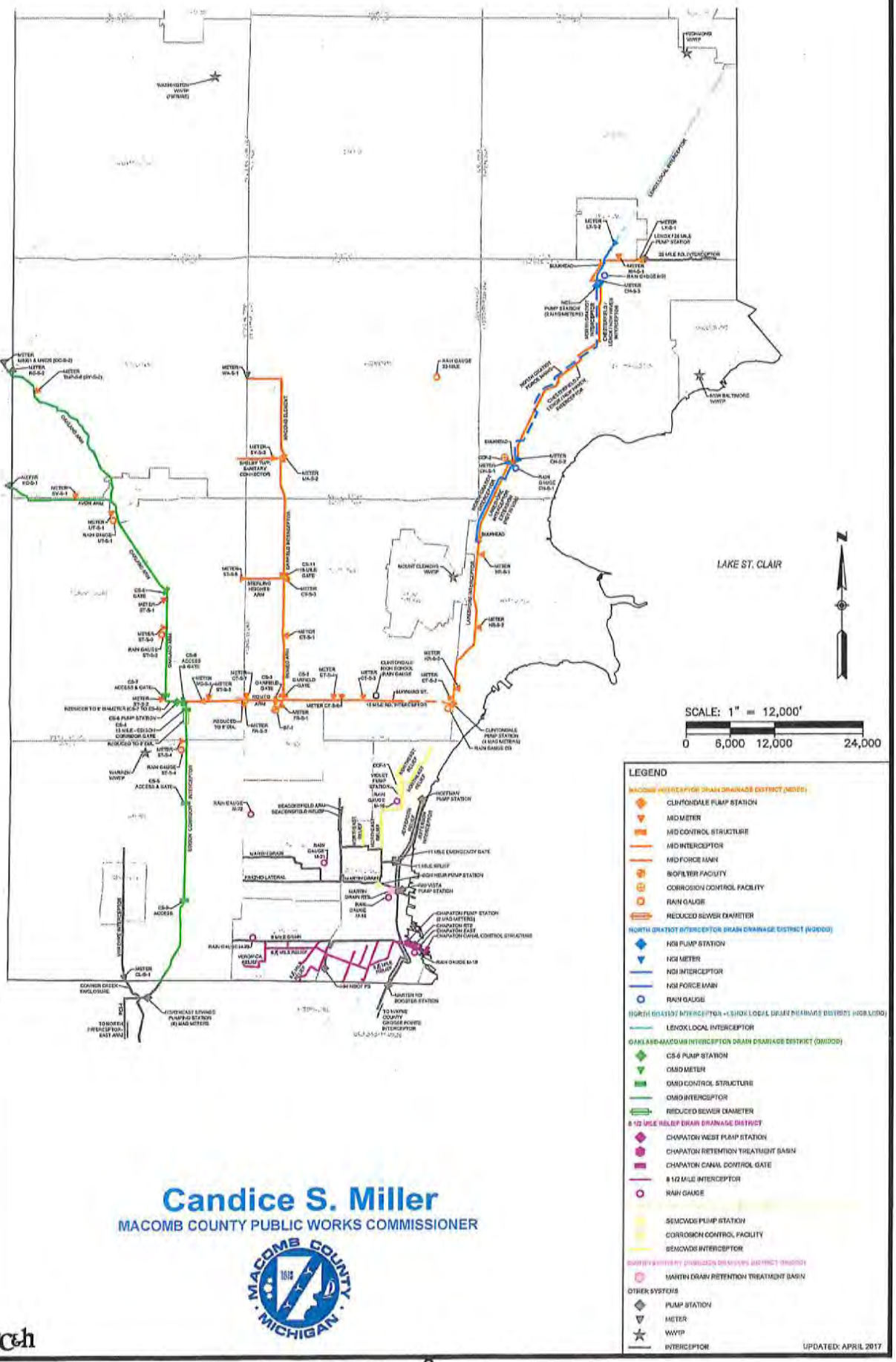
Miller
Santo
Klinefelt

EIGHT AND ONE-HALF MILE RELIEF DRAIN
INTRA-COUNTY DRAINAGE BOARD
JUNE 10, 2019
10:00 A.M.
AGENDA

MACOMB COUNTY WASTEWATER SYSTEMS



Candice S. Miller
MACOMB COUNTY PUBLIC WORKS COMMISSIONER

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An adjourned meeting of the Intra-County Drainage Board for the **EIGHT AND ONE-HALF MILE RELIEF DRAIN** was held in the Office of the Macomb County Public Works Commissioner, 21777 Dunham, Clinton Township, Michigan, on May 13, 2019, at 10:21 A.M.

PRESENT: Candice S. Miller, Chair

Bryan Santo, Member

Veronica Klinefelt, Member

ALSO PRESENT: Robert Leonetti, Macomb County Board of Commissioners; Brian Baker, Chief Deputy Commissioner, Vince Astorino, Operations & Flow Manager, Evans Bantios, Engineer II, Dan Heaton, Communications Manager, Kellie Kource, Drain Account Specialist, Bruce Manning, Financial Manager, Tom Stockel, Construction Engineer, Stephen Downing, Construction & Maintenance Manager, Macomb County Public Works

The meeting was called to order by the Chair, Candice Miller. A motion was made by Ms. Klinefelt, supported by Mr. Santo to approve the agenda as presented.

Adopted: YEAS: 3
NAYS: 0

Minutes of the meeting of April 8, 2019 were presented. A motion was made by Ms. Klinefelt, supported by Mr. Santo to approve the minutes as presented.

Adopted: YEAS: 3
NAYS: 0

The meeting was opened to public participation, then closed, there being no comments from the public.

Mr. Astorino updated the board that the in-system storage RFPs went out in March and we had three proposals that came in for the Phase II Chapaton project design. We are currently in the review process and will have a recommendation for the board next month. SEMSD has committed to contribute around $6 million to the Chapaton and Martin projects on top of the $150,000 they contributed the master plan. We will also be seeking a SRF 20 year loan application at a 2% rate. There will be a hearing on the SRF plan at the end of the month.

A motion was made by Mr. Santo, supported by Ms. Klinefelt to receive and file the project update by Mr. Astorino.

Adopted: YEAS: 3
NAYS: 0

The Chair presented the invoices totaling $154,410.48 to the board for review and approval.

A motion was made by Mr. Santo, supported by Ms. Klinefelt to approve the invoices as presented.

Adopted: YEAS: 3
NAYS: 0

A motion to receive and file the financial report given by Mr. Manning was made by Ms. Klinefelt and supported by Mr. Santo.

Adopted: YEAS: 3
NAYS: 0

There being no further business, it was moved by Ms. Klinefelt, supported by Mr. Santo, that the meeting of the Eight and One-Half Mile Relief Drain Board be adjourned.

Adopted: YEAS: 3
NAYS: 0

The meeting was adjourned at 10:42 a.m.

Candice S. Miller, Chair
Macomb County Public Works Commissioner

STATE OF MICHIGAN
COUNTY OF MACOMB

I certify that the foregoing is a true and correct copy of proceedings taking by the Intra-County Drainage Board for the Drainage District shown on the attached set of minutes, on May 13, 2019 the original of which is on file in the Public Works Commissioner's Office. Public notice of the meeting was given pursuant to Act No. 267, Public Acts of Michigan, 1975, including, in the case of a special or rescheduled meeting or a meeting secured for more than 36 hours, notice by posting at least 18 hours prior to the time set for the meeting.

Candice S. Miller, Chair
Macomb County Public Works Commissioner

DATED: 5/13/19

Candice S. Miller
Public Works Commissioner
Macomb County

From: Macomb County Public Works Office

Date: 6/3/19

To: 8 ½ Mile Relief Drain Board

Copy: File
Evaluation Committee

RE: Proposal Evaluation Project Award Recommendation
MCPWO RFP No.: **WWS-2019-RFP-003**
MCPWO Proposal Name: **In-System Storage – Preliminary Design**

This is an open competitive contract for the Design and Engineering Service to the In-System Storage project. The main goal for this project is to improve the water quality in Lake St. Clair. This project will maximize the storage within the 8 ½ Mile and 9 Mile Interceptors by 10-15 Million Gallons (MG). This combined with the additional 10-20 MG in the Phase 1 – Chapaton Canal Upgrades project will give us over 30 MG of storage and effectively reduce Combined Sewer Overflows by up to 75%.

