

City Council Staff Report

July 15th, 2020**Applicant:** N/A**Location:** N/A**Prepared By:** Steven Lord,
P.E., Public Works
Director/City Engineer**Public Hearing:** No**Zone:** N/A**Attachments:**

Scope of Services

CONSENT AGENDA ITEM

Resolution executing a contract with Hansen, Allen & Luce (HAL) providing ongoing culinary water professional services with an initial contract of \$74,490.

BACKGROUND

Mapleton City has long contracted with RB&G Engineering to provide general engineering services. As the city continues to grow it has become necessary to broaden the pool of firms that provide professional services to the city. This enables us to spread the workload out among multiple firms and receive services from firms with expertise in areas such as culinary water, pressurized irrigation, or sanitary sewer.

RB&G has maintained the city's water model for several years. The model format does not allow any visibility or analysis to be performed outside of the proprietary software package which is cost prohibitive for the city to purchase. We are moving the model to a new format which will allow low level analysis, queries, and data extraction internally while still requiring long term model maintenance be done off site. RB&G does not have the capabilities to run the new model and as such the city has looked for an alternate firm to provide that service.

In addition, we are currently in the process of upgrading the SCADA system throughout the city and will continue to do that over the next several years. The new SCADA will have capabilities beyond what we have had in the past to optimize well production and pressures throughout the culinary and secondary water system. This gives us the chance to re-evaluate our operating practices and create some standard operating procedures based on efficient and real time data which was impossible before now.

The water quality study we performed in 2018 identified a need to establish a unidirectional flushing program. With the implementation of the new water model we will be able to design this flushing program and fulfill on of the recommendations set out in the water quality study.

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ANALYSIS

Selected Firm

In determining which firm to contract with city staff evaluated several firms based on previous experience and the recommendations of other municipalities in the area. Hansen, Allen & Luce have an impeccable reputation when it comes to water resource engineering and are the primary water resource consultant to several cities along the Wasatch Front. We have worked with their staff on previous projects and they are currently helping us with our Culinary Water Impact Fee Study. Katie Jacobsen is one of their staff engineers and she will be the primary technical lead for our contract. Katie comes from RB&G Engineering and has worked with the Mapleton City water model for years.

Services Provided

Build Existing EPS Hydraulic Model

Obtain and review existing water system data and information from GIS inventory, LIDAR or other elevation data, operator notes, SCADA controls and history, pump curves, and billing data, and build the hydraulic model. This will result in a working EPS model of the existing system.

Existing System EPS Model Validation and Calibration

Take the working hydraulic model and compare output to SCADA and other pertinent field data. Adjust the model as necessary to give reasonable match between model and SCADA data. Collect field data as needed and adjust model accordingly. This will result in a calibrated EPS model of the existing Mapleton City drinking water distribution system and will come with a calibration report.

Build Development Model

Obtain and review pipeline and demand data for approved developments and build a development mode to allow evaluation of proposed developments. This will result in an EPS “Development” model of existing system and approved developments.

Build Buildout Model

Obtain and review pipeline and demand data for expected future developments, obtain and review demand data for future growth outside of known developments, and build a buildout mode. This will result in an EPS “Buildout” model (master plan).

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Energy Optimization

Use the Existing System EPS model to complete an energy optimization analysis of the system, determine if more energy efficient methods can be identified, and provide recommendations.

Unidirectional Flushing Plans

Use the revised hydraulic model to generate unidirectional flushing plans that will allow the City to remove biofilm, stale water, and accumulated sediments on over 70 miles of system piping with more efficient use of water and time. The plan will aim to avoid water hammer and high pressures and will be provided in a streamlined way that is accessible to field crews.

CityWater Account Setup

Assist in obtaining a CityWater license/account subscription. Upload existing and development EPS models to CityWater. Demonstrate and provide training on CityWater capabilities using Mapleton's EPS model.

City staff will be able to run the models and perform hydraulic development analysis for small subdivisions through the online application. Staff and field personnel will be able to make comments on an ongoing basis.

Existing and Development Model Maintenance

HAL will maintain current peak day moels of the Mapleton 'Existing' and 'Development' models. Pipes and other system infrastructure will be added to the model as regularly as the city sends update GIS information to HAL. Annually, or as requested, HAL will review billing data to update demands in the model. As real time SCADA data becomes available, HAL will update model validation and calibration.

