Agenda – Executive Policy Committee – February 12, 2014

Report – Standing Policy Committee on Infrastructure Renewal and Public Works – February 4, 2014

Item No. 3 Discoloured Water Investigation Findings and Mitigation Plan

STANDING COMMITTEE RECOMMENDATION:

On February 4, 2014, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the Winnipeg Public Service and submitted the following to Council:

1. That funds in the amount of $580,000.00 be transferred from the Waterworks System Fund – Water Treatment Plant – Functional and Detailed Design and Construction, Account Distribution No. 443 181000 200751 2002421000, to the Water Treatment Research Process and Optimization Replacement Project, Account Distribution No. 443 181000 200751 20025006YY.

2. That the CH2M Hill Canada Limited (CH2M Hill) report entitled "Winnipeg Discoloured Water Investigation" be received as information.

3. That the authority be delegated to the Chief Administrative Officer to negotiate a single source engineering consultant contract for a third party review of the CH2M Hill Canada Limited (CH2M Hill) report entitled "Winnipeg Discoloured Water Investigation", as well as a review of the process design of the water treatment plant, in an amount not to exceed $500,000, GST and MRST extra as applicable.

4. That the Proper Officers of the City be authorized to do all things necessary to implement the intent of the foregoing.

Agenda – Executive Policy Committee – February 12, 2014

Report – Standing Policy Committee on Infrastructure Renewal and Public Works – February 4, 2014

DECISION MAKING HISTORY:

STANDING COMMITTEE RECOMMENDATION:

On February 4, 2014, the Standing Policy Committee on Infrastructure Renewal and Public Works concurred in the recommendation of the Winnipeg Public and submitted the matter to the Executive Policy Committee and Council.

ADMINISTRATIVE REPORT

Title: **DISCOLOURED WATER INVESTIGATION FINDINGS AND MITIGATION PLAN**

Critical Path: **Standing Committee on Infrastructure Renewal and Public Works - Executive Policy Committee – Council**

AUTHORIZATION

Author	Department Head	CFO	CAO
T. Josephson, P.Eng., Manager of Water Services	Diane P. Sacher, P. Eng., Director of Water and Waste	M. Ruta	D. Joshi A/CAO

RECOMMENDATIONS

1. That funds in the amount of $580,000.00 be transferred from the Waterworks System Fund – Water Treatment Plant – Functional and Detailed Design and Construction, Account Distribution No. 443 181000 200751 2002421000, to the Water Treatment Research Process and Optimization Replacement Project, Account Distribution No. 443 181000 200751 20025006YY.

2. That the CH2M Hill Canada Limited (CH2M Hill) report entitled "Winnipeg Discoloured Water Investigation" be received by Council as information.

3. That the Executive Policy Committee delegate the authority to the Chief Administrative Officer to negotiate a single source engineering consultant contract for a third party review of the CH2M Hill Canada Limited (CH2M Hill) report entitled "Winnipeg Discoloured Water Investigation", as well as a review of the process design of the water treatment plant, in an amount not to exceed $500,000, GST and MRST extra as applicable.

4. That the Proper Officers of the City be authorized to do all things necessary to implement the intent of the foregoing.

REASON FOR THE REPORT

The transfer of funds over $100,000.00 or 25% of the base capital budget, whichever is the lesser, requires approval of the Standing Policy Committee on Infrastructure Renewal and Public Works.

The single source negotiation for Consultant Services where the estimated value of the consultant Service relating to capital projects included in the capital budget exceeds $100,000 in total, including all phases of any given project, requires approval of Executive Policy Committee.

IMPLICATIONS OF THE RECOMMENDATIONS

CAPITAL BUDGET

Transfer of funds to the Water Treatment Research Process and Optimization Replacement Capital Project:
Funds in the amount of $580,000 are available in the Waterworks System Fund - Water Treatment Plant – Functional and Detailed Design and Construction, Account Distribution No. 443 181000 200751 2002421000 to transfer to the Water Treatment Research and Process Optimization Facility Project budget of $1.3 million.

This funds transfer will permit accelerated pilot testing and the installation of staff safety systems. Given the proposed location of the pilot plant in the Water Treatment Plant, additional chemical monitors, interlocking /alarming systems and other systems are required to help ensure staff safety.