The approved budget for this base design contract is $500,000.00 for the 8 ½ Mile Relief Drain. SEMSD has approved $250,000 for their portion of the contract.

The Request for Proposals (RFP) was advertised from 3-22-19 to 5-10-19 on the Michigan Inter-Governmental Trade Network (MITN) website. Six-Hundred Ten (610) solicitations were sent out via MITN and Thirty-Four (34) firms downloaded the RFP. There were no Addendums issued during the course of the RFP.

On 5-10-19, proposals were received from 3 consultants. Each member of the Evaluation Committee independently reviewed and scored the proposals in accordance with MCPWO's policy. The possible range of scores was from 0 to 100. For this review, MCPWO reached out to Eastpointe and St. Clair Shores to have a representative on the technical review team. For this they chose Brent Avery and Brett McDonald, which was an excellent choice with his vast experience running Chapaton and now with his role at SEMSD. The proposers were ranked as follows:

Firm	Technical Score	Cost	Composite Score[1]
Tetra Tech	95.8	$749,502	90.23
Spalding DeDecker	75.6	$509,327	80.48
Wade Trim	83.0	$938,000	77.26
Maximum Possible Score	**100**		**100**

1) The composite score is the final score using a weighted percentage of 80% Technical and 20% Cost.

ADDRESS: 21777 Dunham Road, Clinton Township, Michigan 48036 • Phone: 586-469-5325 • Fax: 586-469-5933
ENGINEERING • Phone: 586-469-5910 • Fax: 586-469-7693 ◊ SOIL EROSION • Phone: 586-469-5327 • Fax 586-307-8264

The Tetra Tech proposal received a unanimous highest score among all of the individual evaluators including SEMSD. Due to this and their final score still having them as the highest scoring team, we did start talking to them about costs for the project and how we could reduce it. From that we were able to get them down to the following:

- Task 1 – 8 ½ Mile Portion = $481,098
- Task 2 – SEMSD portion = $247,425
- Total = $728,523

This will bring them under both approved budgeted amounts for this project.

This project will be running through the 8 ½ Mile Relief Drain Drainage District but this district will only be required to pay for Task 1. We will be going to SEMSD on June 12, 2019, which is their next board meeting to seek approval for Task 2. If they decide to not move forward with their portion of the project, then we will still seek to move on Task 1. This task alone will provide the most significant storage within the 8 ½ Mile Interceptor.

Due to all of the reasons listed above the Evaluation Committee recommends that **Tetra Tech,** the number one ranked proposer, be named as the consultant for the above referenced Project. This project is within our approved design budget.

On behalf of the Board please indicate your approval of this recommendation by signing below. Thank you for consideration of this recommendation.

Vince Astorino
Operations & Flow Manager
MCPWO Engineering-Wastewater Services

Steve Rozycki, PE
Engineer II
MCPWO Engineering-Wastewater Services

Evans Bantios, PE
Construction & Maintenance Manager
MCPWO Engineering-Wastewater Services

Stephen Downing
Engineer II
MCPWO Engineering-Wastewater Services

Brent Avery
Administrator
SEMSD

Brett McDonald, PE
Chief Engineer
SEMSD

Approved: _____

Not Approved: _____

Hold: _____

_____ _____

Authorized Board Member Signature Authorized Board Member Name (print)

Macomb County Public Works Office

Request for Proposal Evaluation Summary

RFP Number: MCPWO-WWS-2019-RFP-003
Project Description: In-System Storage Devices
Budget: $750,000 Design

Requirement	Wade Trim	Tetra Tech	Spalding DeDecker
Technical Proposal	x	x	x
Cost Proposal - Separate Sealed Envelope	x	x	x
Owner-Engineer Disclosure From	x	x	x
Non-Collusion Affidavit	x	x	x
General Information	x	x	x
Iran Economic Sanction Act	x	x	x
Federal E-Verify Program	x	x	x
Proposal Form - Submitted with Cost Proposal	x	x	x
Vendor Certification Debarment	x	x	x
Bonding Capacity - Construction Projects Only			
Total:	**9**	**9**	**9**

Technical Proposal Evaluation

Category (Max Score)	Wade Trim	Tetra Tech	Spalding DeDecker
Technical Proposal (50)	40.10	46.90	37.50
Experience & Qualifications (30)	21.00	24.30	18.80
Project Team & Key Individuals (30)	21.80	24.50	19.20
Sub-Total Score:	**83.00**	**95.80**	**75.60**

Cost Breakdown

Task	Wade Trim	Tetra Tech	Spalding DeDecker
Task 1.A. Project Management	$84,278	$47,995	$15,452
Task 1.B. Infrastructure Survey	$140,304	$96,575	$52,370
Task 1.C. Utility Survey	$29,006	$21,100	$21,510
Task 1.D. Basis of Design	$268,428	$290,795	$168,144
Task 2.A. Project Management	$53,591	$33,230	$15,452
Task 2.B. Infrastructure Survey	$161,719	$96,167	$56,790
Task 2.C. Utility Survey	$21,386	$11,928	$11,465
Task 2.D. Basis of Design	$146,103	$151,712	$168,144
Sub-Mark Up	$33,185	-	-
Total Cost	$938,000	$749,502	$509,327
Sub-Total Score:	**54.30**	**67.96**	**100.00**

Composite Score

Proposal	Wade Trim	Tetra Tech	Spalding DeDecker
Technical	66.40	76.64	60.48
Cost	10.86	13.59	20.00
Total Score:	**77.26**	**90.23**	**80.48**

Recommendation

Tetra Tech

Proposal	Weighted Percent
Technical	80%
Cost	20%

Price Proposal

Inline Storage Devices

Submitted to: S-1/2 Mile Drainage District

Contract Type: T&M

Labor Plan

39 Resource

Price Summary / Totals

726,523

0

Total Price 726,523

Pricing by Resource

Project Phases / Tasks	Total Labor Hrs	Labor	Subs	Travel	Task Pricing Totals
	4,317	626,635	34,734	7,100	726,523
1.A. PROJECT MANAGEMENT	811	82,015	-	4,490	17,005
Kickoff Meeting	76	3,040		200	3,240
Technical Workshops	150	31,875		2,625	34,500
Progress Meetings	48	16,800		250	17,050
Intermediate Mgmt	89	30,300		-	30,300
1.B. INFRASTRUCTURE SURVEY	781	98,015	7,700	-	105,715
Survey	781	98,015	7,700	-	105,715
1.C. UTILITY SURVEY	126	20,000	1,500	-	21,500
Survey	126	20,000	1,500	-	21,500
1.D. BASIS OF DESIGN	1,705	273,455	13,034	-	286,470
Review Existing Information	73	12,405			12,405
Control for Surveying	2	450			450
Update SP-SWMM Model	162	21,540			21,540
Perform Transient Analysis	88	11,880			11,880
Perform Geotechnical Testing	223	30,017	3,599		33,617
Identify Permit Requirements	23	3,150			3,150
Identify Easements	3	450			450
Coordinate with MDED	46	8,050	3,234		11,284
Conduct Risk Analysis	48	7,560			7,560
Conduct Feasibility Analysis	599	73,800			73,800
Develop Plan and Level Technologies	248	37,200			37,200
Develop RTC Schemes	198	29,580			29,580
Conduct Monthly Meetings	52	9,000			9,000
Prepare BOD Report	185	25,500			25,500
3D Model	48	6,180			6,180
1.A. PROJECT MANAGEMENT	98	12,420	-	2,700	14,220
Kickoff Meeting	8	1,140		180	1,320
Technical Workshops	44	2,310		1,500	4,810
Progress Meetings	16	5,100		1,020	6,120
Intermediate SUBMT	28	3,870			3,870
1.B. INFRASTRUCTURE SURVEY	345	77,067	9,000	-	86,067
Survey	345	77,067	9,000	-	86,067
1.C. UTILITY SURVEY	78	10,428	1,500	-	11,928
Survey	78	10,428	1,500	-	11,928
1.D. BASIS OF DESIGN	791	139,710	1,500	-	141,210
Review Existing Information	13	2,370			2,370
Control for Surveying	1	450			450
Update SP-SWMM Model	28	3,060			3,060
Perform Transient Analysis	33	7,920			7,920
Perform Geotechnical Testing	92	13,500	1,500		15,000
Identify Permit Requirements	14	2,850			2,850
Identify Easements	2	450			450
Coordinate with MDED	32	6,210			6,210
Conduct Risk Analysis	40	7,560			7,560
Conduct Feasibility Analysis	599	73,800			73,800
Develop Plan and Level Technologies	150	22,230			22,230
Develop RTC Schemes	54	8,460			8,460
Conduct Monthly Meetings	36	8,100			8,100
Prepare BOD Report	150	22,500			22,500
3D Model	10	2,250			2,250
Totals	4,317	626,635	34,734	7,100	726,523

4 Work Plan

Tetra Tech has been protecting surface waters using real-time control systems for more than 20 years, is one of the few firms who has proven experience and has developed preliminary ideas for a Macomb County system within this proposal.