After each update, the 'Existing' and 'Development' models will be made available for viewing on the CityWater platform. HAL will regularly review the comments made by City personnel through the platform and make updates as necessary to ensure the model is accurate, up to date, and useful.

Development Hydraulic Modeling Review

HAL will perform a hydraulic modeling review of proposed developments that complies with all requirements in Utah Administrative Code R309-511.

STAFF RECOMMENDATION

Adopt the attached resolution executing the contract with Hansen, Allen & Luce.

RESOLUTION NO. 2020-

A RESOLUTION OF THE CITY OF MAPLETON, UTAH EXECUTING A CONTRACT WITH HANSEN ALLEN & LUCE PROVIDING ONGOING CULINARY WATER PROFESSIONAL SERVICES WITH AN INITIAL CONTRACT OF \$74,490.

WHEREAS, Mapleton City is committed to maintaining a safe and reliable culinary water system; and

WHEREAS, the existing city water model cannot be accessed internally by City staff; and

WHEREAS, the water quality master plan calls for a unidirectional flushing program; and

WHEREAS, the recent spike in new development has necessitated development of a comprehensive system optimization plan; and

NOW THEREFORE, BE IT RESOLVED by the City Council of Mapleton, Utah to adopt a resolution executing a contract with Hansen, Allen & Luce providing culinary water professional services with an initial contract of \$74,490.

This resolution adopted this 15th day of July, 2020 by the City Council of Mapleton City, Utah.

Dallas Hakes
Mayor

ATTEST:

Camille Brown
City Recorder

October 16, 2019

Mr. Steven Lord, P.E.
City Engineer/Public Works Director
Mapleton City
1405 West 1600 North
Mapleton, Utah 84664

Subject: Proposal for Drinking Water System Model Update

Dear Steven:

We are pleased to provide this proposal to update Mapleton City's drinking water system master plan and use the updated model to prepare an optimization analysis and unidirectional flushing plan.

PROJECT UNDERSTANDING

It is our understanding that Mapleton City would like Hansen, Allen & Luce (HAL) to update the computer hydraulic model of the City's drinking water distribution system. The intent of the project is to produce an updated calibrated GIS-integrated model that is capable of simulating the current ('Existing') system during a single time period (Steady State) and also over time (Extended Period, EPS) to predict system performance. The validated and calibrated 'Existing' model will be used to evaluate hydraulic performance of the distribution system. HAL will also use the 'Existing' model to complete an energy optimization analysis and to prepare unidirectional flushing plans.

HAL will prepare a 'Development' model including the existing system and all approved development, and a 'Buildout' model including all expected future development. These models will have the capability to be used for other analysis tasks the City may desire in the future, including development review.

All models will be loaded into the CityWater® platform for the City's use.

Based upon this understanding, we propose the following Scope for Services for completion of this project as described below.

SCOPE FOR SERVICES

Based on our project understanding, we propose the following tasks. Input and direction from Mapleton City staff will be considered on all tasks.

TASK 1: PROJECT START-UP AND MANAGEMENT

Objective: Review City staff goals for the project, and establish project management protocol. Hold kickoff meeting and provide initial data request. Provide management throughout the project.

Input:

- Contracted project work plan
- City staff's goals for the project
- 2018 Water Master Plan

Activities:

- Provide initial data request list to City.
- Conduct on-site project kickoff meeting to discuss project management protocol, schedule for key meetings/milestones, project goals, system criteria, and data needs.
- Provide project management throughout the project.
- Attend update meetings as needed.
- Prepare and distribute meeting agendas.
- Prepare and distribute meeting notes.
- Provide monthly billings and status reports during the duration of the project.

Output:

- Project management protocol and goals
- Data request
- Meeting notes and presentation materials
- Monthly invoices and status reports

TASK 2: GATHER DATA AND BUILD EXISTING SYSTEM EPS HYDRAULIC MODEL

Objective: Obtain and review existing water system data and information from GIS inventory, LIDAR or other elevation data, operator notes, SCADA controls and history, pump curves, and billing data, and build the hydraulic model.

Input:

- Updated GIS inventory of distribution system
- Publicly-available LIDAR digital elevation model or City-surveyed elevation data
- SCADA archive/data capture of representative time periods in peak summer weeks and low winter weeks
- SCADA control screen images or other description by system operators of how each zone is controlled (winter and summer)
- Billing data
- Prior system models
- Input from City staff

Activities:

- Gather prior studies, existing modeling and mapping, GIS data, billing data, water use and system performance data, system specifications, and operation details.
- Gather list of known problem areas and concerns within the system from City staff.
- Review existing information and identify additional data needs.
- Work with City staff to obtain and prepare any additional data needs.
- Review GIS data for topology issues. Provide feedback to City regarding any topology issues found that should be corrected before building the model in order to streamline future updates. Incorporate City feedback.