Single Source Negotiation and Award of Contract:
Funds in the amount of $300,142,000.00 were included in the Water Treatment Plant capital budget, account distribution 443 181000 200751 2002421000-exconsult. There are funds available in this account to hire a consultant to conduct the third party review

OPERATING BUDGET

The 2014 approved operating budget did not make provision for new and/or expanded work in the form of additional testing of the water supply and distribution network nor an accelerated water main flushing program.

The incremental costs associated with these near term programs are estimated at $250,000. The Department will attempt to absorb within the overall water utility operating budget and if required, will submit an additional budget appropriation later in the year.

POTENTIAL FUTURE COSTS

There is potential for further operating and/or capital costs related to the measures that may be implemented to reduce discoloured water incidents depending on the outcome of water treatment testing and possible changes in operating parameters. These costs, if any, would be included in future budget submissions.

HISTORY

In 2010, in response to an increased frequency of customer-reported discoloured water incidents, the Water and Waste Department engaged the engineering consulting firm of AECOM Canada Ltd., with CH2M Hill Canada Limited as the sub-consultant, to investigate, determine cause and provide recommendations to resolve. This consultant team was selected as they were the design consultants of the water treatment plant which was commissioned in December 2009, and therefore familiar with Winnipeg's water quality and water treatment processes.

AECOM submitted a report in April 2011, providing findings on the underlying cause of the discoloured water, and recommendations to mitigate recurrences. The Water and Waste Department implemented the recommendations and in summer and fall of 2011, observed a decrease in discoloured water reports.

In summer and fall of 2012, an increase in customer reports of discoloured water was observed. In September of 2012, the Water and Waste Department engaged CH2M Hill to review the discoloured water issue and assist in identifying sources of the discoloured water and the measures to potentially mitigate the situation.

While this review was ongoing, Winnipeg experienced a significant increase in customer reports of discoloured water in summer 2013, generating widespread media and customer attention. The Water and Waste Department (WWD) engaged the engineering consulting firm of CH2M Hill to assist in investigating the cause of the unprecedented number of reports of discoloured water in the water distribution system, and to provide recommendations to diminish future recurrences of discoloured water.

Reports of discoloured water have decreased substantially since then, but the water distribution system remains sensitive to operational events that can trigger discoloured water.

The final CH2M Hill report entitled “Winnipeg Discoloured Water Investigation” is attached as Appendix A. The following is a summary of the consultant report findings and recommendations as well as the next steps that Water and Waste Department will take to minimize future recurrences of discolouration in the water distribution system.

Report Findings

CH2M Hill’s key report findings include the following:

- The water continues to be safe and continues to meet all regulatory requirements for health.

- Most discoloured water events can be attributed to construction and maintenance activities, such as water main servicing, water main breaks, hydrant usage, etc. in the water distribution system.

- The 2011 AECOM report identified biofilm issues as the likely cause of discoloured water at that time, and the 2013 CH2M Hill report validates this finding. CH2M Hill indicates in its report that these biofilm issues have been substantially mitigated and controlled due to implementation of the recommendations identified in the 2011 AECOM report.

- The 2013 CH2M Hill report identifies manganese in treated water as the significant contributing factor to the increase in discoloured water reports. The report found that manganese levels in the water distribution system have been increasing since the water treatment plant was commissioned in December 2009.

- While some manganese is present in the source water (Shoal Lake), the main source of manganese in the treated water has been identified as the coagulant chemical, ferric chloride,

used at the water treatment plant. Ferric chloride supplies contain small and varying amounts of manganese as an incidental by-product of production. All chemicals used at the water treatment plant meet applicable standards for use in drinking water (AWWA Standards) but there are ferric chloride coagulants available with varying concentrations of manganese.

- It is noted by the WWD that the ferric chloride currently in use at the water treatment plant at the time of this writing was specified by the plant design consultant (AECOM and CH2M Hill).

- The CH2M Hill report notes that the water treatment plant was not designed to remove manganese, based on the historical data and pilot testing that the design consultant undertook at the time. Nonetheless, they are now recommending a maximum target of no more than 0.015 mg/L from the water treatment plant in order to reduce the potential for discoloured water incidents.