PROJECT UNDERSTANDING

The three primary goals of the project as stated in the RFP are summarized below:

1. To maximize the use of in-system storage volume;
2. To improve water quality of treated CSO discharges, and;
3. To protect basements by safely passing the high wet weather flow rates.

However, this project has additional challenges to be addressed as well as additional opportunities. Tetra Tech believes that the following are additional objectives that must be achieved for the project to truly be a success:

- Managing multiple potential risks during and after construction
- Constructing facilities that are reliable and easy to operate/ maintain
- Soliciting project input from residents and community officials, especially those who will be impacted
- Restoring disturbed areas to enhance the community, leaving the communities in better condition than they were before the project
- Identifying cost-effective alternatives to achieve goals

We have organized this statement of understanding around the above major goals and objectives.

Controlling CSO Quantity and Quality Through In-system Storage

The 8½ Mile and 9 Mile Drains are important and underutilized assets. They hold over 38 MG of storage, yet for small storms, are only filled with a few feet of sewage. The in-system storage project was conceived by Tetra Tech and MCPWO staff in 2018 to use more of these sewers to store sewage and to reduce the frequency and volume of overflow to Lake St. Clair. In doing so, the RTB will be better utilized, the overflow volumes will decrease, and the Lake will be better protected for ourselves, our children, and our grandchildren.

MCPWO has worked with consultants to identify three conceptual locations for devices to create more storage during low flows. The project will start with a study to locate and conceptually size structures to more effectively use the storage volume of the existing pipes. Computer modeling will assist in identifying these locations and sizes.

MCPWO is also wise to have requested the consultant to develop a real-time control (RTC) strategy to monitor system performance and adjust the operating schemes to account for ever-changing precipitation and water levels. Tetra Tech has been developing RTC systems for more than 20 years, is one of the few firms who has proven experience and has developed preliminary ideas for a MCPWO system within this proposal.

Managing Risks (Basement Backups and Others)

The project promises a large benefit, but also poses large risks if not properly managed. By forcing the water elevation in the sewers to rise, it is placing the sewer system and connected basements at greater risk. This risk must be understood and minimized both during the project and throughout the service life of the structures.

However, risk management goes beyond the risk to basements. Risks to the public must be reduced during construction. For instance, construction will take place near residential structures. The construction must protect these properties and the people within them. Therefore, the construction documents must have means to protect the public.

Louisville, KY - RTC Control

Construction within an active sewer also brings risks. Since the trunk sewers will continue to be in-service during the construction, creative designs and carefully planned construction phases must be developed to ensure backups do not occur during construction. These examples and others will be covered during the risk analysis completed as part of the Basis of Design.

Designing for Operation and Maintenance

The ability to access and maintain the proposed deeply buried infrastructure is a design factor as well. Equipment and materials selected will directly impact the type and frequency of required maintenance. Therefore, understanding future maintenance tasks during the design phase is critical to ensuring the design enables MCPWO to properly maintain the system at a reasonable cost.

The construction of structures to create sewer storage will also displace air in large quantities and in new locations. Venting locations should be selected and designed to manage system pressure and prevent damage. Furthermore, trapped air containing odors and dangerous sewer gases, such as Hydrogen Sulfide, must be treated prior to venting. The rapid filling and draining of large sewers may also create hydraulic transient conditions that cause undesirable impacts. Thus, transient water flow analysis and control measures will be needed to ensure no damaging transients occur.

Another design factor is long-term operational reliability through redundancy. Redundant systems will be needed to help avoid the risk of basement flooding caused by equipment malfunction or failure.

For instance, even though only one gate may be needed for operation, two gates being installed in parallel will avoid the chance of flow being accidentally blocked in the pipe. Dependable physical and mechanical technologies like weirs, gates, and inflatable dams must enable MCPWO to precisely fill, hold, and drain the storage volume as necessary during each rain event. Building in redundancy for power sources and control systems must also be considered.

Engaging the Public

The proposed projects will have a significant impact on residents of Macomb County. The project will need to coordinate with parks, local neighborhood groups, and community leaders and respond to their needs. A successful project will educate and engage parties who are directly impacted or who need to approve the project.

Enhancing the Community

The project will significantly disrupt some St. Clair Shores and Eastpointe neighborhoods. For instance, Welsh Family Park will be impacted by construction. Tetra Tech's vision is to return the disturbed areas to the residents in an even better condition than they were before the project. This provides an outstanding public relations opportunity for MCPWO and helps to offset the cost of losing use of the areas during construction. Our proposal outlines how we will achieve this vision.

Cost Efficiency

Tetra Tech understands that State Revolving Funds (SRF) will be used to help fund this project. Tetra Tech's approach will maximize loan forgiveness opportunities which will reduce the cost to sewer users. The project may also reduce operational costs for MCPWO through reduction of chemical treatment and sediment removal costs within the Chapaton Retention Treatment Basin (RTB).

Our approach optimizes the capital investment so every dollar of funding is used effectively. Our design approach will thoroughly vet all alternatives so that effective and cost-efficient alternatives are selected.

APPROACH

We have organized our work plan around the outline in the RFP. However, our plan goes beyond the RFP to thoroughly outline numerous added value ideas that the Tetra Tech team brings to MCPWO. Along the way, our approach outlines such steps as community enhancement, public engagement, risk management, and cost savings that are critical to delivering a successful project to Macomb County residents.

Tetra Tech engages local residents to enhance their neighborhood. This image shows City of Detroit residents planting a rain garden.

Key Steps to In-System Storage Devices Project

Task	Approach	Benefit
 **B. Infrastructure Survey**	• Conduct 3D scan • Inventory all connecting pipes	• Fewer construction changes • Understand controlling water elevations
 **C. Utility Survey**	• Confirm location, elevations, and sewer conditions	• Correct easements obtained • Fewer construction changes
 **D. Basis of Design**	• Use Prof. Steven Wright's national expertise on transients	• No post-construction operational challenges
	• Identify restoration concepts for Welsh Park and other sites	• Community acceptance of projects
	• Thoroughly evaluate all feasible control structure alternatives	• Best solution for Macomb County • Fewer overflows and cleaner Lake St. Clair
	• Identify real-time control scheme based on Tetra Tech's proven approach	• Fewer overflows and cleaner Lake St. Clair • "Smarter" techniques to capture combined sewage and lower cost
	• Plan for redundancy with every component	• Minimizes risk
 **E. Final Design**	• Validate design through CFD and physical modeling	• System functions as studied (no unpleasant surprises)
	• Engage public before and during construction	• Community acceptance of project
	• Identify project components eligible for SRF Principal Forgiveness	• Lower cost to sewer users
	• Specify measures to monitor construction impact on neighboring structures	• Fewer construction risks

A. PROJECT MANAGEMENT

Task A Objectives

- ✓ *Develop project management plan*
- ✓ *Develop file-sharing website*
- ✓ *Hold workshops and progress meetings to receive MCPWO input*
- ✓ *Execute/Deliver envisioned project*

To avoid repeating some common elements, we have combined our discussion on common items of Tasks 1 and 2 as these tasks will be completed concurrently. The fees for each are derived separately in the fee section of this submittal.

We have summarized portions of our Work Plan in graphics and tables such as the "Key Steps" table on the following page.

Managing the Contract

Tetra Tech has developed a management approach to demonstrate to MCPWO that our team of experienced and qualified professionals has the organizational framework and management structure needed to effectively and efficiently coordinate staff efforts, resources, and procedures for each work phase. Our approach is based on two key principles: **responsiveness** and **responsibility**. Our mission is to have every task executed efficiently and to provide MCPWO with maximum value. Additionally, our management approach embodies sustainability, quality, safety, and a **true commitment to working with MCPWO** as basic core principles for our daily operations. Our mission to serve MCPWO is woven with integrity and fortitude to provide a balance of quality, time, and costs that meet project goals and objectives, while providing a landmark project that protects Lake St. Clair for generations.