- Import GIS data (pipes, pumps, valves, tanks) into modeling software and use software automation to properly connect all model elements and fix any remaining topology issues.
- Extract elevations from LIDAR data or from City survey data and assign to model elements.
- Analyze, validate, process, and clean billing data to allow for use in the model.
- Allocate demands from billing data. Verify new customers and top 10% large customers are properly represented in the model. Scale demands to match water production data as appropriate.
- Derive diurnal consumption patterns from SCADA and billing data where possible and appropriate. Apply diurnal patterns to demands in the model.
- Set up important scenarios as deemed appropriate or requested by City personnel. Design scenarios to allow for straightforward maintenance of the model in the future.
- Update pump and storage curves as needed from data provided.
- Apply winter and summer control schemes to scenarios.

Output:

- A working EPS model of the Existing system in selected model format.

TASK 3: EXISTING SYSETM EPS MODEL VALIDATION & CALIBRATION

Objective: Take the working hydraulic model from the previous step and compare output to SCADA and other pertinent field data. Adjust the model as necessary to give reasonable match between model and SCADA data. Collect field data as needed and adjust model accordingly.

Input:

- Output from previous tasks
- SCADA data and other system records
- Input from City staff
- Existing fire flow data
- Field data from activities such as fire flow testing or pressure monitoring

Activities:

- Compare model output with SCADA data provided to HAL.
- Identify parts of the model where the match is not adequate (if any).
- Meet with system operators to refine system control and operation parameters until a reasonable match is found.
- If further calibration is necessary, use the updated model, existing fire flow data and system operator input to establish a calibration plan.
- Complete field data collection efforts during the expected peak demand time of July 15 – July 30, 2020.
- Use calibration data to guide adjustments to the model to reach a targeted match between model output and field data.
- Create a report to summarize and convey the achieved level of validation/calibration.
- Meet with Mapleton City personnel to deliver model and discuss updates.

Output:

- Calibrated EPS model of the Existing Mapleton City drinking water distribution system in selected model format.
- Calibration report.

TASK 4: BUILD DEVELOPMENT MODEL

Objective: Obtain and review pipeline and demand data for approved developments and build a development model to allow evaluation of proposed developments.

Input:

- Validated EPS model from previous tasks
- Previous modeling efforts from others
- CAD/GIS linework for approved developments
- Database/spreadsheet of approved ERCs

Activities:

- Gather prior modeling and mapping.
- Import CAD/GIS data (pipes, pumps, valves, tanks) into modeling software and use software automation to properly connect all model elements and fix any remaining topology issues.
- Extract elevations from LIDAR data or from City survey data and assign to model elements.
- Extract demand data from previous modeling efforts.
- Allocate demands.

Output:

- EPS 'Development' model of existing system with approved developments, for use in development reviews.

TASK 5: BUILD BUILDOUT MODEL

Objective: Obtain and review pipeline and demand data for expected future developments, obtain and review demand data for future growth outside of known developments, and build a buildout model.

Input:

- Validated EPS model from previous tasks
- Previous modeling efforts from others
- CAD/GIS linework for expected future developments
- Demand for future growth

Activities:

- Gather prior modeling and mapping.
- Import CAD/GIS data (pipes, pumps, valves, tanks) into modeling software and use software automation to properly connect all model elements and fix any remaining topology issues.
- Extract elevations from LIDAR data or from City survey data and assign to model elements.
- Extract demand data from previous modeling efforts.
- Allocate demands.

Output:

- EPS model of system at buildout ('Buildout').

TASK 6: ENERGY OPTIMIZATION

Objective: Use the 'Existing' system EPS hydraulic model to complete an energy optimization analysis of the system, determine if more energy efficient methods can be identified, and provide recommendations.

