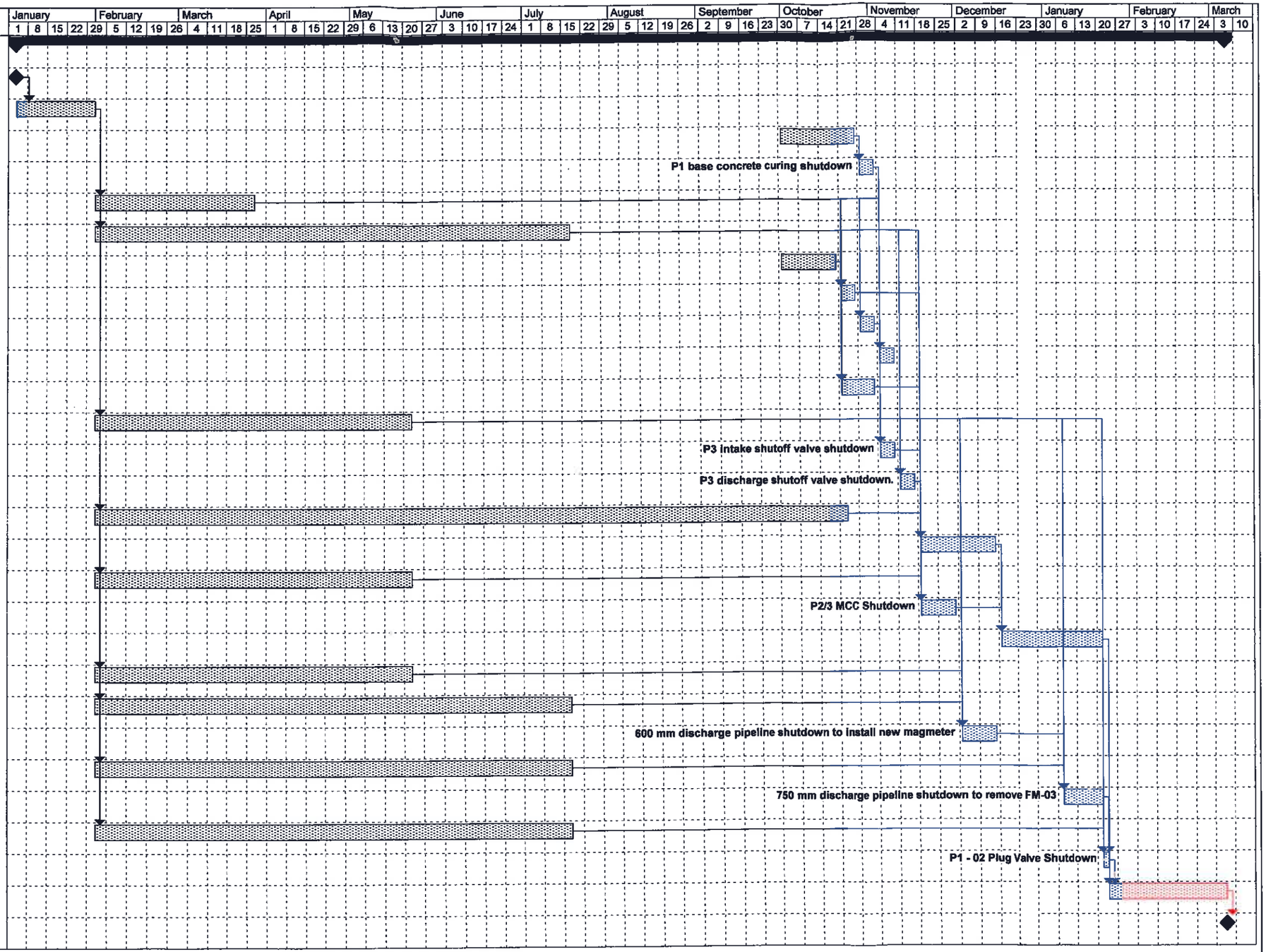
The schedule then indicates a one month allowance for the contractor to order various key equipment. Equipment delivery is a major component in the project schedule as key equipment has deliveries ranging from 18 to 36 weeks with the pump currently having the longest delivery. Time frames shown for equipment delivery include time for shop drawing submissions, review of same and then production and delivery of the equipment.

Based on the equipment deliveries currently quoted by equipment suppliers, key components would not be available on-site before late May 2012. The pump P3, which is the key component for the major package of work on this project, would likely not be available until late October 2012.

The obvious option would be to begin construction on site as soon as materials arrived on site and then continue to schedule shutdowns as key components arrived on site. However shutdown work scheduled for summer and fall would be significantly more subject to change due to weather or other operational issues at the station. Also beginning construction work in summer, even work that does not require a shutdown such as P1 concrete base modifications, would cause the contractor to have to mobilize and be on site, on and off for an extended period of up to 10 months.

In reviewing this situation, it was suggested that perhaps the construction contract should limit the contractor from beginning shut-down work on the site until seasonal weather related risks are no longer an issue. Preparatory works for the first shutdowns could be performed in October 2012, with shutdown related work beginning in the last week of October. The contractor could then reduce his total time on site significantly, and reduce the number of mob/demob requirements to a minimum.

ID	Task Name
1	**Construction Contract**
2	Construction Contract Award
3	Mobilize & order key materials
4	P1 - Complete pump base concrete works
5	P1 - Pump base concrete curing time
6	P1, P2 & P3 lifting systems - material delivery
7	P3 - inlet & outlet valve delivery - 3 in total
8	P3 - Demolish existing pump, motor and suction/discharge piping & concrete bases
9	Install P3 lifting systems - Remove P3 vertical shaft as required
10	Install P2 lifting system
11	Install P1 lifting system
12	P3 - Pour new pump base
13	Procure piping, fabricate and paint inside/outside, and ship to site
14	P3 - Shutdown wet well 2 & install new shut-off valve on P3 intake
15	P3 - Shutdown pump discharge header & install P3 discharge shutoff valve
16	P3 - Pump delivery - 16 to 36 weeks - 36 weeks shown
17	P3 - Install pump & related inlet & outlet piping system
18	P3 - MCC & VFD - Deliver MCC & VFD
19	P3 - MCC & VFD - Shutdown non-essential MCC, including P2 - Install electrical works
20	P3 - Commission new pump & discharge plug valve
21	New Magmeter - deliver
22	New Magmeter - deliver new discharge valve
23	New Magmeter - Shutdown 600mm pipeline & install new mag & related piping changes
24	FM-03 - 900 mm - deliver new 450 mm knife gate valve
25	FM-03 - 900mm - shutdown 750mm pipeline & remove old and install new valve
26	P1-02 plug valve - delivery
27	P1-02 plug valve - Shutdown P1, replace valve & commission
28	Resolve deficiencies, submit as-builts & related project close-out submissions
29	Project Complete



KGS GROUP

Replacement of Raw Sewage Pump P3 - Perimeter Road Pumping Station
Schedule - September, 2011
Figure 3.1

Reducing the overall time on-site will also allow the contractor to use his personnel more efficiently and move his on-site personnel from one area to another as various shutdowns occur. This should result in lower overall construction costs, more certainty in planning various shutdown dates around which most contract work revolves, and minimize disruption to W&W operations personnel at the station. The contractor's on-site time could under this scenario be reduced from 10 months to perhaps 5 to 6 months. Therefore the schedule presented is based on this basic premise.

Another basic assumption in preparing the construction plan, involves how the key materials would be purchased. Long delivery components could be prepurchased under a separate contract, or all materials could be purchased through the construction contract. It was decided earlier in the project that material would be purchased under the construction contract as this would avoid potentially significant issues that can arise between the supply and install contracts. A single contract would also decrease project administration costs.

Given the general construction plan guidelines described, a sequence of work was laid out on the project schedule shown in Figure 3.1. The intent of the sequence presented is to permit efficient use of contractor resources while on-site and to minimize disruptions to station operations. In the month of October 2012, the structural works related to the P1 concrete base upgrade work and installing the 3 new pump lifting systems is scheduled. During the month of October the concrete framing and lifting system installation work can be completed, with the P3 lifting system installed on level 2. Installing this system early will permit it to be used to install the new P3 pump. None of this work would require a shutdown. Then in the last week of October, P1 could be locked out while the new base concrete is cured.