Establish Project Team Organization

Our team has a dedicated local management team and a local core design team to provide timeliness, flexibility, and the technical expertise the project will require.

Mr. Brian Rubel, PE, PMP will serve as the Project Manager to MCPWO. Mr. Rubel is a Vice President with 29 years of experience successfully serving southeastern Michigan clients. He is in charge of Tetra Tech's Midwest Operations with the ability to execute contracts locally, dedicate resources, bring in national level subject matter experts, and create project budgets. Tetra Tech empowers our Vice Presidents and Regional Managers with making local decisions because we understand every client is different; therefore we need to have autonomy to adjust budgets, resources, and contracts accordingly. Mr. Rubel will oversee that MCPWO's needs are met and our team has the necessary resources.

Mr. Eric Geerlings will assist in coordinating project work to ensure tasks are executed on time, on budget, and that MCPWO's expectations are being met and/or exceeded.

Project Management Plan

A Project Management Plan (PMP) will be developed for this project. Included in this effort is the development and maintenance of a project schedule; preparation of monthly status reports; and communication norms. An electronic and hard copy version of the plan will be submitted to MCPWO at the beginning of the project and updated versions as requested. Our standard PMP includes:

- Basic Project Information
- Project Summary
- "Hot Button" Issue Identification
- Project Team
- Contract Information
- Milestone Schedule for Key Project Deliverables
- QA/QC Plan
- Communication Plan
- Project Standards

What Our Clients Say About Brian Rubel's Project Management:

"You are right on top of it as always. Of all the Project Managers I have worked with, you are the best."

— Todd Schaedig, PE
City of Warren WWTP Engineer

- Preliminary Drawing List
- Health and Safety Plan (HASP)
- Project Financial Plan

MCPWO can be confident that Tetra Tech will manage and administer this project with proven project control tools and techniques, high quality assurance, collaboration, flexibility, and excellence. Our Tetra Linx E-business suite and on-line project management portal provide up-to-the-minute project management data regarding hours, expenses, and subcontractor fees. We have a proven track record of on-time, in-budget project delivery.

We will provide project management services for administration of the project and submit monthly invoices acceptable to MCPWO.

Communication Management

A major component of the PMP will be a Communications Plan, which will support responsive and thorough attention to detail and project progress. This will include a project team and an authority/assignment matrix. The Communications Plan will also include project standards for written and verbal documentation of meetings, telephone calls, e-mail, as well as technology standards.

Our management approach was specifically developed to provide proper communication and coordination among the team and MCPWO staff. Communication within our team will be led from the top down, repeated from the bottom up, and structured to provide a full circle of communication internally and externally.

Coordinating the Design Team

Strict and streamlined procedures for internal coordination between disciplines, subconsultants, and other offices reduces confusion, maximizes deliverable quality, and minimizes potential cost increases and lost time over the length of the project. Tetra Tech is focused on coordination, and as such, will perform our duties as an integrated team with integrated services.

For each project task level, budgets will be continually monitored by the individual task order project managers, as well as on a monthly basis by the Tetra Tech management team. The PMP provides the controls structure for product delivery to ensure seamless coordination between a multi-disciplined team. Once the project has started, weekly meetings are set up for the production staff to review any coordination issues that need to be addressed. During the design phase, a schedule is set up for external subconsultants, as needed, to receive and upload required information for their project components. It is our standard practice to set up a SharePoint site at the beginning of each project for external subconsultants and internal disciplines to upload and download base files for coordination purposes.

Files from SharePoint are copied daily to a central network so that each discipline is viewing the most up-to-date information. Closer to each submittal, extra time is set aside for engineering review of the plans as well as a plan set review by the CADD coordinator. Coordination issues are resolved during this review period reducing review time by the MCPWO, which keeps the project on time and budget.

How the Design Team Will Work and Interact with MCPWO

Communication with MCPWO, as well as internally within the Tetra Tech team, will be led by our Project Manager, Mr. Rubel. He will be the point of contact for MCPWO with regards to coordination and delivery of this contract, as well as the lead contact internally within our team.

Project Websites. A project website or SharePoint site, accessible to all project team members, is a valuable tool for project coordination. DropBox is yet another easy-to-use alternative that may utilized. The website will make project information such as a project calendar, meeting minutes and other pertinent documents or information available immediately to team members. A website will provide a forum for rapid and secure transfer of data and information between the project team and MCPWO. Access can be restricted to only project team members or can be open to all relevant stakeholders and even the general public depending on the needs of the MCPWO.

Project Meetings. Project meetings will be held at least monthly with the MCPWO. Tetra Tech will prepare meeting minutes for all meetings with MCPWO. Our goal is to provide draft copies of the minutes to MCPWO within two business days of the meeting. We will then prepare final meeting minutes within two business days of receiving comments and suggested edits. The following meetings will foster interaction and open communication between the design team and MCPWO:

- **The Kickoff Meeting** is an important point in the project in which the Tetra Tech team will confirm and clarify the detailed understanding of MCPWO objectives and establish communication channels and methods. Verifying the scope of implementation for achieving the identified goals and reviewing the project work plan will be the key focus of this meeting between the design team and MCPWO.
- **Presentations** will be made to MCPWO Management to provide project updates regarding the direction, schedule, and costs as needed upon request.
- **Project Workshops** will be conducted to enhance communications during planning and detailed design phases. We will submit an agenda that defines workshop goals and describes issues of concern. This approach allows for timely input from all team members as the project progresses, rather than being overwhelmed by a large

single document submitted at the end of the project.

- **Submittal Milestone Meetings** will be held to review formal submittals at completion of the Preliminary Design Report and at 30, 60 and 90 percent final design stages.
- **Site Visits** can be scheduled to facilities or locations that have similar aspects to those being considered for projects under this contract. During these visits, MCPWO and consultant staff will have the opportunity to observe process or equipment operation firsthand as well as obtain candid input from O&M personnel regarding the process or equipment performance.

Execute and Deliver the Project

Our goal is to deliver a successful, project that exceeds our clients' expectations and fulfills project objectives. Our team has consistently demonstrated an ability to meet client expectations that require project management as well as technical expertise. As professionals serving many repeat clients, the ability to complete quality work within a timely manner has long been an ingredient in building our strong reputation in the industry.

Some of the specific project controls Tetra Tech uses for schedule, cost, and scope management are described here.

Schedule Controls

Due to Tetra Tech's vast experience with projects under a fixed term or continuing consulting contract, Tetra Tech knows how to successfully manage projects and is experienced in the scheduling requirements, coordination, and organization required to maintain the schedule. Schedules often have overlapping tasks, which utilize various personnel and require experience in coordinating subconsultants, if used, so that multiple critical paths are preserved. Below are some of the controls Tetra Tech uses to management schedule:

Computer-Based Project Management

Our ability to meet the project schedule is based on our periodic meetings with team members. Within these meetings a thorough project and 30-day lookahead schedule is prepared and reviewed with each team member. Each team member pledges their commitment to meet the agreed upon schedule.

Close Coordination During Construction

During the construction phase, Tetra Tech's project manager will identify key items that may affect the schedule, such as critical shop drawings for long lead items. Where such long lead items exist, Tetra Tech will encourage the contractor(s) to submit those critical shop drawings as soon as possible, while Tetra Tech will dedicate and commit the time to returning those shop drawings as soon as possible in advance of the allotted time for contract review. Our field inspectors will also continually review work progress and inform the project manager when progress is slipping, either for the entire project, or for individual project components.

Engineering Cost Controls

Tetra Tech's PMP also includes the overall budget, the budget for each task, and anticipated billings. The PMP closely coordinates the schedule and the budget so as the project progresses, the project manager can monitor the billings versus the budget. Below are some of the controls Tetra Tech uses to manage engineering costs:

Computer-Based Accounting System

The PMP is enhanced by our computer-based Oracle accounting system, TetraLinx. The TetraLinx system is tied directly to employee timesheets and billing information and is kept up-to-date on a weekly basis. This electronic system reduces delays in getting the project manager budget information. Timesheets are entered every Friday and on Monday morning, the project manager receives an automated Project Summary Report in their email showing a snapshot of the budget used since the last invoice and the budget remaining. Tetra Tech also uses a Portfolio Review Workbook, allowing the project manager to have a dashboard of all project performance metrics.

