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December 16, 2019

Troy Baughman, P.E.
Senior Project Engineer
City of Ann Arbor Systems Planning
301 E. Huron Street, P.O. Box 8647
Ann Arbor, Michigan 48107

Subject: Distribution System Analysis of U of M Separation Proposal

Dear Mr. Baughman:

Presently, the University of Michigan (UM) owns, operates, and maintains much of the distribution system serving the North, Central, and Athletic campuses. Since this system is integrated into the City of Ann Arbor (City) distribution system, water entering these areas may flow through the UM system to other City customers. Compliance with MDEQ regulations may require that the City either perform all maintenance of these systems, or that steps be taken to isolate these campuses from the City distribution system. For this second alternative, metering and backflow prevention would need to be provided at each connection point between the two systems.

In 2007, CDM Smith conducted an evaluation of the impacts of isolating the UM water distribution system from the City water system under the second alternative above. This proposal is in response to your request to reproduce that analysis, updated for current conditions.

The focus of the analysis is to understand the pressure, water age and fire-flow impacts of this potential isolation, and to develop planning level costs to provide the same level of service if this isolation were to be implemented.

We have developed scope, schedule, and budget to perform the analysis needed to understand the impacts of providing the isolation of these two systems. Following are the work scope items we expect to perform:

Scope

Task 1 - Verify and Update UM Boundaries: There are potentially two sources of data to support the confirmation of existing boundaries:

1. Current City GIS data, which may include ownership information on City versus UM pipes and valves





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2. The original 2007 study models. In support of developing this proposal, CDM Smith reviewed some of the 2007 models, which were developed in H₂OMap Water. It appears that the methodology applied in 2007 was to de-activate each City to UM connection and replace it with an equivalent check valve connection. The locations of these check valves could be exported from the model and used to inform the connection points in the current InfoWater model.

CDM Smith will review City GIS data and its appropriateness to support this task before embarking on the second approach.

Based on similar studies we have recently performed, CDM Smith would propose to evaluate permanently cutting and capping some connections and retrofitting others with backflow prevention devices.

Task 2 – Review and Update Demands: CDM Smith last updated the system demands as part of the updated master plan in 2010. The base scope and budget assumes that CDM Smith will only work with the City to identify any new or proposed UM buildings or substantial developments proposed in the City in the short term.

Although we have not budgeted for it, CDM Smith recommends that the City consider performing a more in-depth update to the water system demands for this analysis, particularly to understand potential water age impacts. This can be accomplished by geocoding or directly linking billing records data and updating the model demands through a database process and using the InfoWater Allocator tool. If this task is authorized, CDM Smith would request a specific format to receive the data and update the model with the updated billing demands, applying the same patterns to those used from 2010. This has been shown as an optional task in the project budget.

Task 3 – Perform Pressure and Fire Flow Analysis: CDM Smith will perform simulations using maximum day and average day demand conditions with and without the proposed modifications. Based on these reviews, pressure and fire flow deficiencies will be identified. Pressure and fire flow changes will be identified as follows:

- Change in average pressure over a simulation for maximum day and average day conditions, using color-coding
- Flag junctions that exhibit a minimum pressure that is changed by more than 10 psi, or that is above 40 psi under “as is” conditions but would be less than 40 psi under alternate conditions
- Flag junctions that exhibit a maximum pressure that is changed by more than 10 psi, or that is below 100 psi under “as is” conditions but would be more than 100 psi under alternate conditions



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- Change in fire flow for specific maximum day conditions using the same model configuration (i.e. same pumps on, tank levels, etc.)

During the pressure and fire flow analysis, there may be some give and take concerning which connections can be permanently closed without causing an undue impact on pressure or especially fire flow availability.

Task 4 - Perform Water Age Analysis: CDM Smith will perform a water age analysis under average day flow conditions to identify areas that would potentially be impacted. Water age changes will be identified as follows:

- Produce graphs (trend) showing before and after water age for each tank
- Change in average water age over the course of a long-term (336-hour) simulation, using color-coding
- Flag locations that exhibit a water age that is 24+ hours more under alternate condition than under as is conditions
- Flag locations that exhibit a maximum water age that is less than 1 week under as is conditions but more than 1 week under alternate conditions

5 - Determine and Test Required Improvements: CDM Smith will incorporate updates to the model to include new mains needed to address the identified hydraulic deficiencies and to resolve the water age issues noted above. Once established, the final pressures and fire-flows will be reviewed for adequacy.

6 - Prepare Cost Estimate: CDM Smith will prepare a planning level cost estimate for the additional mains needed. This cost estimate will also include the construction of meters and backflow prevention devices at each connection point between the two systems. It is assumed that unit costs for different size mains and the metering sites will be provided by the City based on bid tabulations, for use in developing this overall cost estimate. CDM Smith will prepare a technical memorandum to summarize the analysis work and provide the cost of the interconnection work.

Schedule

Given that a notice to proceed is received by the end of 2019, work can be completed and a draft report delivered by February 28, 2020. An initial meeting would need to be scheduled early in 2020 to discuss the ownership of mains and connection points for the UM system.



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Budget

The estimated project budget for this scope of work is provided in the attached Table 1. The budget is shown without and with optional work to perform a complete demand refresh as described in Task 2.

Table 1 - Analysis Cost				
Task Description	Hours	Labor	ODC	Budget
Task 1 - Verify and Update U of M Boundaries	42	\$ 6,464	\$ 400	\$ 6,864
Task 2 - Review and Update Demands	10	\$ 1,363	\$ -	\$ 1,363
Task 3 - Perform Pressure and Fire Flow Analysis	26	\$ 3,747	\$ -	\$ 3,747
Task 4 - Perform Water Age Analysis	20	\$ 3,287	\$ -	\$ 3,287
Task 5 - Determine and Test Required Improvements	30	\$ 4,930	\$ -	\$ 4,930
Task 6 - Prepare Cost Estimate	32	\$ 4,732	\$ 100	\$ 4,832
Total without Optional Demand Refresh	160	\$ 24,522	\$ 500	\$ 25,022
Optional Complete Demand Refresh	96	\$ 8,786	\$ -	\$ 8,786
Total with Optional Demand Refresh	256	\$ 33,308	\$ 500	\$ 33,808

If you have any questions about any of these items, do not hesitate to call me at (313) 230-5612.

Very truly yours,

David Vidikan, P.E.
Senior Client Service Leader
CDM Smith Michigan Inc.

cc: Craig Hupy, City of Ann Arbor
Jay Zawacki, CDM Smith
Mark Schobert, CDM Smith
Stan Plante, CDM Smith