Similarly in October the P3 pump/motor and related inlet and outlet piping up to the shut-off valves could be removed. This work will not require a shutdown. Should the inlet or outlet shutoff valves leak excessively, the contractor would have to install blind flanges over the pipe ends if he wanted to continue P3 demolition work before the next 2 shutdowns which involve replacing these shut-off valves, are completed.

Demolishing the P3 system early in the project, and scheduling the P3 inlet and outlet valve replacement shutdown early, provides the mechanical contractor early access to the major

portion of project work. He can then keep his crew working on this portion of the project and move them to each sequential shutdown as they occur. As noted earlier this should allow the contractor more continuous and efficient use of his on-site personnel.

When beginning this shutdown work, the contents of the P3 piping will be emptied onto the floor and removed by the existing sump pump. Excess solids will have to be removed by the contractor. If at this time the flow does not stop as a result of either the inlet or outlet valves leaking excessively, the contractor will be required to install a blind flange on the valve as quickly as possible.

Also with the P3 system demolished, the new base for P3 can perhaps be poured at the same time as the new P1 base, again providing efficiencies for this subtrade and leaving him with most of his work completed. Any other miscellaneous concrete works could also be addressed early in the project so as to largely have this subcontractor out of the way before further mechanical works get underway.

Electrical works would also not be permitted to begin on-site until October 1st. However the non-essential MCC replacement shutdown would have to wait until scheduled some time after November 1st. This electrical shutdown work will be discussed later in this report along with the other shutdowns. There is plenty of time beginning on October 1st for the electrical contractor to prepare for his MCC replacement shutdown. After the shutdown, there is also plenty of time for him to finish his work and to debug any issues that arise during commissioning. Therefore there is no further discussion in this plan regarding electrical works.

With the structural works completed and the project now in early November, the sequence of 6 final shutdowns can begin. The intent would be to in general, start shutdowns on a Tuesday so as to best fit with operations staff programming. Most shutdowns will be completed within 4 days or less and would therefore be completed in the same week. Only one shutdown per week is planned so as to limit disruption of construction works on operations personnel.

It should also be noted that the proposed schedule of shutdowns is for consideration by the contractor which he can use as a basis for pricing his work. He will however have the freedom

to propose changes to the schedule described. However as noted, they will only be accepted if they provide a benefit to W&W as well as to the contractor.

The shutdowns involved in completing project work are outlined on the summary Table 3.1. Each shutdown has been given a number, along with a proposed time slot/week when it would take place, along with an estimated shutdown duration.

For each of the 7 shutdown events, a detailed listing of steps required to prepare for and complete each shutdown has been prepared and attached in Appendix A. The listing also assigns responsibility to the various parties involved in the project. This includes the contractor, W&W operations personnel, KGS Group personnel, and for one shutdown, Community Row personnel.

Given that shutdown work will be performed in the late fall/winter season, scheduling timing for the shutdowns well in advance should be feasible. As noted earlier this schedule is subject to change, but is one that should work well.

For all shutdowns, an emphasis has been placed on making preparations in advance of the actual day the shutdown is initiated. These preparations are listed on the shutdown plans in Appendix A.

To further reduce the chances of problems during shutdown events, the contractor will be required as part of his contract to submit as a shop drawing, a complete listing of the materials required for the shutdown. Once reviewed and accepted, materials on this list will have to be on-site before the shutdown can proceed.

The next section presents a detailed discussion as to the work and coordination required to complete the shutdowns successfully.

Table 3.1
Perimeter Road Pumping Station
Construction Plan - Shutdown Summary Table - Rev 0

September 2011

Equipment/system out of service during shutdown period	Shutdown Event Schedule & Estimated Duration (1)						
	1	2	3	4	5	6	7
	P1 base concrete curing	Replace P3 450 mm inlet valve	Replace P3 discharge plug valve - P3-02	P2/P3 MCC shutdown	Install new magmeter (2)	Replace 900 mm gate valve FM-03 (3)	Replace P1 - 500 mm plug valve - P1-02
	Shutdown duration during week listed						
	Oct 29 2012	Nov 5	Nov 12	Nov 19 & 26	Dec 3	Jan 8 2013	Jan 22
			(Entire Station)				
P1	7 days		6 hours				2 days
P2			6 hours	14 days			
P3	NA	NA	NA	NA	NA	NA	
P4		1 day	6 hours				
600 mm pipeline			6 hours		4 days		
750 mm pipeline			6 hours			4 days	

Notes

1. Shutdowns will generally start on Tuesday of week listed.
2. A brief shutdown of the entire station for an estimated 3 hours will also be required while the 750 mm discharge main is drained back into the station inlet wetwell.
3. A brief shutdown of the entire station for an estimated 3 hours will also be required while the 600 mm discharge main is drained back into the station inlet wetwell.

4.0 PROCESS SHUTDOWNS

Each of the 7 shutdowns required is described in written form in this section. The sequence of work is presented in outline form along with the rational for the approach taken. Detailed work sheets that would be used during construction as a check list to execute each shutdown, are attached in Appendix A.

Also attached in Appendix B are reference drawings highlighting the identification numbers of valves and equipment referenced in these shutdown procedures.

4.1 SHUTDOWN 1 – P1 CONCRETE BASE CURING TIME – SHUTDOWN P1

Shutdown No. 1 has already been discussed. It involves locking out P1 while its new concrete base is allowed to cure. Not a lot of preparations are required for this shutdown. This shutdown is scheduled for the last week of October when this pump is likely not required.

4.2 SHUTDOWN 2 – P3 – INTAKE VALVE REPLACEMENT – SHUTDOWN WET WELL 2

This shutdown will leave P4 unavailable, but will leave P1 and P2 operational as they are connected to wet well 1. Therefore this shutdown would not be considered critical in terms of its duration. However the contractor will be required to complete work as quickly as possible. This would be in his interests as well.

For this shutdown, preparations by the contractor would involve installing rigging as required, confirm all materials required are in place. He can also remove 50% of the bolts on the existing valve flange and the 900 mm inlet pipe flange.

Early on the Tuesday morning of the shutdown, station operations personnel (OP) would begin cleaning wet well 2 inlet gate seat area so as to reduce gate leakage when it is closed. The inlet gate would then be closed, and P4 would be used to draw the level down to a very low level that will prevent flow into the P3 inlet pipe. This has been tried before and should work well. It was agreed that a suction truck or temporary pump would not be required to achieve and maintain the required water level. However if one was required operations would make the necessary arrangements.

Once the contractor is given approval to proceed with the shutdown work, the remaining bolts on the P3 inlet pipe would be removed and the entire 900 mm spool piece, 900 x 400 mm reducer and 400 mm gate valve would be removed as one piece and placed out of the way. The new spool piece and new knife gate valve assembly would then be lifted and bolted to the P3 wet well inlet pipe connection and a temporary pipe support placed under the reducer.

Once it has been agreed the works are complete, OP would be requested to open the wet well 2 inlet gate and resume normal operations. With the new valve in place and in the closed position, new P3 inlet piping work can continue.

The shutdown plan in Appendix A also lists potential problems that could arise during the shutdown. They relate primarily to addressing anticipated leakage of valves that will likely occur. Unless at the time of this shutdown either P1 or P2 is also out of service for some reason, the shutdown should be a low risk one.

4.3 SHUTDOWN 3 – P3 – DISCHARGE VALVE REPLACEMENT – SHUTDOWN MAIN PUMP DISCHARGE HEADER

This is the most significant shutdown required by this project as it will require the shutdown of all pumping capacity for an estimated 6 hours. As a result flow to the treatment plant will stop completely. This will have to be addressed at the plant.

Coordination from Community Row will also be required to stop pumping to provide as much contingency time as possible to complete shutdown work. Also manholes will have to be monitored as the shutdown proceeds so as to ensure the level in the station inlet piping is clearly understood as time progresses. This will permit decisions to be made during the shutdown to ensure potential problems are anticipated and responded to in a timely manner.