Input:

- Validated 'Existing' system EPS model from previous tasks
- Power billing records for system components

Activities:

- Obtain power costs, source water costs and water quality data from Mapleton City and review the data.
- Using the existing system model, analyze the water system facilities to identify areas of potential system operation and performance improvements. Identify instances of leaking, loading, looping, losing and leaping (categories of energy inefficiencies). Identify areas of high pressure, low pressure, and high pressure fluctuation that represent energy inefficiencies. Identify transmission bottlenecks and extreme velocities. Determine utilization of equalization storage.
- Use the model to predict electricity use by water system facilities during various demand conditions. Identify facilities that appear to have unusually high electrical demand.
- Use the model to analyze water quality of water system facilities during various demand conditions. Identify areas of predicted poor water quality/high water age.
- Based on the above analyses, develop alternatives and recommendations for system operation that will potentially reduce system electrical consumption and maintain or improve water quality and level of service.

Output:

- Recommendations to reduce electrical consumption and maintain/improve water quality and level of service.
- Opportunity register (list of opportunities, descriptions, assignments, and conceptual costs and savings).

TASK 7: UNIDIRECTIONAL FLUSHING PLANS

Objective: Use the revised hydraulic model to generate unidirectional flushing plans that will allow the City to remove biofilm, stale water, and accumulated sediments in over 70 miles of system piping with more efficient use of water and time. The plan will aim to avoid water hammer and high pressures and will be provided in a streamlined way that is accessible to field crews.

Flushing sequences will average approximately ½-mile in length and will identify valves to operate and 1-3 hydrants to open. Target velocity will be 5 feet per second or above, but may be lower in some cases. At least three pipe volumes will be assumed for all flushing times. A minimum operating pressure of 30 psi will be maintained at all connections. Flushing priorities will focus on adequate velocity and efficient use of water, energy, and manpower.

Input:

- Validated 'Existing' EPS model from previous tasks
- Water valve and hydrant GIS layers
- Input from City staff

Activities:

- Create flushing sequences using a steady state version of the validated EPS model.

Output:

- A unidirectional flushing program complete with field maps and documentation provided in a user-friendly electronic format.

TASK 8: CITY WATER ACCOUNT SETUP (Price includes \$5,000 for first year license)

Objective: Assist Mapleton City in obtaining CityWater® license/account subscription. Upload existing and development EPS models to CityWater®. Demonstrate and provide training on CityWater® capabilities using Mapleton's EPS model.

The City staff will be able to run the models and perform hydraulic development analysis for small subdivisions through the online application. Staff and field personnel will be able to make comments and review the system on an ongoing basis.

Input:

- Validated 'Existing' EPS model from previous tasks

Activities:

- Coordinate and facilitate loading existing system model and development model onto Aquaveo – CityWater® platform. Licensing fee allowance of \$5,000 is included in proposal budget.
- Provide 4 hours of training to City personnel.

Output:

- CityWater® login and subscription information for Mapleton City.
- Validated EPS model loaded into CityWater® for City use in operations and in-house development review.

TASK 9: EXISTING AND DEVELOPMENT MODEL MAINTENANCE

Objective: HAL will maintain current peak day models of the Mapleton 'Existing' and 'Development' models. Pipes and other system infrastructure will be added to the model as regularly as Mapleton City sends updated GIS information to HAL. Annually, or as requested by Mapleton City, HAL will review billing data to update demands in the model. As Mapleton begins to collect real-time SCADA data, HAL will update model validation and calibration.

After each update, the 'Existing' and 'Development' models will be made available for viewing on the CityWater® platform. HAL will regularly review comments made by City personnel through the platform and make updates as necessary to ensure that the model is accurate, up to date, and useful. Upon request, HAL will also provide model .inp files for the City for internal use in the EPANET modeling system.

This task may also be used to assist the City with system operation questions that may arise from staff.

Input:

- Validated 'Existing' and 'Development' EPS models from previous tasks
- CityWater® account

Activities:

- Add new developments (pipelines and demands) to models upon request by City.
- Review billing data and update all demands upon request by City.
- Use SCADA data to revise model validation and calibration upon request by City.

- Use the 'Existing' or 'Development' model to answer operations question from City staff upon request.

Output:

- 'Existing' and 'Development' EPS models loaded into CityWater® after each update.

HAL will provide services under this task on a Time and Material basis. HAL can provide a fee estimate before proceeding if the City requests.