- The presence of manganese was identified in the treated water storage reservoirs and throughout the water distribution system primarily in the form of sediment and deposits on pipe walls. The CH2M Hill report indicates that discoloured water recurrences will most likely continue until manganese is removed / minimized at the water treatment plant, and removed from the storage reservoirs and distribution system.

The CH2M Hill Discoloured Water Investigation report includes a summary of recommendations and actions. The key recommendations and actions together with the Water and Waste Department's implementation plans are as follows:

1. Monitor both Shoal Lake and the Deacon Reservoir for manganese to determine if source water contributions have an increasing influence on the plant and whether or not dedicated treatment for manganese is necessary
    - WWD has historically monitored both Shoal Lake and Deacon Reservoir for manganese, but the consultant recommends more frequent sampling and testing. Based on the monitoring, manganese removal processes may be required at the water treatment plant.

2. Replace the ferric chloride coagulant with an alternative product that contains less manganese
    - The ferric chloride coagulant being used in 2013 had an average manganese concentration of 802 parts per billion. A bid opportunity for an alternative ferric chloride coagulant that specifies a <u>maximum</u> allowable concentration of 600 parts per billion (so that the average will likely be in the range of 400-500 parts per billion) closed on December 11, 2013, with contract award pending. A ferric chloride coagulant with a lower concentration of manganese will be in use by mid-February 2014.

3. Select an alternative coagulant
    - This recommendation requires substantial pilot testing to ensure proper water treatment plant performance and ongoing water safety. There is an existing capital project entitled the Water Treatment Research Process and Optimization Replacement project. This capital project is for the design and construction of the required pilot plant facility within the existing water treatment plant to be used for

testing purposes. However, in order to expedite the evaluation and testing of an alternative coagulant other than ferric chloride, the department is recommending transfer of funds from the water treatment plant capital account to expedite the completion of the project and to install several life safety systems that will need to operate in conjunction with the plant. This will be achieved using a dedicated contractor in lieu of the original project plan to have City forces construct the facility. Once the pilot plant facility is constructed, pilot testing of 12 months is required to evaluate and test the coagulant(s) through all four seasons of water quality conditions. As such, it will be approximately two years before a decision is made whether or not to proceed with an alternative coagulant.

4. Modify the existing WTP treatment process to improve manganese reduction without jeopardizing the ongoing operation of the WTP to produce safe water
    - City staff and the consultant are currently conducting demonstration tests of recommended filtration process changes. The first phase of demonstration testing will be complete in February, 2014. Further testing to optimize manganese removal will continue until full-scale implementation in summer 2014.

5. Provide consistent water quality to the distribution system
    - pH targeted between 7.6 and 7.8 – this has been implemented with monitoring procedures to ensure consistency.
    - Increased chlorine residual target – this was a recommendation in the 2011 AECOM report and was implemented at that time.
    - continued orthophosphate for corrosion control – this has been in place since 2000
    - year round ozonation, except for short-term outages required to undertake maintenance, has occurred since the water treatment plant was commissioned with the exception of November 2012 to May 2013, when ozone was shut down for an extended period of time primarily for maintenance purposes.

6. Review distribution system operations from the perspective of operating the distribution system to manage water quality (i.e. maintain flows, avoid dead ends, minimize water age, look at role of changing flow directions).

7. Continue to flush the system as a means to reduce the deposits (particulate metals) in the system using unidirectional flushing
    - Accelerated water distribution system flushing will begin in May 2014, as it is seasonal work and cannot be undertaken during freezing conditions. City staff is developing a plan that would target flush the entire system within two years. It should be noted that it typically takes six years to flush all water mains in Winnipeg's distribution system (about 2400 kilometres).

8. Regularly draw down and inspect the treated water storage reservoirs
    - Reservoir cleaning (three water storage reservoir locations) is already a routine scheduled activity. However, in response to this recommendation, staff are ensuring that all three reservoirs will be cleaned and inspected by late summer 2014. It will be repeated as necessary until there is no further evidence of manganese in the reservoirs.

Next Steps

With the exception of recommendation #3, which may or may not be implemented depending on pilot testing results, implementation of all report recommendations is expected to take approximately two years to complete. However, it is expected that incremental improvements (reduction in the level of discoloured water incidents) should occur as each recommendation is implemented. Several of the recommendations will be implemented by summer 2014, and residents should expect improvement in summer 2014 compared to 2013, and continued improvement as the remaining recommendations are implemented until the issue is fully resolved.