Preparations for this shutdown are listed in Table A.3. Prior to this shutdown, OP will advise CR as to when the shutdown is scheduled for and when their pumps are to be shutdown to reduce flow to the Perimeter Road pumping station.
Also piping upstream of the P3 discharge valve will already have been removed. Rigging to remove the existing valve and increaser will be in place, and all new material required will be on level 2.

The concrete base under the existing shutoff valve will have been removed and replaced by a temporary support. This is required because in its current position, the concrete support will interfere with the new valve being installed.

On the evening prior to the shutdown, OP would advise CR to shutdown their pumps. They would advise the distribution system personnel to monitor the specified manholes and to advise as to levels on a regular basis.

At the same time OP would use P2 to pump out wet well 1, and perhaps also P4 to pump out wet well 2. When this is finished, pumps P1, P2 and P4 would be shut down and locked out to prevent them from starting during the shutdown. The main discharge header would then be isolated by closing the main header's discharge valve located just upstream of the existing magmeter (FM-02). The shutoff valve (FM-01) just upstream of the existing ultrasonic flow meter is likely already closed, but this should be confirmed.

Manual vent valves on P2 and/or P4 discharge headers should be opened to allow air to enter the main header as it drains. Then the P2 discharge control valve (P2-02) would be opened using manual control. This would drain the main discharge header into the wet well. This valve would stay open during the shutdown to drain any leakage from the main header discharge valves that may occur during the shutdown. Once main header draining has been confirmed complete, the contractor will be given approval to proceed to remove the existing increaser and shutoff valve as one piece, and install the new increaser and valve also as one piece. A new stainless steel pipe support would be installed under the new increaser.

With shutdown work complete, the P2 discharge control valve (P2-02) would be closed and placed back in automatic operation mode. With the new knife gate (P3-03) closed, the main header discharge valve (FM-02) located just upstream of the existing magmeter would be reopened. This will vent air in the main discharge header into the downstream pipeline. Once this is complete, the lockouts on pump P1, P2 and P4 would be removed and normal pumping using P2 could again begin.

Given that the time required to complete this work is relatively short and should be completed well within 6 hours, there should not be a problem managing incoming flows. Leakage through

the main header discharge valves would continuously drain through the P2 discharge control valve which will remain open during the shutdown.

With this shutdown complete, the contractor is now free to complete any remaining work involved in installed P3 inlet/outlet piping and the new pump itself. However in order to bring the new P3 on line, the existing MCC must be replaced. Therefore this shutdown has been scheduled next to permit time for issues that might arise sufficient time to be resolved while work on other smaller work packages continues in parallel.

4.4 SHUTDOWN 4 – REPLACE NON-ESSENTIAL MCC FOR P2/P3

This shutdown involves replacing the MCC panel for P2, P3 and the well water pump. During this shutdown P1 and P4 would remain available. Therefore a longer shutdown can be accommodated, particularly as it will be performed in winter when flows are low. The shutdown will also put the well water pump off line for a period of days. According to the current schedule, there are no other shutdowns planned that would require well water to clean up leakage during the shutdown. If for some reason shutdown 5 or 6 which involve shutdown of a discharge pipeline were to overlap with this shutdown, then there would be value in having this pump operational. At this stage we would propose this pump remain inactive for the duration of this shutdown. Although 2 weeks have been scheduled for this shutdown, it may be completed within one week if things go well.

Before the shutdown can begin, the contractor must verify all required materials are on-site. Power wiring and the VFD for P3 should be in place and all controls checked out before this shutdown begins. Then once the pump installation is complete, power can be provided and the final pump checks completed and the pump placed on line.

On the day of the shutdown, OP would disable P2 and its discharge control valve from the DCS. Programming for the station pump operation would be adjusted as required to exclude P2. The closed feeder breakers at the MCC would be opened for P2 motor and its parallel speed drive, the well water pump and also the M600 reset controls. Then the non-essential main feeder breaker within the main switchgear would be opened and locked out.

With the MCC isolated, work would continue to disconnect feeders and controls from the MCC. At this point the contractor will take special care in removing the control cables for pump M200PP. The contractor shall trace all the existing control wiring and provide an asbuilt for review by the Engineer. Then the MCC itself would be removed from the building and the new MCC installed. Prior to the new MCC being installed, the concrete housekeeping pad is to be put into place. Existing power feeders would be reconnected along with the new feeders for P3. The existing power feeders from the main switchgear panel would be installed and energize the new MCC equipment. Then individual breakers for P2, P3 and the well water pump inside the new MCC would be closed to energize the load. The P2 pump would then be confirmed fully operational once its power systems and controls have been verified. It would then be placed back in service. The same would then be done for the well water pump. If P3 is ready mechanically, then it to could be commissioned and placed into operation. However the formal shutdown essentially ends when P2 is back on line.

As this shutdown only affects P2 and the well water pump, the duration of this shutdown is not critical. There are few potential problems that could arise that would be of significant concern to the station providing reliable service.

4.5 SHUTDOWN 5 – INSTALL NEW MAGMETER – SHUTDOWN 600 MM DISCHARGE PIPELINE

This shutdown must proceed before the FM-03 900 mm discharge valve on the discharge piping of the existing magmeter is removed (Shutdown 6). This sequence is required as shutdown 6 involves a shutdown of the existing magmeter. Therefore the new magmeter must be installed and fully operational before work on shutdown 6 can begin.

This shutdown will also stop flow to the treatment plant for the time it takes to drain the 600 mm pipeline back into the station wet well. This has been done before and there should be sufficient capacity in the wet well to accommodate this volume before pumps are restarted. Arrangements will have to be made at the plant to address this flow stoppage.

All electrical and control work related to the new magmeter must be complete before starting this shutdown. Shutdown preparations would also include confirming the 600 mm discharge pipeline cross connection valve (FM-04) on level 3 is closed.

Once this has been confirmed, as for shutdown 3, CR must be advised to draw down their wet well and shutdown their pumps. Manhole monitoring would be initiated. Then all 4 pumps would be locked out. Then valve FM-02 on the inlet to the existing magmeter would be closed. Valve VCa-3 in valve chamber VC2a, would also be closed. Once this has been done, the air vent in the air release manhole would be opened. FM-02 upstream of the existing magmeter would be closed to prevent the 750 mm pipeline from draining. Treatment plant flow will drop to zero, and arrangements to address this at the plant will have to be made. Valve FM-01 upstream of the ultrasonic meter would then be opened. The discharge plug control valves on P1 and P2 would then be opened to drain the 600 pipeline back into the wet well. It is our understanding that involvement from distribution or Community Row would not be required for the short time required to drain the pipeline (1 to 2 hours).

When the pipeline is empty, valve FM-01 would be closed, FM-02 reopened and pumps P1, P2 and P4 placed back in operation, running flow through the existing magmeter and the existing 750 mm pipeline. With the 600 mm pipeline drained work can begin on removing the piping as required. The concrete pipe support just south of valve FM-01 would be removed. It will not interfere with shutdown work and can be removed when it is most convenient for the contractor. This would likely occur when the existing piping has been removed. KGS would recommend that jack hammers not be permitted to remove concrete works wherever possible. Cutting tools should be used.

Removing piping from the work area without cutting it into pieces does not appear to be possible as the main discharge header is blocking the way. The area above the discharge header is not high enough to pass the 900 mm piping or elbow that must be removed. An alternative would be to cut the piping into sections before lifting the pieces out. This should be done with mechanical cutting tools, not a torch. Using a torch would burn the paint off the pipe and likely create toxic gases. Another alternate considered was to cut the end off the stem of the 900 mm FM-03 valve that overhangs the existing magmeter. This would create an opening through which the 900 x 900 elbow will pass, if it is carefully rotated as it is moved out so as to bypass the top of the Victaulic couplings on the top of the main header piping. The long section of straight pipe can then also move out of this opening. However it would likely have to be cut into 2 equal length sections to allow it to be removed through this opening. The existing hand railing on the west

side walkway would have to be removed to facilitate this work. It would have to be reinstalled once work is completed.