TASK 10: DEVELOPMENT HYDRAULIC MODELING REVIEW

Objective: HAL will perform a hydraulic modeling review of proposed developments in Mapleton that complies with all requirements in Utah Administrative Code R309-511. This includes two types of development review:

- 1) Overall Development Master Review: These reviews are recommended for larger master-planned developments, which may require a number of master planned pipes, multiple pressure zones, or other special considerations. The overall development demand is analyzed, and recommendations for pipe sizes, pressure zone boundaries, and locations of tanks or other infrastructure are made as necessary. We recommend an overall development plan review while the development is in an early concept stage, so developers can more easily accommodate these recommendations in their designs. A memo, summarizing all findings, is provided for each review.
- 2) Subdivision or Phase review: These reviews are required under R309 for all system expansions. These reviews are performed for small developments and individual phases in larger developments which have already been reviewed. Hydraulics and demands are checked in detail to ensure that system capacity is available and that all pressure and fire flow requirements in R309-511 are met. A memo, summarizing demands and findings, is provided for each review.

Mapleton City intends to perform hydraulic modeling reviews in-house for very small and straightforward subdivisions. HAL will facilitate City in-house review by keeping CityWater® models updated as outlined in previous tasks.

Input:

- Validated 'Development' EPS model from previous tasks.
- Development plans and water usage data.

Activities:

- Upon request from Mapleton City, add infrastructure and demands from proposed developments into 'Development' EPS model and evaluate hydraulic performance within the development and across the City system, according to the requirements of Utah Administrative Code R309-511.

Output:

- Memo summarizing modeling review results.

It is anticipated that each development will be tracked and billed separately on a Time and Material basis. Our experience with other Cities is that these costs can be passed along to developers. Due to the varying complexity and size of the developments it is difficult to predict an actual cost, however a range for the larger master-planned developments would be \$2,000-\$3,500. The costs for a subdivision or a phase review could be anticipated between \$100-\$2,500. **HAL will bill Mapleton City for these reviews and will not contract directly with developers.**

SCHEDULE

We propose to complete the proposed work within 6-12 months of notice to proceed.

FEE

It is estimated that this effort can be completed for \$74,490. A summary of our estimated fee is presented below.

Task	Estimated Fee
Task 1: Project Start-up and Management	\$6,170
Task 2: Gather Data & Build Existing System Model	\$7,650
Task 3: Existing System Model Validation/Calibration	\$6,800
Task 4: Build Development Model	\$5,080
Task 5: Build Buildout Model	\$4,470
Task 6: Energy Optimization	\$9,370
Task 7: Unidirectional Flushing Plans	\$27,320
Task 8: CityWater® Account Setup & Training	\$7,630
Task 9: Existing and Development Model Maintenance	Time + Materials
Task 10: Development Hydraulic Modeling Reviews	Time + Materials
Total	\$74,490

ASSUMPTIONS

Our proposed scope, fee, and schedule assume the following:

- Mapleton City will respond promptly to requests for data, meetings, and feedback.
- Previous modeling efforts can be used to determine demands for the 'Development' and 'Buildout' models. No growth planning or calculation of future demand is included.
- No evaluation of water rights, source, or storage is included, other than as is included in the system Energy Optimization analysis.

Thank you for your consideration. Please contact us with any questions on this proposal.

Sincerely,

HANSEN, ALLEN & LUCE, INC.