OPEN COMMUNICATION

Tetra Tech believes in open communication during all phases of every project. By dedicating time in the schedule to meet with the County to fully understand the requirements of the project, Tetra Tech will design the correct project in one iteration. Likewise, during permitting, Tetra Tech has an established philosophy of arranging pre-application meetings with all applicable permitting agencies as a means to facilitate a more streamlined permitting review process. We have permitted numerous projects without receiving any requests for additional information based on our commitment to working with the permitting agency and our ability to incorporate their comments into the design before it is finalized.

Cost Price Model

Cost control begins with establishing a realistic budget. Tetra Tech has experienced project managers and lead design engineers as well as a vast catalog of similar projects to use as a basis of estimating project budgets. Lead design engineers create the staffing plan and estimate hours per project milestone or deliverable. The project manager then uses our custom Cost Price Model to create the overall pricing plan with all direct and indirect costs, employee billing rates, overhead rates, and multipliers. The Cost Price Model generates the Project Labor Plan and Pricing Plan. This tool follows the project from inception to close out and is updated quarterly for reviews.

Proactive Communication

Controlling costs also requires proactive coordination to get it right the first time and avoid costly redesigns. Engaging the design team with MCPWO and proactively coordinating progress, focusing on inter-discipline coordination, communicating questions, and using experienced staff helps control costs.

Project Manager Portal

Tetra Tech has developed custom Project Management Tools to help control costs from the big picture level to the granular level per hour billed. Each project manager has a PM Portal with a dashboard that shows a quick snapshot of all project performance. Custom reports can be generated ranging from Work Breakdown Structures, Staff Billing Report, Weekly Project Transaction Reports, and Accounts Receivable reports.

Quarterly Project Reviews

Cost control relies on actively monitoring and assessing projects. Tetra Tech requires quarterly reviews of all projects by management called Operations Managers. Large projects get more in-depth reviews and go thru the Project Evaluation & Estimate at Completion (PEEAC) review process. Project Managers update the project Cost Price Model by meeting with the Lead Design Engineer from each discipline and updating their estimates to complete the project versus the schedule and deliverable requirements. The estimate to complete is compared to the remaining budget and corrective actions are implemented if the project is projecting over budget. The project is also evaluated for risks, health and safety, schedule delays, and subcontractor performance issues.

Utilize Technical Oversight

Our team's vast national resources enable us to provide expert technical development and review of the project, and also allows independent oversight. Checking quality at intermediate stages will help avoid time-consuming changes later in the final design.

Construction Cost Controls

Quality Documents

A major factor of Tetra Tech's excellent performance record is the ability to provide thorough and complete documents with which to estimate and control construction costs. One of the lessons learned in the firm's years of experience is that good planning and good quality deliverables are the best insurance for successful completion of a construction project. Because we pay close attention to each detail and make sure that all aspects of the project are covered in the design or plan development, our clients are assured that when projects are released for construction, budgets will be maintained.

Value Engineering

If requested by MCPWO, value engineering (VE) can be used to evaluate ways to reduce the construction cost while still meeting the intent of the design. Using a VE approach allows the team to arrive at the best possible operational system for any project. The VE team members performing the review, all have construction experience directly related to the needs of MCPWO. The VE team further consists of members that have years of general contracting and construction management experience.

Scope Management Controls

Requirements Gathering

To ensure we meet the project schedule, the project manager will meet with the MCPWO Project Manager and begin to develop the scope outline, understand project objectives, and agree on deliverables. Fully understanding the project requirements and capturing them is the best way to control the scope as the project progresses.

SUCCESS STORY

For our work in replacing the incinerator scrubber in Warren, MI, Tetra Tech subcontracted with a major equipment supplier for shop drawings ahead of the construction contract. This shortened the construction duration and avoided the general contractor passing a mark-up for this work to the City.

Experienced Project Teams

Involving experienced project team members in the scope preparation and project execution brings lessons learned from past projects to benefit MCPWO to help define the project scope and ensure the level of effort is fully understood up front. The experience also pays off as the project progresses because the team is efficient at delivering the scope and knowledgeable about what is expected. If the team members get bogged down at any point or begin to stray from the intent of the scope, they can recognize it early and course correct.

Defined Scope of Work

The Project Manager will present a clearly defined scope to the MCPWO. Each task and deliverable will be identified and matched up to the task level budget so MCPWO can review and refine the level of effort per task until everyone is on the same page.

Bringing Our Projects to Life with 3D Designs

Tetra Tech sets the industry standard for utilizing a 3D design environment, and 3D design is our standard practice on all projects. Our projects are designed utilizing Autodesk Revit® for structural, architectural, process and mechanical elements and Autodesk Civil 3D for pipelines and site design.

Our Revit and Civil 3D designs greatly improve design and construction efficiency by:

- reducing construction document generation time;
- visually identifying conflicts and consider constructability issues;
- providing for better design and construction change management;
- coordinating the design which is built in a single model shared by all disciplines;
- reflecting design changes automatically throughout the model; and
- creating accurate construction quantities.

By ensuring the highest level of design quality via 3D integration, our designs result in lower construction costs and shorter construction times by reducing errors, reviews, and changes during construction.

Project Close Out

Final closeout for a project involves procedural issues and phase-out administrative procedures, transfer of responsibilities, financial closeout activities, and preparation of appropriate documentation. The purpose of a project closeout effort is to ensure a timely, orderly, and cost-effective project termination. If the closeout is complex and may take substantial time, a closeout plan should be issued prior to full project demobilization. To ensure orderly closeout of a project, the Project Manager should, once all costs are incurred against the project with invoices and contracts are closed—prepare a project closeout report.

The following items should be addressed in the closeout report:

- Technical, scope, cost, and schedule baseline accomplishments
- Financial closeout, including a final cost report with details as required
- Closeout approvals
- Permits, licenses, and/or environmental documentation
- Contract closeout status
- Adjustments to obligations and costs
- Photographic documentation
- Baseline change control log

B. INFRASTRUCTURE SURVEY

Task B Objectives

- ✓ *Obtain invert elevations of lateral sewer connections for computer model analysis*
- ✓ *Obtain other information on Drains such as alignment, diameters, manhole locations, and other structures*
- ✓ *Prepare updated record drawings of 8½ Mile and 9 Mile Drains*

Surveying will be a critical part of this project, to plan for the design and manage numerous risks present.

FTCH will lead the survey efforts for the project and their vision for surveying follows and continues in Section C. The objective for Task B is to acquire accurate elevations of the lateral sewer connections to the Drains so the risk of basement backups can be understood.

8½ Mile Relief Drain Infrastructure Survey

For this project, we propose to 3D scan the interior of the approximately 4.2 miles of the 8½ Mile Relief Drain to provide MCPWO with the comprehensive survey of the interceptor as required.

FTCH is a leader in 3D scanning and survey. FTCH's experience includes scanning of buildings and facilities to develop 3D Revit models of systems, such as the Chapaton Facility. FTCH also has extensive experience 3D scanning underground piping. For example, FTCH has been scanning the steam tunnels and chambers at universities for a few years.

FTCH has already surveyed the rims of the manholes along the drain as part of the 8½ Mile Relief Drain Drainage District SAW Grant Program. FTCH did not perform any manhole inspections at the time, however, but relied on the inspections performed in 2012 as part of an S-2 Grant to determine invert elevations. The first step will be to re-visit the manholes both on the main line as well as the branches, measure the depth of each manhole, calculate the invert elevation, and verify the number and size of pipes leading into each structure.

FTCH will then utilize its 3D scanner to completely map the main drain. Given the large size of the drain and low water levels during dry weather conditions, the scanner will provide the most complete mapping of the system as well as all existing structures and pipes leading into it. The scanner uses infrared lasers, providing approximately 1 million points per second and can operate in complete darkness.