The contractor can be given the option to either cut piping to be demolished into pieces and remove it over the main discharge header, or remove it in larger sections toward the west over the existing magmeter where more vertical height is available. The best option would appear to be to move material out westward over the existing magmeter because the new elbow required has to be brought in in one piece. This would be much preferred to fabricating and painting the new elbow inside the limited work area south of the main discharge header.

Valve FM-01 has Victaulic connections which are constrained by restraining bolts. When the downstream piping is demolished, this restraint will be compromised. In reviewing this situation with Victaulic, they indicated there should be no need for these constraints. However as they are already there, the project would weld new plates onto the new reducer being installed downstream of this valve and the restraining bolts reconnected to their original position.

Once new piping, the magmeter and new knife gate valve (FM-03A) are installed, valve FM-01 can be reopened and the new piping and downstream 600 mm pipeline refilled. The vent valve in the air release manhole would have to be monitored and closed once the air has been vented from the system. The new piping joints can then be checked for leaks.

The new magmeter would then be connected and made operational. Timing for work after the 600 mm pipeline is drained is not really time sensitive as the station will be operational with all 3 existing pumps and one of two pipelines. Once the new magmeter has been commissioned as far as possible without flow, valve VC2a-3 in pit VC2a and valve H102-HV1 can be reopened, thus bringing this pipeline back into service. New magmeter performance with flow should then be confirmed.

The new automatic knife gate installed as part of this shutdown can now be connected to the compressed air system and power, and then commissioned.

The only uncertainty of significance for this shutdown would appear to be if the 900 mm valve FM-01 were to not open or close. Based on past experience, it is expected the valve will

perform, with perhaps an acceptable level of leakage. If there is a serious unexpected leakage problem with this valve, a blind flange adapted to a Victaulic connection would perhaps be installed to contain flow while the project work is completed. It is proposed the contractor not be requested to provide this special flange at this time.

4.6 SHUTDOWN 6 – REMOVE FM-03 AND INSTALL NEW 450 MM SHUTOFF VALVE – SHUTDOWN 750 MM PIPELINE

This shutdown will be very similar to the previous shutdown, except it will be the 750 mm instead of the 600 mm pipeline that will be shutdown.

The pipeline 600 mm cross connection valve FM-04 between the 2 discharge pipelines should still be closed from the previous shutdown. As for shutdown 3 and 5, request CR to drain their wet well, then shutdown their pumps. Also request CL to monitor their manholes. In addition FM-01 should be closed. Valve VC2a-2 in pit VC2a would be closed and the air vent in valve pit VC1 opened. Then the process of draining the 750 mm pipeline can begin. Treatment plant flow will drop to zero, and arrangements to address this at the plant will have to be made. Then P1 and P2 discharge control valves (P1-02 & P2-02) would be opened by manual control. The pipeline would then drain back into the wet well.

When the 750 mm pipeline is empty, FM-02 located upstream of the existing magmeter would be closed. Then FM-01 located on the inlet to the new magmeter would be opened. The lockouts on the pumps would be removed and the station placed back into operation, this time using the 600 mm pipeline and the new magmeter for flow measurement. Care should be taken to ensure the new magmeter discharge valve is not closed for testing or other reasons during this shutdown period. Also the treatment plant would have to be adjusted as required to address restart of flow to the plant.

The contractor would then remove FM-03. It can be removed directly north between the main discharge header and the concrete beams above. There is an estimated clearance of 130 mm between the top of the piping victaulic couplings and the concrete beams above.

Once removed, the new replacement spool piece would be lifted into position and secured with new Victaulic couplings. The existing 450 mm spool piece would then be removed along with its pipe support. A shorter spool piece along with the new knife gate valve would be installed.

With the pipeline installation work completed, valve FM-02 would be opened, introducing flow back into this new piping and refilling the downstream 750 mm pipeline. The vent valve in valve chamber VC1 would have to be monitored and closed once the air has been vented from the system. The refilling rate should be controlled to avoid water hammer when the last of the air is removed from the system. The new piping joints can then be checked for leaks. The new piping joints would be checked for leakage, and adjustments made as required. Valve VC2a-2 in pit VC2a and valve H102-HV1 would be reopened and the pipeline placed back into service. During this period, both magmeters should be combining their flow readings to ensure total flow leaving the station is accurately recorded.

At this point the 600 mm pipeline cross connection valve FM-04 can be reopened or left closed as required by OP.

As for some of the other shutdowns, the main concerns or uncertainties involved in the shutdowns is whether or not the existing valves that need to be opened or closed will operate properly. If for example the 600 mm cross connection valve FM-04 does not hold well, leakage will have to be redirected to permit work to continue under adverse conditions to permit the new 900 mm spool piece and the 450 mm spool piece to be satisfactorily installed. Responsibility for redirecting residual flow will be the contractor’s responsibility. Draining this flow from the station will be OP’s responsibility.

Should the contractor run into fit or leakage issues that are difficult to resolve on this or any other project work, he will have to address these as they arise. The result would be an extension of the shutdown time required.

4.7 SHUTDOWN 7 – P1 PLUG VALVE REPLACEMENT – SHUTDOWN P1

This shutdown involves replacing the P1 discharge plug control valve (P1-02). It will require P1 be locked out. As for other shutdowns, preparations would involve installing rigging, and ensuring all materials required are on level 200.

On the day of the shutdown P1 would be locked out. Power to the actuator as well would be locked out. Then the shutoff valve P1-03 upstream of the control valve would be closed. Perhaps by loosening bolts on the spool piece upstream of the plug valve Victaulic coupling, or drilling a hole in the spool piece that is to be replaced, air could be introduced to the P1 discharge piping. Wastewater would then drain back down through P1 into the wet well. The wet well level is below the level 200 work area. Once the water level has dropped below the level 200 floor level, the spool piece, valve and its actuator can be disassembled and removed. The concrete support under the existing plug valve would then be cut off at floor level as a new stainless pipe support would be provided upstream of the new plug valve.

The new plug valve and actuator would then be installed, followed by the new spool piece. A new spool piece is required as the new valve will be shorter than the existing one it is replacing. The new plug valve should be installed with the plug in the open position to permit flow to pass during the subsequent shutdown work to check for joint leaks.

Once this work is completed, the P1 inlet valve P1-01 at level 100 would be manually closed. Then the new plug valve discharge shutoff valve P1-03 would be opened and pressure applied to the new valve and spool piece joints. Air in the pipeline would be carried downstream. The manual air vent valve located down stream on the main header, just downstream of valve FM-02 could be opened to release any air trapped at the top of the main discharge header. Once any potential leaks have been resolved, the new plug valve can be connected to compressed air and power connected to the solenoid valves. Once the valve controls have been fully connected and tested, P1 can be placed back on line.

5.0 STATEMENT OF LIMITATIONS AND CONDITIONS

5.1 THIRD PARTY USE OF REPORT

This report has been prepared for The City of Winnipeg to whom this report has been addressed and any use a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

APPENDICES

APPENDIX A

SHUTDOWN PROCEDURE TABLES

Table A.1
Perimeter Road Pumping Station
Construction Plan - Shutdown 1 - Rev 0
P1 Concrete Base Curing Time

Maximum Duration: 7 days

Start Date: 29 Oct 2012

Equipment out of service: P1

Legend:
OP = WEWPCC
CO = Contractor
KGS = KGS
CR - Community Row

Task No.	Performed By	Done	Activity	Comments
Preparations Before Shutdown Day				
A	CO		Prepare concrete works	
B	CO		Pour concrete	
Shutdown Start Day Activities				
1	OP - CO		Lock out P1 for 1 week curing time.	OP and CO both to install lock.
2	OP - CO		Remove P1 lock-out locks	

Table A.2
Perimeter Road Pumping Station
Construction Plan - Shutdown 2 - Rev 0
Replace Suction Valve P3-01 - Shutdown Wet Well 2