Steven C. Jones, M.S., P.E.
Vice President

HAL PROPOSAL SPREADSHEET

5 %	Contingency
5 %	Billing Period 2 - Projected Rate Increase

CLIENT: **Mapleton City**
PROJECT: **Drinking Water System Model Update**

Pha	Task #	Task Activity	Billing Period	Hours							Total Hours	Labor Costs	Communications /Office Expense	Miles Travel	Direct Expense	Expense Cost	Total HAL Cost	Outside Expense	COMMENT	
				Sr. Man Prof	Manging Prof. SCJ	Sr Prof II	Prof III KJ	Prof II	Prof I	PEI RJG										
I PROJECT START-UP AND MANAGEMENT																				
	100	Project management	1		8.4						8.4	\$1,381.80	\$50.40			50.40	\$1,432.20			
	101	Provide data request to City	1				2.1				2.1	\$275.63	\$12.60			12.60	\$288.23			
	102	Kickoff meeting	1		3.2		4.2			4.2	11.55	\$1,484.81	\$69.30	84.0		123.90	\$1,608.71			
	103	Update meetings	2		6.3		6.3			6.3	18.9	\$2,486.30	\$113.40	168.0		222.60	\$2,844.34	2 meetings		
	199	Quality Control (QC) / Quality Assurance (QA)	1								0	\$0.00	\$0.00			0.00	\$0.00			
	SUBTOTAL HOURS/UNITS:			0	17.85	0	12.6	0	0	10.5	40.95			252	0					
	SUBTOTAL:			\$0.00	\$2,936.33	\$0.00	\$1,653.75	\$0.00	\$0.00	\$1,038.45		\$5,628.53	\$245.70	\$163.80	\$0.00	\$409.50	\$6,173.47	\$0.00	Outside / Subconsultant Costs	
II GATHER DATA AND BUILD EXISTING SYSTEM EPS HYDRAULIC MODEL																				
	200	Gather prior studies/data	1				2.1			2.1	4.2	\$483.32	\$25.20			25.20	\$508.52			
	201	Review data and identify/obtain additional data needs	1				2.1			2.1	2.1	\$275.63	\$12.60			12.60	\$288.23			
	202	Review GIS data	1				4.2			4.2	4.2	\$551.25	\$25.20			25.20	\$576.45			
	203	Import GIS data to modeling software	1				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,152.90				
	204	Extract elevations	1				2.1			2.1	\$275.63	\$12.60			12.60	\$288.23				
	205	Prepare billing data for use in model	1				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,152.90				
	206	Allocate demands from billing data	1				4.2			4.2	\$966.63	\$50.40			50.40	\$1,017.03				
	207	Derive diurnal pattern and apply to model	1				2.1			2.1	\$275.63	\$12.60			12.60	\$288.23				
	208	Set up scenarios	1				4.2			4.2	\$551.25	\$25.20			25.20	\$576.45				
	209	Update pump and storage curves	1				2.1			2.1	\$275.63	\$12.60			12.60	\$288.23				
	210	Apply winter and summer control schemes	1				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,152.90				
	299	Quality Control (QC) / Quality Assurance (QA)	1		2.1					2.1	\$345.45	\$12.60			12.60	\$358.05				
	SUBTOTAL HOURS/UNITS:			0	2.1	0	48.3	0	0	6.3	56.7			0	0					
	SUBTOTAL:			\$0.00	\$345.45	\$0.00	\$6,339.38	\$0.00	\$0.00	\$623.07		\$7,307.90	\$340.20	\$0.00	\$0.00	\$340.20	\$7,648.10	\$0.00	Outside / Subconsultant Costs	
III EXISTING SYSTEM EPS MODEL VALIDATION & CALIBRATION																				
	300	Compare model update with SCADA/City records	1				8.4				8.4	\$1,102.50	\$50.40			50.40	\$1,152.90			
	301	Identify parts of model with inadequate match	1				4.2			4.2	8.4	\$966.63	\$50.40			50.40	\$1,017.03			
	302	Meet with system operators to refine control/operation	1				4.2			2.1	6.3	\$758.94	\$37.80	84.0		92.40	\$851.34			
	303	Establish field data collection plan (if needed)	1		1.1		2.1			3.15	\$448.35	\$18.90			18.90	\$467.25				
	304	Complete field data collection	1							8.4	\$830.76	\$50.40	84.0		105.00	\$935.76				