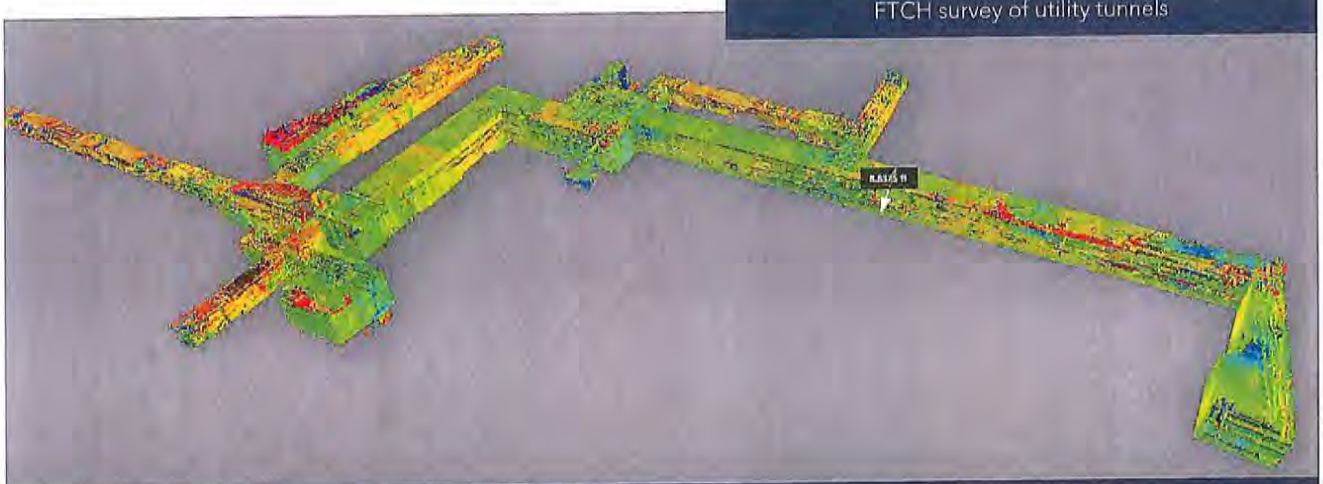
The advantages of using the scanner as opposed to a traditional in-pipe survey for this project include:

- Complete and accurate mapping of the entire pipe, including changes in pipe diameter.
- All local connections and lateral connections coming into the pipe will easily be identified since the scanner collects millions of points and the leads will be identified as the only "stray" points penetrating the walls of the system. Both pipe inverts and diameters will be documented.
- Pipe conditions can be assessed by the scan data collected. The scan is capable of identifying large cracks and joint separations.
- Location of the manholes will be verified against the GPS survey.
- Pipe alignment determined.
- Manholes with only a vertical 16-inch drop into the sewer will be located and verified against the GPS survey.
- Any anomalies such as weirs or even blockages will be identified.

The scanner will utilize control from the manholes above. Plumb rods with targets will be lowered from the rim of the structure to a set distance into the tunnel. This will give the scanner its orientation of X,Y, Z. Since the scanner cannot penetrate water, the measurements to the bottom of the structure from the manhole inventories will be relied upon to set the elevations for the bottom of the structure. It is anticipated that no more than 5 to 8 inches of water will be present in the system during dry weather conditions. We will take traditional invert measurements on the floor of the drain at the manholes and confirm pipe height at regular intervals in between manholes as a check of the interpolated floor.

We propose to scan the drain from the upstream end at Boulder Avenue and Oak Avenue to the Chapaton wet well entrance. We acknowledge the long run of 12-foot pipe from the wet well to the first manhole on Malvern Avenue and Newberry Avenue and have taken that into account while planning the work. As part of the 3D Scan we will scan the connections of the 8½ Mile

FTCH survey of utility tunnels



3D model of an underground utility system prepared by FTCH

Relief Drain Branches into the main drain. We do not intend to scan the branches themselves but will set up the scan at the branch opening and pickup as much info as possible in each pipe. We will however scan the three overflow lines from the 9 Mile Drain to the 8½ Mile Relief Drain (7'-6" at Boulder Avenue, 6'-6" at David Avenue, and 72" at Beaconsfield).

We have reviewed available information on the drain and determined there are approximately 66 manholes located on the branches of the 8½ Mile Relief Drain that have lateral sewers entering. The invert elevation of the laterals will be picked up as part of the manhole surveys. We have also determined approximately 17 pipe segments within the branches have blind taps entering them. For those blind taps, we propose to survey the first manhole upstream on the lateral and determine the invert elevation of the lateral sewer.

The elevations of these lateral sewers set a limit as to how high the water elevation can be set without risking basement backups. While the topography of Eastpointe and St. Clair Shores is relatively flat, FTCH will pick up 10 to 20 first-floor elevations of low elevation homes to add to our data set.

Updated as-built drawings showing all invert elevations, rim elevations, pipe slopes, lateral size, location, and invert elevations will be developed. The alignment of the sewer will also be shown in plan view. An additional feature of scanning is that the 3D scan can be incorporated into the system's 3D BIM model that MCPWO already has relatively easily.

FTCH understands this is a confined space and will take all the necessary precautions to ensure the safety of staff entering this space. Project staff will be trained in confined space entry. At minimum, six people will be present to complete the survey, MCPWO will provide staff to assist in the entries. Hand-held radios will be used to communicate between all staff, and calibrated gas meters will always be on the entrants. Equipment such as harnesses and tripods will be used to safely lower and retrieve entrants from the confined space. It is anticipated that this portion of the project will take approximately one week in the field to complete, in dry weather conditions. The scanner takes approximately one minute to complete a full 360-degree scan. The scanner will be moved approximately 150-200 feet per scan, creating 150+/- scan stations along the route. While the scanner can operate and move very quickly, the coordination and safety of staff moving along the system will take time and be paramount. The data will be post processed and adjusted to the targeting lowered at the manhole locations to accurately register the point cloud. Location, size and invert of each lateral will then be accurately extracted from the point cloud.

Our team proposes to perform the survey on the 8½ Mile Drain first since it has less flow in the pipe then proceed to the 9 Mile Drain.

9 Mile Drain Infrastructure Survey

FTCH proposes a similar procedure to perform the comprehensive survey of the approximately 4.6 miles of the 9 Mile Drain.

FTCH will use GPS to locate all manholes along the Drain. The manhole structures will then be opened and accurately measured to identify bottom of structure elevations as well as any pipes leading into the structure and system.

Our team will then enter the drain and 3D scan it including each of the double boxes at the downstream end of the drain.

Given that there is anticipated to be more flow in the 9 Mile Drain than the 8 ½ Mile Drain that the scanner can not scan below, we propose to take traditional invert shots of the drain not only at the manholes but at regular intervals in the pipe runs to verify invert elevation of the pipe.

CASE STUDY

Chapaton 3D Model

In 2017, FTCH created a 3D model of the Chapaton RTB to facilitate an understanding of the facility's operation for the staff and public. This was created by preparing a laser scan and then assembling the scan into a 3D image. Tetra Tech envisions a similar deliverable will be developed for the in-line storage project where a 3D model of the sewer system is developed to visually show the sewers filling and draining. This will be created conceptually during the study to enlist public support and updated at the end of the project with record data.

We propose to scan the drain from the upstream most end at the border with the City of Warren to where the 9 Mile drops into the Jefferson Interceptor and the 9 Mile tide gates. We can proceed further and scan the 9 Mile Emergency Bypass pipe if desired by the MCPWO.

Similar to the 8 ½ Mile Infrastructure survey, as-built drawings will be developed showing all the necessary features including the overflow points to the 8½ Mile Drain. A 3D will be incorporated into the 3D BIM Model of the system that FTCH initiated for Chapaton.

In total, it is anticipated that this portion of the project will take approximately 10 days to complete, in dry weather conditions.

The results of the infrastructure survey will be used to update the SWMM model and an Infrastructure Survey Workshop will be conducted with MCPWO Staff as requested to go over the findings and any revisions to the design that may result from the survey.

C. UTILITY SURVEY

We will not begin the utility survey until we have completed the Infrastructure Survey Workshop and the results indicate that the chosen sites are applicable.