Maximum Duration: 8 hours

Start Date: 6th Nov 2012

Equipment out of service: P4

Legend:
OP = WEWPCC Operations
CO = Contractor
KGS = KGS
CR - Community Row

Task No.	Performed By	Done	Time	Activity	Comments
Preparations Before Shutdown Day					
A	CO			Install rigging as required.	
B	CO			Confirm all new materials are on Level 100	
C	CO			Confirm P3-01 suction valve is in closed position	
D	CO			Remove 50% of flange bolts on existing inlet valve and spool piece	
Shutdown Start Day Activities					
1	OP		5:00 AM	Clean wet well 2 sluice gate seat	
2	OP			Close sluice gate to wet well 2	
3	OP			Use P4 to pump down level in wet well 2	Use vacuum truck to keep level sufficiently low if deemed necessary.
4	KGS/CO			Confirm with OP that shutdown can proceed	
5	CO			Remove existing suction valve P3-01/piping section as one piece.	
6	CO			Install new 760 x 600 reducer & knife gate valve	
7	CO			Install temporary support under reducer	Fill in gap between existing concrete support and pipe.
8	OP			Open wet well 2 sluice gate	
9	OP			Resume normal operation	

Table A.3
Perimeter Road Pumping Station
Construction Plan - Shutdown 3 - Rev 1
Replace Discharge Valve P3-03 - Shutdown Main Discharge Header

Maximum Duration: 6 hours

Start Date: 13 Nov 2012

Equipment out of service: All pumps

Legend:
OP = WEWPCC Operations
CO = Contractor
KGS = KGS
CR - Community Row
CL = Collections

Task No.	Performed By	Done	Time	Activity	Comments
Preparations Before Shutdown Day					
A	CO			Piping upstream of the discharge valve P3-03 has already been removed.	
B	CO			Install rigging as required.	
C	CO			Confirm all new materials are on Level 200	
D	OP			Advise CR as to the proposed shutdown time and date	
E	CO			Install temporary support under discharge valve increaser	
F	CO			Remove concrete support from under discharge valve P3-03.	
G	CO			Assemble new discharge valve and increaser	This will Permit them to be installed as one piece & reduce shutdown time.
H	OP			Confirm FM-01 is closed.	
I	KGS/CO/OP			Confirm all preparations are complete	
Shutdown Start Day Activities					
1	OP/CR		9:00 PM	Request CR to pump down their wetwell	
2	OP/CR		11:00 PM	Request CR to shutdown their pumps.	
3	OP		1:00 AM	Use P2 to pump out wet well. When finished, lockout P2	
4	CL		2:00 AM	Monitor manholes	
5	OP/CO		2:00 AM	Lockout P1 and P4	Pump lockout eliminates the need to close pump discharge manual shutoff valves
6	OP			Close valves FM-01 & FM-02 at mag and ultrasonic flow meter inlets	
7	OP			Manually open P2 &/or P4 discharge pipe air vent	
8	OP			Open P2 discharge plug valve (P2-02) to drain main pump header into wet well	
9	OP/KGS/CO		4:00 AM	Authorize contractor to begin removing P3 discharge valve (P3-03)	
10	CO			Remove P3 discharge valve & downstream pipe section as one piece.	
11	CO		7:00 AM	Install new increaser/valve assembly as one piece. Install pipe support	
12	OP			Open FM-01 & FM-02 valves on main discharge header	Vent air through two open vents.
13	OP			When air has been removed from the pipe, close P2/P4 discharge pipe air vents.	
14	OP/CO			Remove lockouts from P1, P2 and P4.	
15	OP/CR			Advise CR to restart pumping	
16	OP/CL			Advise CL to stop monitoring manhole levels.	
17	OP			Begin pumping using P2	

Table A.4
Perimeter Road Pumping Station
Construction Plan - Shutdown 4 - Rev 0
Replace Non-Essential MCC for P2/P3

Maximum Duration: 2 weeks

Start Date: 19 Nov 2012

Equipment out of service: P2 & Flushing water pump

Legend:
OP = WEWPCC Operations
CO = Contractor
KGS = KGS

Task No.	Performed By	Done	Time	Activity	Comments
Preparations Before Shutdown Day					
				None	
Shutdown Start Day Activities					
1	OP/CO			Lockout breakers supplying non-essential MCC	Both OP & CO to install locks
2	KGS/OP/CO			Authorize contractor to begin work	
	OP			Remove P2 from DCS	
3	CO			Replace non-essential MCC	
4	CO			Commission non-essential MCC & controls back to DCS.	
5	CO/OP			Place P2 back on line within the DCS.	

Table A.5
Perimeter Road Pumping Station
Construction Plan - Shutdown 5 - Rev 0
Install New Magmeter - Shutdown 600 mm Discharge Pipeline

Maximum Duration: Up to 2 weeks.

Start Date: 4 Dec 2012

Equipment out of service: Entire station for time required to drain 600 mm pipeline. After that, the 600 mm pipeline will be shutdown until work is completed.

Legend:
OP = WEWPCC Operations
CO = Contractor
KGS = KGS

CR - Community Row
CL = Collections

Task No.	Performed By	Done	Time	Activity	Comments
Preparations Before Shutdown Day					
A	OP			Confirm 600 mm discharge pipeline bypass valve FM-04, located on level 3, is closed.	Confirm role of forcemain vent piping located near FM-04.
B	KGS/CO/OP			Confirm all electrical/control works for the new magmeter and valve FM-03A is complete and varified.	
C	OP			Commission wiring from marshalling panel to DCS panel for new mag and valve FM-03A	
D	OP			Remove Ultrasonic flow metering system	
Shutdown Start Day Activities					
1	OP/CR		9:00 PM	Request CR to pump down their wetwell	
2	OP/CR		11:00 PM	Request CR to shutdown their pumps.	
4	CL		2:00 AM	Monitor manholes	
1	OP/CO		2:00 AM	Close FM-02 on inlet to existing magmeter	Both OP & CO to place locks
2	OP		2:00 AM	Lockout P1,P2, P3 & P4	
3	OP			In valve pit VC2a - close valve VC2a-3. Varify VC-2a-5 is closed. Close H102-HV1 in headworks. Then open air vent in air release manhole.	Confirm air vent location.
4	OP			Open FM-01 on inlet to existng ultrasonic flow meter to permit draining 600 mm pipeline back into wetwell.	Review implications of closing FM-04 on adjacent vent system piping.
5	OP			Open P1-02 and P2-02 discharge plug control valves to permit back draining the 600 mm pipeline into the wet well	
6	OP			When pipeline is empty, close FM-01 on inlet to new magmeter	
7	OP			Open FM-02 on linlet to existing magmeter.	
8	OP/CO			Remove lockouts on P1, P2, P3 & P4	
9	OP			Place pumps back into normal operation	
10	OP/KGS/CO		8:00 AM	Authorize contractor to begin work	
11	CO			Remove ultrasonic flow metering system.	Turn system over to OP
12	CO			Cut and remove existing elbow and piping.	
13	CO			Remove existing concrete pipe support	
14	CO			Install new elbow. Modify base support as required.	
15	CO			Install remaining piping/supports/valve FM-03A & new magmeter	Install FM-03A in open position.
16	CO			Complete wiring of new magmeter and valve FM-03A & commission wiring to the marshalling panel.	Note the next shutdown no. 6 cannot start until the new magmeter is operational & the signal from both magmeters is being totalized correctly.
17	OP/CO			Open FM-01 on new magmeter inlet.Monitor vent valve in air release manhole and close when all air has been removed. Watch for leaks.Repair as required.	
18	OP/CO			With valve FM-03A in manual mode confirm valve limit switches and speed of operation.	
19	OP/CO			With valve FM-03A in computer mode initiate valve operation and confirm operatonal.	Test valve FM-03A operation by triggering the float in the level 100 sump & checking valve operation and limit switches.
20	CO/OP			Commission new magmeter and valve FM-03A and confirm systems are fully operational.	

Table A.6
Perimeter Road Pumping Station
Construction Plan - Shutdown 6 - Rev 0
Remove FM-03 and Install new 450 mm Shutoff Valve

Maximum Duration: Up to 2 weeks

Start Date: 08 Jan 13

Equipment out of service: Entire station for time required to drain 750 mm pipeline. After that, the 750 mm pipeline only will be shutdown until work is completed.