	305	Adjust model	1				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,152.90				
	306	Provide calibration report and recommendations	1				6.3			6.3	\$826.88	\$37.80			37.80	\$864.68				
	399	Quality Control (QC) / Quality Assurance (QA)	1		2.1					2.1	\$345.45	\$12.60			12.60	\$358.05				
	SUBTOTAL HOURS/UNITS:			0	3.15	0	33.6	0	0	14.7	51.45			168	0					
	SUBTOTAL:			\$0.00	\$518.18	\$0.00	\$4,410.00	\$0.00	\$0.00	\$1,453.83		\$6,382.01	\$308.70	\$109.20	\$0.00	\$417.90	\$6,799.91	\$0.00	Outside / Subconsultant Costs	
IV BUILD DEVELOPMENT MODEL																				
	400	Gather prior modeling and mapping	2				2.1				2.1	\$275.63	\$12.60			12.60	\$302.64			
	401	Import CAD/GIS data to modeling software	2				12.6			12.6	\$1,653.75	\$75.60			75.60	\$1,815.82				
	402	Extract elevations	2				2.1			2.1	\$275.63	\$12.60			12.60	\$302.64				
	403	Extract demand data from previous models	2				4.2			4.2	\$551.25	\$25.20			25.20	\$605.27				
	404	Allocate demands	2				4.2			4.2	\$551.25	\$25.20			25.20	\$605.27				
	405	Adjust model operations as needed	2				4.2			4.2	\$966.63	\$50.40			50.40	\$1,067.88				
	499	Quality Control (QC) / Quality Assurance (QA)	2		2.1					2.1	\$345.45	\$12.60			12.60	\$375.95				
	SUBTOTAL HOURS/UNITS:			0	2.1	0	29.4	0	0	4.2	35.7			0	0					
	SUBTOTAL:			\$0.00	\$345.45	\$0.00	\$3,858.75	\$0.00	\$0.00	\$415.38		\$4,619.58	\$214.20	\$0.00	\$0.00	\$214.20	\$5,075.47	\$0.00	Outside / Subconsultant Costs	
V BUILD BUILDOUT MODEL																				
	500	Gather prior modeling and mapping	2				2.1				2.1	\$275.63	\$12.60			12.60	\$302.64			
	501	Import CAD/GIS data to modeling software	2				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,210.55				
	502	Extract elevations	2				2.1			2.1	\$275.63	\$12.60			12.60	\$302.64				
	503	Extract demand data from previous models	2				4.2			4.2	\$551.25	\$25.20			25.20	\$605.27				
	504	Allocate demands	2				4.2			4.2	\$551.25	\$25.20			25.20	\$605.27				
	505	Adjust model operations as needed	2				4.2			4.2	\$966.63	\$50.40			50.40	\$1,067.88				
	599	Quality Control (QC) / Quality Assurance (QA)	2		2.1					2.1	\$345.45	\$12.60			12.60	\$375.95				
	SUBTOTAL HOURS/UNITS:			0	2.1	0	25.2	0	0	4.2	31.5			0	0					
	SUBTOTAL:			\$0.00	\$345.45	\$0.00	\$3,307.50	\$0.00	\$0.00	\$415.38		\$4,068.33	\$189.00	\$0.00	\$0.00	\$189.00	\$4,470.20	\$0.00	Outside / Subconsultant Costs	
VI ENERGY OPTIMIZATION																				
	600	Obtain power and water costs and data	2		2.1		8.4				10.5	\$1,447.95	\$63.00			63.00	\$1,586.50			
	601	Analyze system using water model	2		2.1		16.8			18.9	\$2,550.45	\$113.40			113.40	\$2,797.04				
	602	Predict electricity use by facilities	2				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,210.55				
	603	Analyze quality during demand conditions	2				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,210.55				
	604	Develop alternatives and recommendations	2		2.1		4.2			6.3	\$896.70	\$37.80			37.80	\$981.23				
	605	Generate opportunity register and report	2				8.4			8.4	\$1,102.50	\$50.40			50.40	\$1,210.55				
	699	Quality Control (QC) / Quality Assurance (QA)	2		2.1					2.1	\$345.45	\$12.60			12.60	\$375.95				
	SUBTOTAL HOURS/UNITS:			0	8.4	0	54.6	0	0	0	63			0	0					
	SUBTOTAL:			\$0.00	\$1,381.80	\$0.00	\$7,166.25	\$0.00	\$0.00	\$0.00		\$8,548.05	\$378.00	\$0.00	\$0.00	\$378.00	\$9,372.35	\$0.00	Outside / Subconsultant Costs	