Task C Objectives

- ✓ *Perform more detailed topographic and utility surveys for selected control structure locations*
- ✓ *Identify likely easement needs*

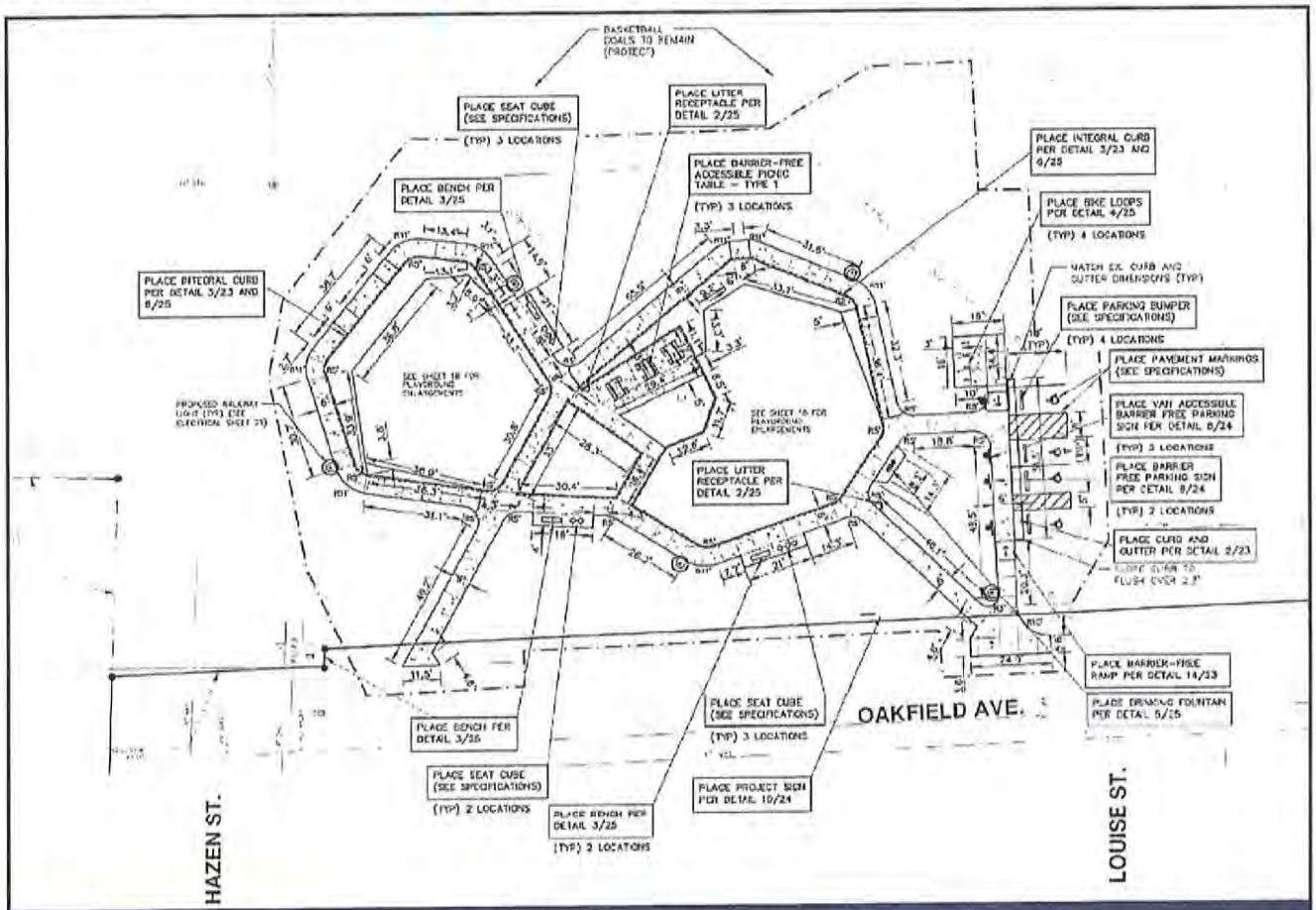
We have assumed that three sites will be selected to complete surveys for in-system storage. Site topographic surveys will be completed using GPS and Total Stations to set control and complete mapping. Benchmarks will be placed on site and leveled for use in future construction.

Site topographic survey will include all property features and adjoining property such as trees, building lines, utility structures and other site-specific features encountered. FTCH will provide topographic survey maps of each site in an AutoCAD drawing of appropriate scale and contour interval.

Boundary Surveying

Boundary surveying will also be important for this project. There are few records confirming the horizontal locations of the 8½ Mile Sewer. However, at Welsh Park, the sewer is believed to be located very near the property line between Welsh Park and northerly homes.

Property information will be obtained for each site and title work will be ordered if needed. FTCH will provide Certified Surveys depicting all boundaries and easements of record for each property.



Site topographic survey example

D. BASIS OF DESIGN

Task D Objectives

- ✓ *Identify control structure locations and configurations.*
- ✓ *Identify risks to projects and risk control measures.*
- ✓ *Gather probable design conditions such as Real-Time Control scheme.*
- ✓ *Determine permits needed.*
- ✓ *Summarize proposed design in a report.*
- ✓ *Identify means to enhance affected communities through restoring affected parks and open spaces.*
- ✓ *Develop 3D animated model of the proposed system.*

Completion of a thorough basis of design is necessary to accomplish a number of project features such as the location of storage control structures, what the design elements should be for each structure, what types of control systems should be used, how the disturbed areas should be restored, and who may be impacted by the project (residents and permitting authorities). Furthermore, the basis of design will clearly recommend what is feasible, where construction will need to take place, how the system will be operated and maintained, and how much the project will cost. A basis of design document will be created which will cover the ideas developed for both the 8½ Mile Relief Drain and the 9 Mile Drain.

Maximizing Storage to Reduce Overflows

As first studied by Tetra Tech in 2018, in-system storage shows potential to increase storage in the system and reduce the volume and frequency of overflows at the Chapaton RTB. Tetra Tech's report showed that a reduction in overflow volume of 20 percent or more may be achievable.

Tetra Tech's conservative analysis showed that up to 7.4 MG could be obtained by keeping the hydraulic grade line near the pipe crown. MCPWO subsequently performed additional modeling, assuming the hydraulic grade line could rise well above the crown, that showed 16.7 MG may be achieved. This storage gain is equivalent to increasing the Chapaton RTB storage volume by 60 percent. Additionally, since the in-system storage volume is upstream of the Chapaton RTB, it will prevent some flow from entering the RTB during small storm events and reduce O&M.

However, a higher water surface comes with risks that must be understood and managed. As the grade line is allowed to rise, the risk of basement backups increases. Furthermore, the location of the devices that force this storage to occur must be located and constructed in locations that are acceptable to the St. Clair Shores and Eastpointe communities.

Lastly, the devices must be reliable to operate and maintain. This is the heart of completing a feasibility analysis and basis of design. These competing constraints must be evaluated. The result of the evaluation is the optimal balance of storage, risk, cost, and other constraints to protect Lake St. Clair and Macomb County residents.

Our vision for accomplishing this evaluation and identifying the long-term solution is described below.

Review Information and Clarify Project Requirements

Tetra Tech has a head start on this task with both our familiarity with the 8½ Mile and 9 Mile systems as well as the participation of FTCH who is leading Macomb County's master plan. Much of the scope refinement can be accomplished during contract negotiations so we can hit the ground running at the kickoff meeting.

The basis of design major objectives are to confirm the location and design concept for control structures, the design concept for site restoration, the potential impact on reducing overflow, and the conceptual cost.

Compile Survey Data and Update Hydraulic Model

One of the first steps will be to compile survey data that was collected to verify if any of the invert elevations assumed in MCPWO's calibrated hydraulic model require adjustment. This survey data review will also confirm the locations and elevations of all pipes that discharge flow into the drains.

There will be a small amount of review needed to familiarize our model team with the county's recent updates. However, Tetra Tech engineers use SWMM every day and our acclimation period will consist of a few days at most.

The updated hydrologic/hydraulic model along with the survey information will be used to provide a review of the key network components and an evaluation of the baseline conditions through the model simulation of real rainfall events and design events. Data will be compiled to make comparisons between: sewer flow capacities; peak flows; the duration of peak flows; water surface elevations; times to travel between potential control sites to the Chapaton RTB; the duration of peak conditions as well as overflow conditions. The analysis will estimate the residual hydraulic capacity for flow conveyance and in-line storage in the 8½ and 9 Mile Drains for the identification of control sites and control strategies. Since both Drains share the same downstream available capacities (i.e., treatment capacity at the Chapaton RTB and conveyance capacity in the Jefferson Interceptor), the analysis will also identify priority for storage dewatering and any hydraulic bottlenecks and critical water levels to respect during design to minimize any flooding risk both upstream and downstream of the control facilities.

The methodology applied for the selection of the control sites is based on finding opportunities in the system to achieve the goals for better management of flow in wet weather flow conditions and maximized uses of available

capacities in all situations. The main criteria for the in-line storage site selection is that there should be no increased risk of flooding and the total amount of effective storage volume available should have a beneficial impact on reducing overflow volume.