Legend:
OP = WEWPCC Operations
CO = Contractor
KGS = KGS

CR - Community Row
CL = Collections

Task No.	Performed By	Done	Time	Activity	Comments
Preparations Before Shutdown Day					
A	OP			Confirm 600 mm discharge pipeline bypass valve FM-04, located on level 3, is closed.	
B	CO			Confirm all electrical/control works for the new magmeter and valve FM-03B are complete and varified.	Confirm all wiring and compressed air piping to valve FM-03B is installed.
C	OP			Complete wiring from marshalling panel to DCS panel, and commission wiring and related software.	
Shutdown Start Day Activities					
1	OP/CR		9:00 PM	Request CR to pump down their wetwell	
2	OP/CR		11:00 PM	Request CR to shutdown their pumps.	
3	CL		2:00 AM	Monitor manholes	
4	OP		2:00 AM	Close FM-01 on inlet to new magmeter.	
5	OP/CO		2:00 AM	Lockout P1,P2, P3 & P4	Both OP & CO to place locks
6	OP			In valve pit VC2a - close valve VC2a-2. Varify VC-2a-5 is closed. Close H101-HV1 in headworks. Then open air vent in VC-1.	
7	OP			Open P1 and P2 discharge control valves (P1-02 & P2-02) to permit back draining the 750 mm pipeline into the wet well	
8	OP			When 750 mm pipeline is empty, close FM-02 on inlet to existing magmeter	
9	OP			Open FM-01 on inlet to new magmeter.	
10	OP/CO			Remove lockouts on P1, P2 & P4	
11	OP			Place pumps back into normal operation	
12	OP/KGS/CO		8:00 AM	Authorize contractor to begin work	
13	CO			Remove 900 mm FM-03 valve & related power & control wiring	
14	CO			Install replacement spool piece and related Victaulic couplings.	
15	CO			Modify piping and install new valve FM-03B.	Install FM-03B in open position.
16	CO			Open FM-02 on existing magmeter inlet.Watch for leaks.Repair as required.	Monitor vent valve in valve pit VC1.
17	OP			When all pipeline air has been removed, close air vent & open valve VC2a-2 in valve pit VC2a	
18	CO/OP			With valve FM-03B in manual mode confirm valve limit switches and speed of operation.	
19	CO/OP			With valve FM-03B in computer mode initiate valve operation and confirm operatonal.	Test valve FM-03B operation by triggering the float in the level 100 sump & checking valve operation.
20	CO/OP			Commission valve FM-03B and confirm system is fully operational.	
21	OP			Open FM-04 600 mm bypass valve.	This item is at the discretion of OP

Table A.7
Perimeter Road Pumping Station
Construction Plan - Shutdown 7 - Rev 1
Replace P1-02 Plug Valve

Maximum Duration: 3 Days

Start Date: 22 Jan 2013

Equipment out of service: P1

Legend:
OP = WEWPCC Operations
CO = Contractor
KGS = KGS
CR - Community Row

Task No.	Performed By	Done	Activity	Comments
Preparations Before Shutdown Day				
A	CO		Install rigging as required.	
B	CO		Confirm all new material is on Level 2.	
C	CO		Confirm all controls for new valve P1-02 are tested and ready	
D	CO/KGS		Confirm shutdown can proceed	
Shutdown Day Activities				
1	OP - CO		Lock out P1 and shutoff power to Plug valve P1-02 actuator controls.	OP and CO both to install lock.
2	OP		Close plug valve downstream shut-off valve P1-03	
			Open existing plug valve P1-02.	
3	OP		Dewater P1 discharge pipe to below floor level	Provide vent air by drilling hole in pipe to be removed.
4	OP/KGS		Advise contractor work can begin	
5	CO		Disconnect P1-02 compressed air supply.	
6	CO		Remove upstream pipe section	
7	CO		Remove valve actuator & body	
8	CO		Remove concrete base	
9	CO		Install new pipe support upstream of plug valve	
10	CO		Install new valve/actuator assembly	Install valve in open position and provide temporary support.
11	CO		Install modified pipe section & new victaulic coupling	
12	CO		Reconnect compressed air and power supply to actuator	
13	CO/OP/KGS		Commission P1-03. With the valve in manual mode, stroke the valve open and closed, & confirm limit switches are working. Adjust valve speed of operation.	
14	CO/OP		With valve in on-line mode, start pump in manual mode and confirm valve operates correctly. Adjust delay timer setpoints to ensure smooth operation during opening and closing.	Note pump discharge valve P1-03 is closed.
15	CO/OP		Start pump in automatic mode and confirm valve operation. Make adjustments as requried.	Note pump discharge valve P1-03 is closed.
16	OP		Open shutoff valve P1-03	
17	OP - CO		Remove pump P1 lockout	
18	CO		Turn over completed work to W&W	

APPENDIX B

REFERENCE DRAWINGS

200 AIR RELEASE
20 AIR RELEASE
13 AIR RELEASE

INFLUENT
1350

1350ø SLUICE GATE
1200x1200 SLUICE GATE
1200x1200 SLUICE GATE
900ø SLUICE GATE
900ø SLUICE GATE
900ø SLUICE GATE
1200ø SLUICE GATE
1200ø SLUICE GATE

INLET CHAMBER
DISTRIBUTION CHAMBER
WET WELL NO. 2
WET WELL NO. 1
WET WELL

P4-01 PUMP P4 P4-02 P4-03
P3-01 PUMP P3 P3-02 P3-03
P2-01 PUMP P2 P2-02 P2-03
P1-01 PUMP P1 P1-02 P1-03

FM-01 FE-M650 FM-03A
FM-02 FE-M600 FM-03B
AIR RELEASE
AV-01 AV-02

EFFLUENT TO WEST END WASTEWATER TREATMENT PLANT
EFFLUENT TO WEST END WASTEWATER TREATMENT PLANT

LEGEND:
- GATE VALVE
- PLUG VALVE
- BALL VALVE
- CHECK VALVE
- REDUCER

APEGM Certificate of Authorization KGS Group No. 245

NO.	REVISIONS	DATE	BY
A	CONSTRUCTION PLAN	11 08 18	RED

FIELD BOOK #:
POSTED TO LIDS

KGS GROUP CONSULTING ENGINEERS

DESIGNED BY	RED	CHECKED BY	
DRAWN BY	VJH	APPROVED BY	
HOR. SCALE		RELEASED FOR CONSTRUCTION	
VERTICAL			
DATE	2011 09 16	DATE	