In addition to the CH2M Hill's recommendations in the Discoloured Water Investigation report, the Water and Waste Department is taking additional steps to minimize incidents of discoloured water. These steps include careful coordination of construction schedules, minimizing and optimizing fire hydrant use by City forces and contractors, employing unidirectional flushing techniques for spot flushing, and operating the water distribution system to minimize disruptions in flow direction and velocity. However, discoloured water incidents are expected to occur over the next two years, albeit at reduced frequency.

The department recommends that a third party independent engineering consultant be engaged to review the water treatment plant design and the subsequent discoloured water investigation reports. The Department will procure an engineering consultant who is independent of the original water treatment plant design work and the subsequent discoloured water investigation reports, and who has the necessary experience to successfully complete the assignment. This process will be fully identified in the award report for the CAO's approval. Approval for single source negotiations is recommended because the review is urgently required. Section B4.1 (j) of the Materials Management Policy allows for single source negotiations when there is an emergency which adversely affects the functioning of the City and which may not be reasonably met by any other procedure. A public bid solicitation would not be required pursuant to the Agreement on Internal Trade because the proposed services would be provided by licensed professionals that are exempt from the application of the Agreement on Internal trade.

Water Treatment Plant Capital Budget Financial Status:

Authorized Capital		$ 300,142,000.00
Amount of Previous Awards or Expenditures	$ 297,251,041.00	
Amount recommended for transfer to WTPRO	$ 580,000.00	
Amount of this Award, third party review	$ 500,000.00	
Total Estimated Cost	$ 298,331,041.00	$ 297,751,041.00
Estimated Residual for Remaining Projects		$ 1,810,959.00

Water Treatment Research Process and Optimization (WTRPO) Capital Budget Financial Status:

Approved Capital		$1,300,000.00
Amount Recommended for Transfer from WTP		$ 580,000.00
Total Amount of Funding		$1,880,000.00
Amount of Previous Awards or Expenditures		$ 421,774.00
Amount required for WTRPO engineering and contractor		$1,458,226.00
Total Estimated Cost	$1,880,000.00	$1,880,000.00

FINANCIAL IMPACT

Financial Impact Statement

Date: January 29, 2014

Project Name:

DISCOLOURED DRINKING WATER INVESTIGATION FINDINGS AND MITIGATION PLAN

First Year of Program **2014**

	2014	2015	2016	2017	2018
Capital					
Capital Expenditures Required	$ 2,380,000	$ -	$ -	$ -	$ -
Less: Existing Budgeted Costs	2,380,000	-	-	-	-
Additional Capital Budget Required	$ -	$ -	$ -	$ -	$ -
Funding Sources:					
Debt - Internal	$ -	$ -	$ -	$ -	$ -
Debt - External	-	-	-	-	-
Grants (Enter Description Here)	-	-	-	-	-
Reserves, Equity, Surplus	-	-	-	-	-
Other - Enter Description Here	-	-	-	-	-
Total Funding	$ -	$ -	$ -	$ -	$ -
Total Additional Capital Budget Required	$ -				
Total Additional Debt Required	$ -				
Current Expenditures/Revenues					
Direct Costs	$ 250,000	$ -	$ -	$ -	$ -
Less: Incremental Revenue/Recovery	-	-	-	-	-
Net Cost/(Benefit)	$ 250,000	$ -	$ -	$ -	$ -
Less: Existing Budget Amounts	250,000	-	-	-	-
Net Budget Adjustment Required	$ -	$ -	$ -	$ -	$ -

Additional Comments: The capital costs will be funded from retained earnings. The Department will attempt to cover the additional operating costs through the overall 2014 operating budget of approximately $95 million. If required, the Department will seek an additional budget appropriation later in the year.

Original Signed by
Moira L. Geer, C. A.
Manager of Finance and Administration

CONSULTATION

In preparing this report there was consultation with:

Legal Services Department (as to legal issues)
Materials Management Division, Corporate Finance Department

SUBMITTED BY

Water and Waste Department
Water Services Division
Prepared by: T.S. Josephson, P.Eng.
Date: January 29, 2014

APPENDIX A



Appendix A Winnipeg
Discoloured Water In