CLIENT: **Mapleton City**
PROJECT: **Drinking Water System Model Update**

Pha	Task #	Task Activity	Billing Period	Hours						Total Hours	Labor Costs	Communications /Office Expense	Miles Travel	Direct Expense	Expense Cost	Total HAL Cost	Outside Expense	COMMENT	
				Sr. Man Prof	Manging Prof. SCJ	Sr Prof II	Prof III KJ	Prof II	Prof I										
VII UNIDIRECTIONAL FLUSHING PLANS																			
	700	Prepare model	2				8.4			16.8	25.2	\$2,764.02	\$151.20		151.20	\$3,060.98			
	701	Create flushing sequences	2		4.2					168.0	172.2	\$17,306.10	\$1,033.20		1033.20	\$19,256.27			
	702	Generate program maps and documentation	2							42.0	42	\$4,153.80	\$252.00		252.00	\$4,626.09			
	799	Quality Control (QC) / Quality Assurance (QA)	2		2.1					2.1	2.1	\$345.45	\$12.60		12.60	\$375.95			
	SUBTOTAL HOURS/UNITS:			0	6.3	0	8.4	0	0	226.8	241.5			0	0				
	SUBTOTAL:			\$0.00	\$1,036.35	\$0.00	\$1,102.50	\$0.00	\$0.00	\$22,430.52		\$24,569.37	\$1,449.00	\$0.00	\$0.00	\$1,449.00	\$27,319.29	\$0.00	Outside / Subconsultant Costs
VIII CITYWATER ACCOUNT SETUP AND TRAINING																			
	800	Set up CityWater account	2							2.1	2.1	\$207.69	\$12.60		12.60	\$231.30	\$5,000.00	\$5,000 toward CityWater license included	
	801	Load models into CityWater	2				2.1				2.1	\$275.63	\$12.60		12.60	\$302.64			
	802	Training	2		6.3		6.3			12.6	12.6	\$1,863.23	\$75.60	84.0	130.20	\$2,093.10			
	899	Quality Control (QC) / Quality Assurance (QA)	2							0	0	\$0.00	\$0.00		0.00	\$0.00			
	SUBTOTAL HOURS/UNITS:			0	6.3	0	8.4	0	0	2.1	16.8			84	0				
	SUBTOTAL:			\$0.00	\$1,036.35	\$0.00	\$1,102.50	\$0.00	\$0.00	\$207.69		\$2,346.54	\$100.80	\$54.60	\$0.00	\$155.40	\$2,627.04	\$5,000.00	Outside / Subconsultant Costs
IX EXISTING AND DEVELOPMENT MODEL MAINTENANCE																			
	900	Not included -- billed on time/materials basis	2							0	0	\$0.00	\$0.00		0.00	\$0.00			
	999	Quality Control (QC) / Quality Assurance (QA)	2							0	0	\$0.00	\$0.00		0.00	\$0.00			
	SUBTOTAL HOURS/UNITS:			0	0	0	0	0	0	0	0			0	0				
	SUBTOTAL:			\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Outside / Subconsultant Costs
X DEVELOPMENT HYDRAULIC MODELING REVIEW																			
	1000	Not included -- billed on time/materials basis	2							0	0	\$0.00	\$0.00		0.00	\$0.00			
	1099	Quality Control (QC) / Quality Assurance (QA)	2							0	0	\$0.00	\$0.00		0.00	\$0.00			
	SUBTOTAL HOURS/UNITS:			0		0	0	0	0	0	0			0	0				
	SUBTOTAL:			\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Outside / Subconsultant Costs
	TOTAL HOURS BY EMPLOYEE:			0	48.3	0	220.5	0	0	268.8									

PHASE	TASK	Labor	Direct Exp	Subtotal	Subconsultant	SubTotal
		Costs	Cost		Costs	
I	PROJECT START-UP AND MANAGEMENT	\$5,628.53	\$409.50	\$6,173.47	\$0.00	\$6,173.47
II	GATHER DATA AND BUILD EXISTING SYSTEM EPS HYDRAULI	\$7,307.90	\$340.20	\$7,648.10	\$0.00	\$7,648.10
III	EXISTING SYSTEM EPS MODEL VALIDATION & CALIBRATION	\$6,382.01	\$417.90	\$6,799.91	\$0.00	\$6,799.91
IV	BUILD DEVELOPMENT MODEL	\$4,619.58	\$214.20	\$5,075.47	\$0.00	\$5,075.47
V	BUILD BUILDOUT MODEL	\$4,068.33	\$189.00	\$4,470.20	\$0.00	\$4,470.20
VI	ENERGY OPTIMIZATION	\$8,548.05	\$378.00	\$9,372.35	\$0.00	\$9,372.35
VII	UNIDIRECTIONAL FLUSHING PLANS	\$24,569.37	\$1,449.00	\$27,319.29	\$0.00	\$27,319.29
VIII	CITYWATER ACCOUNT SETUP AND TRAINING	\$2,346.54	\$155.40	\$2,627.04	\$5,000.00	\$7,627.04
IX	EXISTING AND DEVELOPMENT MODEL MAINTENANCE	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
X	DEVELOPMENT HYDRAULIC MODELING REVIEW	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	TOTAL:	\$63,470.30	\$3,553.20	\$69,485.81	\$5,000.00	\$74,485.81

Filename: H:\Marketing\Proposals_SOO\2019\Mapleton\Mapleton City Drinking Water Model Update Proposal.xlsx>Data - Contingency in Hours