ENGINEER'S SEAL

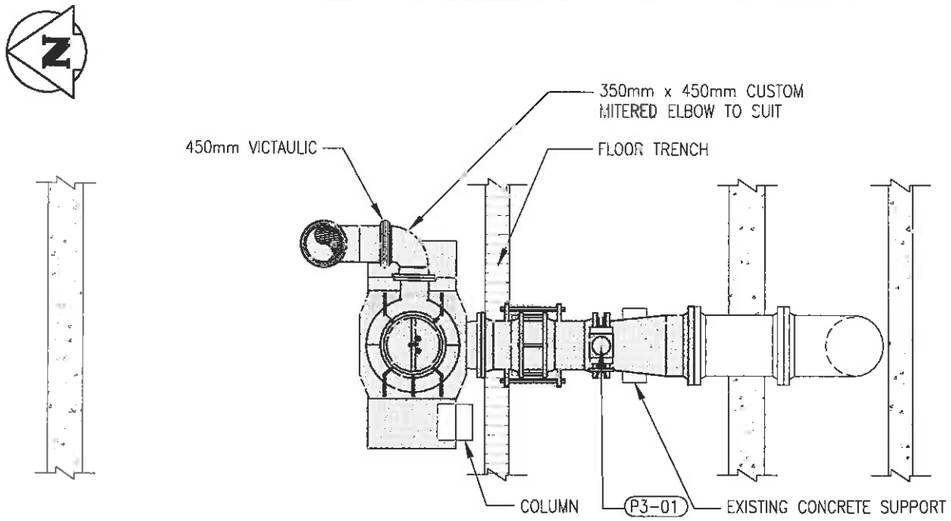
FIGURE 4.1

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

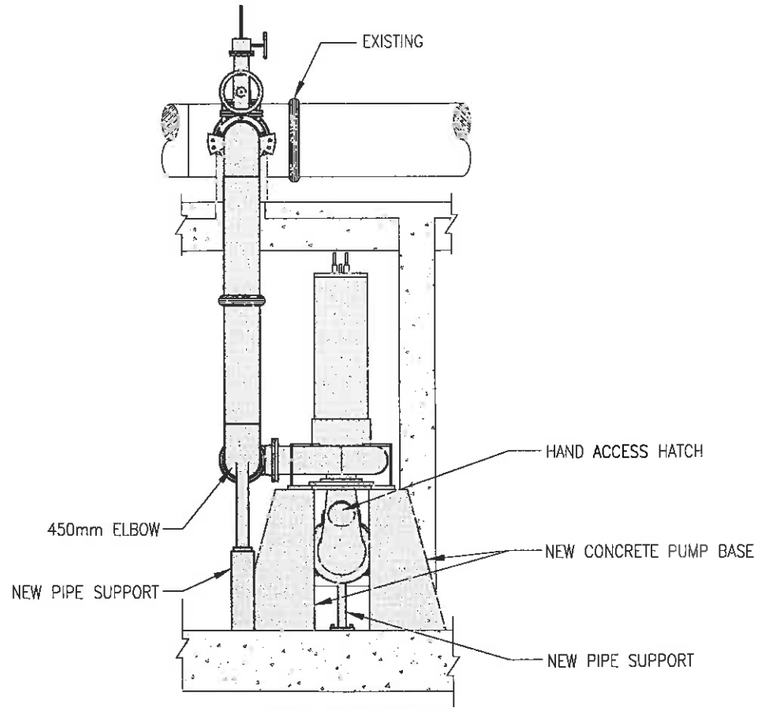
REPLACEMENT OF RAW SEWAGE PUMP P-3
PERIMETER ROAD PUMPING STATION
PIPING SCHEMATIC

SHEET 1 OF 1
CITY DRAWING NUMBER

FileName: P:\Projects\2010\10-0107-23\Dwg\Mech\10-0107-23M00.dwg -- Tab: Layout1 Plotted By: Hewitt 09/16/2011 [Fri 8:15am]



PLAN – LEVEL 100



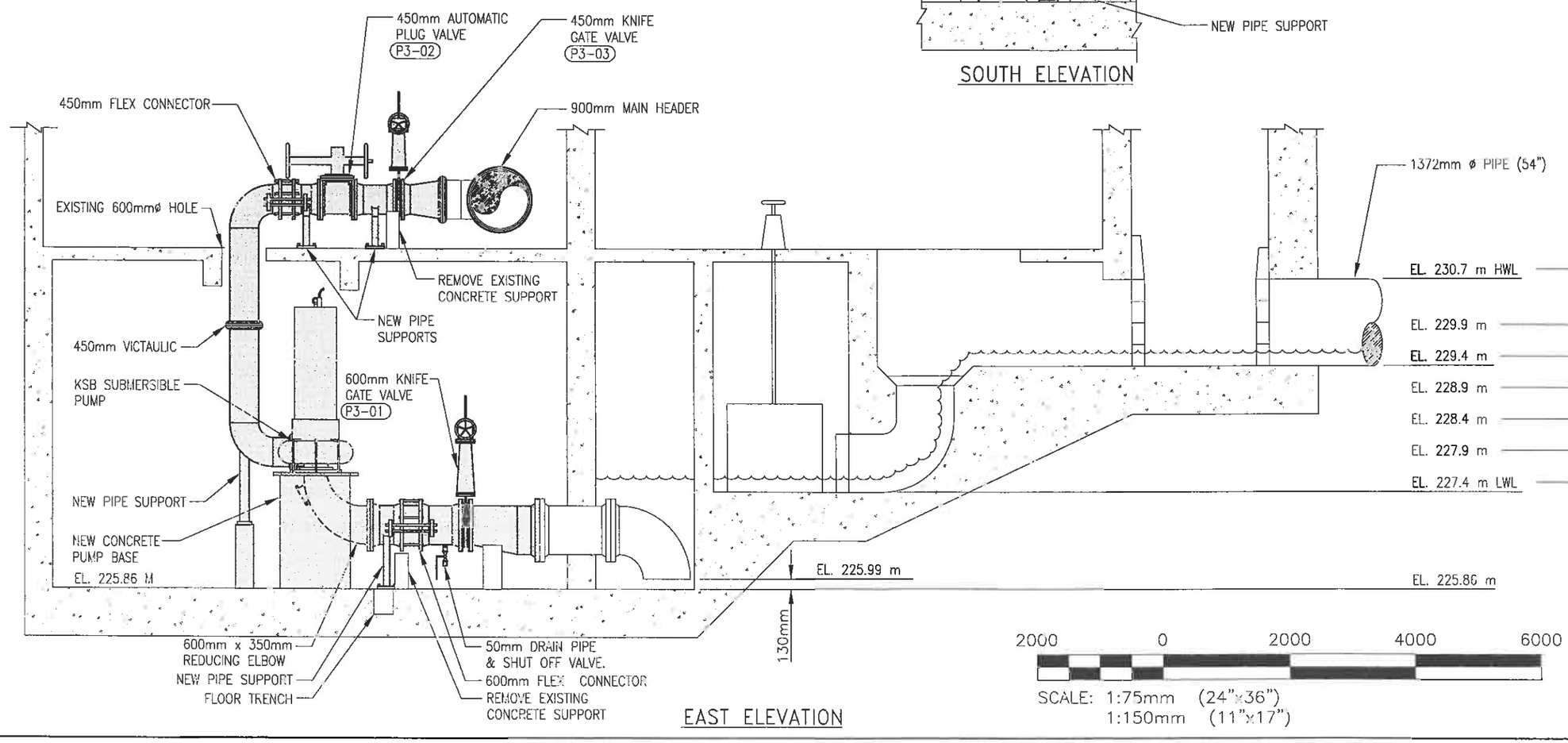
SOUTH ELEVATION

LEGEND:

FLANGED CONNECTION

VICTAULIC CONNECTION

SHADED NEW PIPING & EQUIPMENT



EAST ELEVATION

2000 0 2000 4000 6000

SCALE: 1:75mm (24"x36")
1:150mm (11"x17")

KGS GROUP CONSULTING ENGINEERS

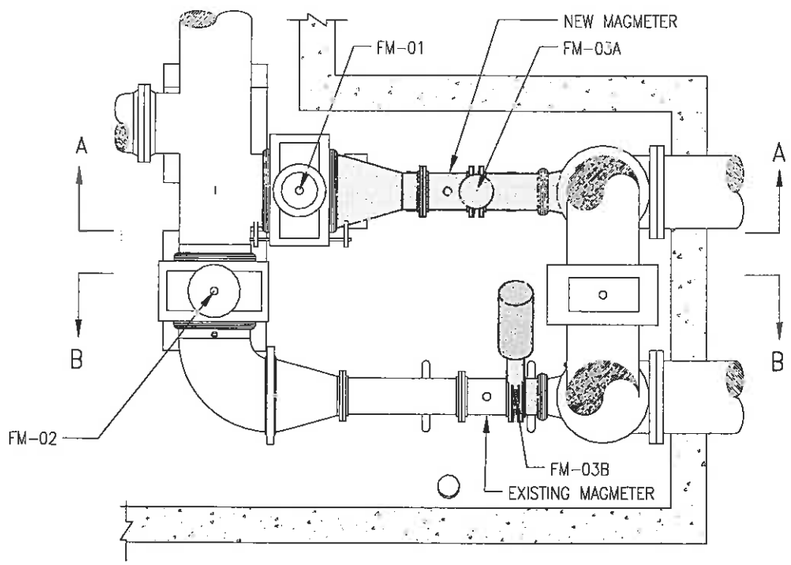
THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT

REPLACEMENT OF RAW SEWAGE PUMP P-3
PERIMETER ROAD PUMPING STATION

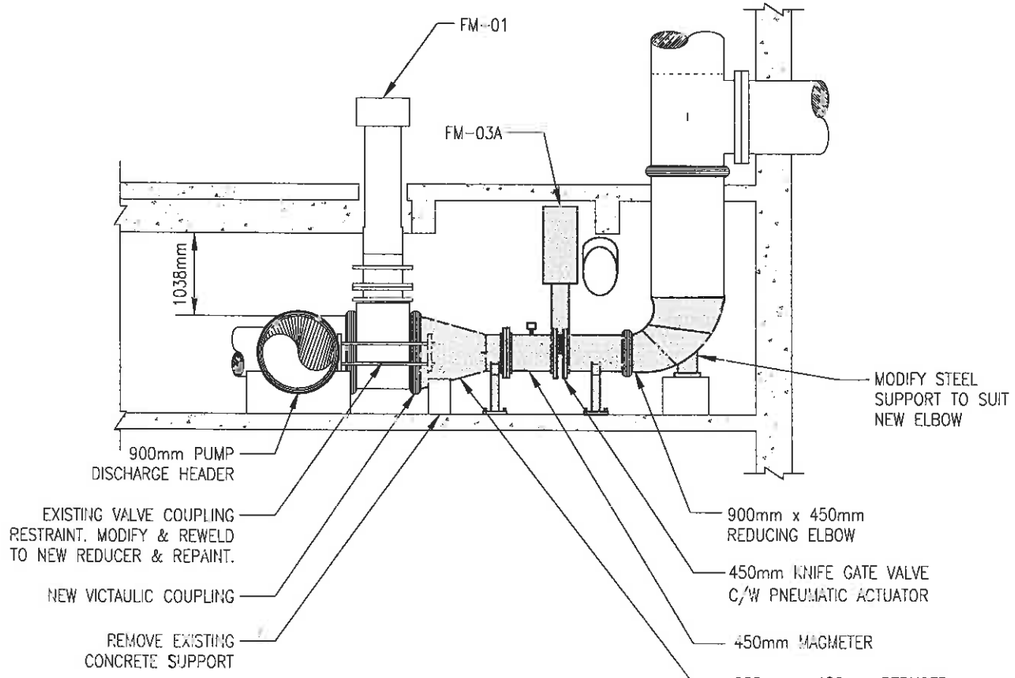
MECHANICAL
PUMP P-3 LAYOUT

MAY/2011 | FIGURE 2.1 | REV —

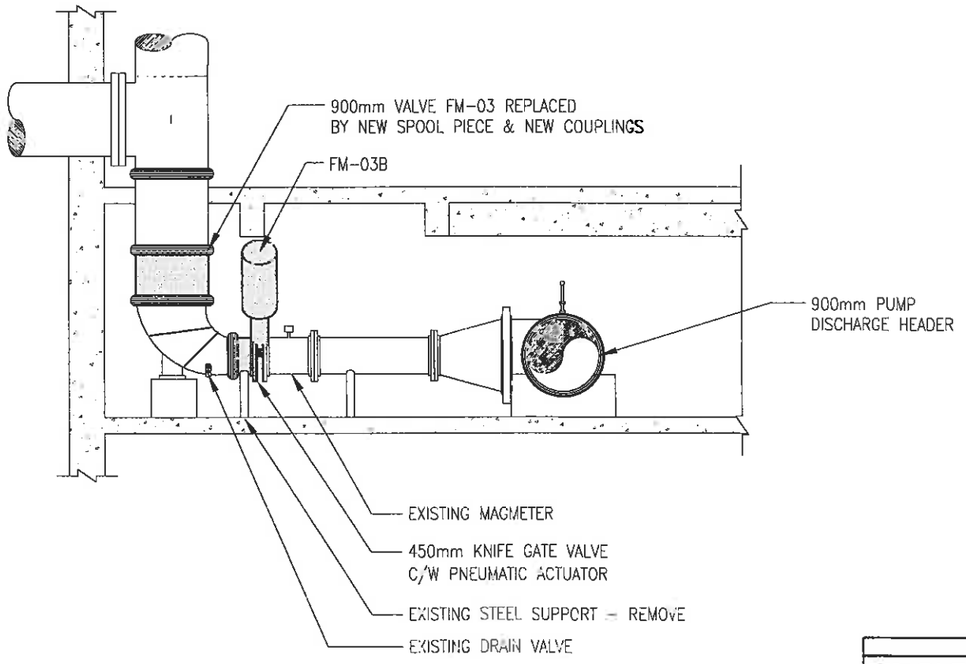
2



PLAN LEVEL 200 – STATION DISCHARGE MAGMETERS



SECTION A – NEW MAGMETER



SECTION B – EXISTING MAGMETER

LEGEND:

FLANGED CONNECTION

VICTAULIC CONNECTION

SHADED NEW PIPING & EQUIPMENT

2000 0 2000 4000 6000

SCALE: 1:75mm (24"x36")
1:150mm (11"x17")

KGS GROUP CONSULTING ENGINEERS

THE CITY OF WINNIPEG WATER & WASTE DEPARTMENT

REPLACEMENT OF RAW SEWAGE PUMP P-3
PERIMETER ROAD PUMPING STATION

MECHANICAL
LEVEL 200 – NEW STATION
MAGMETER & GATE VALVES

MAY/2011 | FIGURE 6.1 | PW —

File Name: P:\Projects\2010\10-0107-23\Dwg\Mech\10-0107-23_FIGURE 6.1.dwg – Tab: FIG. 6.1 Plotted By: mlocquiao 09/01/2011 [Thu 2:33pm]
2'x36" PLOT SCALE: 1:1 11"x17" PLOT SCALE: 1:2

B SIZE 11" x 17" (279.4mm

PLOT: 08/11/20 2:45:46 PM

Saved By: denoudenw

D265-202-01_00-C-F303_RX.dwg

ISS/REV: A
UMA FILE NAME:

Valve ID	Valve Location	Size	Type	Normal Position
PRPS-D1	PRPS Pump Floor West FM Discharge	900	Gate Valve	Open
PRPS-D2	PRPS Pump Floor East FM Discharge	900	Gate Valve	Closed
PRPS-D3	PRPS Common Header	600	Gate Valve	Open
VC1-1	VC1 North Valve	600	Gate Valve	Open
VC1-2	VC1 South Valve	600	Gate Valve	Open
VC2a-1	VC2a Common Header - North Valve	600	Knife Gate	Open
VC2a-2	VC2a - 900 FM	600	Gate Valve	Open
VC2a-3	VC2a - 600 FM	600	Gate Valve	Open
VC2a-4	VC2a Lagoon Bypass	450	Gate Valve	Closed
VC2a-5	VC2a Common Header South Valve	450	Knife Gate	Closed
VC5-1	VC5 Lagoon Discharge	450	Gate Valve	Closed
L103-HV2	VC2b Plant Valve	600	Gate Valve	Open
L103-HV1	VC2b Bypass Valve	600	Gate Valve	Closed
H101-HV1	WEWPCC 900 Inlet	600	Gate Valve	Open
H102-HV1	WEWPCC 600 Inlet	900	Gate Valve	Open

VC1-1
VC1-2
VC1

PERIMETER ROAD
PUMPING STATION
INV 234.63

WILKES AVENUE

IMH1
IMH2
IMH3
IMH4
INV 235.15

C.N.R. Right-of-Way

PERIMETER HIGHWAY

600 PVC FRM

VC1
INV 235.46

IMH5
INV 235.31

750 PCCP FRM

IMH6

PRPS-D1
PRPS-D2
PRPS-D3
MAG METER
ULTRA-SONIC FLOW METER

H102-HV1
H101-HV1

AREA 'H' - HEADWORKS

AIR RELEASE MANHOLE
INV 235.85

WEST END WATER POLLUTION CONTROL CENTRE

OLD WWTP

IMH7

VC2a-1
VC2a-2
VC2a-3
VC2a-4
VC2a-5
VC2a

VC3
VC4
600 PCCP FRM
600 PCCP FRM
900 PCCP FM
600 PCCP FM
VC2b
INV 235.05
VC2a
INV 235.68
600 PVC FRM
DRAIN MANHOLE
INV 234.39

CELL #1

450 FRM
VC5
INV 235.44

L103-HV1
L103-HV2
VC2b

VC5-1
VC5

The City of Winnipeg, Water and Waste Department
Perimeter Road Sewage Pumping Station Reliability
Forcemain Twinning

UMA | AECOM

Figure 2