Confirmation of Control Structure Locations

Due the long length of the Drains, there is potential for multiple locations of the control structures to maximize storage capacity, as well as the possibility of flow transfer between the two Drains. The initial screening assessments of in-line storage control structure locations are made balancing the benefit of a high water level that uses more volume versus the risk that this higher elevation imposes on basement backups.

The construction of control structures generally requires extensive excavation and sizable permanent equipment. There will also need to be supporting equipment such as compressors and electrical centers. This equipment could be installed in below-ground vaults, however, it is Tetra Tech's experience that the design life is longer and O&M easier if the support equipment is installed above ground. Therefore, the control structures require a sizable open area. Furthermore, the control structure locations require them to be spaced along the length of each Drain. Our initial thoughts follow by each Drain.

8½ Mile Locations

Chapaton Pump Station - Using the pump station's operating levels must be evaluated as this creates a non-structural means to create storage. It also creates challenges to operate the highest capacity sewage outlet at a restricted rate if flows increase.

Welsh Family Park (RFP Site 1) - This is an excellent site for a control structure located upstream of Chapaton and downstream of Beaconsfield. There is substantial room south of the sewer for construction, but minimal space to the north.

Beaconsfield/I-94 at Oak (RFP Site 2) - We will investigate installing structures on either side of I-94. The eastern half of the Beaconfield right-of-way is open for construction. There are major trunk sewers at this site and the design may dictate relocating the sewers to both facilitate construction and use their volumes for storage.

Eastpointe - Constructing a device further upstream in Eastpointe would yield a volume benefit. However, there are few obvious locations of available land. This option will be further explored during the study.

Oak Avenue, east of Boulder Avenue, is a site on the 8½ Mile Drain that could warrant further investigation. At this site, the Drain is located approximately 35 feet below Oak Avenue. There are double-length lots that appear to be private property. One of these lots along Oak Avenue is triangular and could potentially be used for an in-line storage device if an easement or property purchase were feasible.

If more property were purchased to the north, a small neighborhood park could be created for residents after project completion.

9 Mile Locations

The 9 Mile Corridor has few open spaces and the Drain is shallower (especially at the downstream end), making storage more risky. A structure along Beaconsfield (RFP Site 3) looks feasible. We understand the current vision for this site is to install an inflatable dam, which may have a smaller impacting footprint than other types of construction.

There is the potential to store an additional 5 MG or more in the pipe within Eastpointe should land be available for construction. However, the location of the Drain in the 9 Mile right-of-way presents a significant challenge to construction and future O&M.

To better identify the feasibility of space in Eastpointe to construct additional structures, we propose to invite the City of Eastpointe officials to an internal progress meeting to receive their input on property owners who may wish to participate in this project.

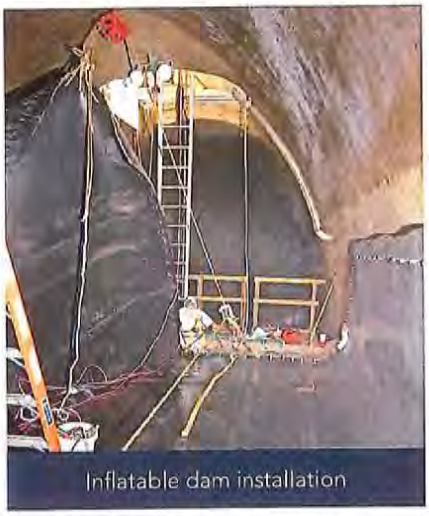
There is a site that may warrant further investigation during the Basis of Design. Since the site would require construction directly under 9 Mile Road, the cost and feasibility would need to be evaluated. The location is at the intersection of 9 Mile Road and Donald Avenue. At this site, the 9 Mile Drain is located approximately 23 feet below the second lane from the north side 9 Mile Road. On the south side, there is greenspace in front of the Grant Manor Senior Citizen Apartments that could be used to stage construction equipment. It could be restored afterward to be more park-like for the residents.

There is a bus stop at this location as well. Any control building needed for the in-system storage could include bus stop amenities (awnings, restrooms, etc.) to benefit the public.

Potential Control Structure Design Options

One primary objective of the study will be to evaluate the control mechanisms to be used to force storage to occur. This is challenging because it involves competing objectives from low to high flow. At low flows, the objective is to create energy loss and force storage to occur upstream of the control device. At high flows, the objective is to prevent energy loss (as it is this energy loss that may lead to basement backups) and allow the flow to travel downstream uninterrupted.

Every system that involves a moving device, such as sluice gates, requires an energy system to power the device. Most likely, the energy source will involve electrical power, but pneumatic or hydraulic power are also a possibility. Thus, each option discussed involves the construction of a control facility, most likely constructed above-grade in a small control building. Further discussion on this control building is presented in this proposal.



Inflatable dam installation

We have organized our discussion on options around the method used to shunt high flow downstream, either within the current pipe (in-line) or by providing an overflow weir (passive overflow).

In-Line Options

Options that keep the high flows within the existing pipe are almost certainly the least expensive to construct because they continue to use the existing pipe to convey high flows. However, they come with challenges including constructability within an active sewer.

CASE STUDY

Ottawa, Ontario CSO Control

Tetra Tech completed RTC evaluation and design. This project involved controlling overflows originating from a major collector sewer through the utilization of in-line storage and better flow regulation controlled by real-time water depth and rainfall measurements. The project reduced CSO volume by 69 percent and saved the City of Ottawa over $100 million compared to new facilities to store the CSO.

Inflatable Dams

An inflatable dam is constructed at the invert of a pipe and allows dry weather flows to pass through the pipe nearly uninterrupted when the dam is deflated. When called by the RTC system, the dam inflates to create storage. When the upstream elevation reaches a control elevation, the dam is deflated and conveyance to the downstream is returned through the pipe.

Inflatable dams require an air compressor, typically located in an above-ground control building, to operate. Pneumatic hoses are used to diverted compressed air to the dam. Upon deflation, air is vented to the ground surface.

There are at least five manufactures internationally that market these systems. One manufacturer is supplying inflatable dams to the GLWA system. Tetra Tech has previously evaluated the availability and reliability of these systems in North America and brings this head start to MCPWO.

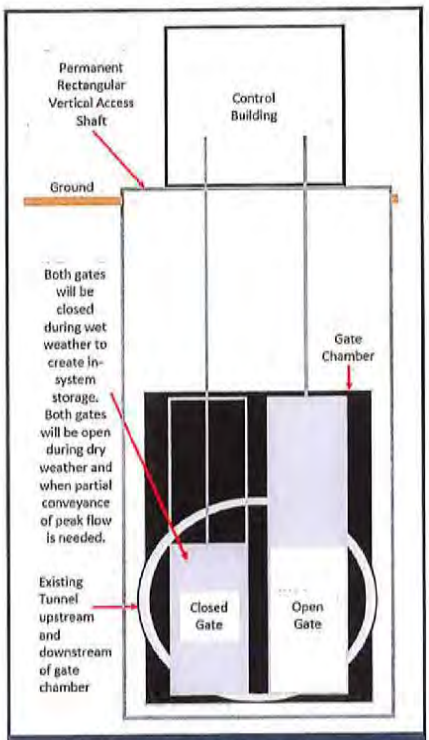
Sluice Gates

Sluice gates can be installed across the pipe and opened and closed as required. However, the size of the 8½ Mile Drain will present a significant challenge to construct a single gate of this size.

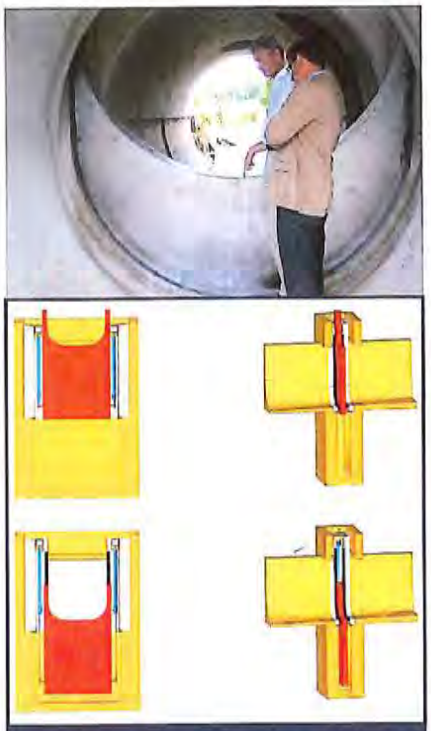
Furthermore, a single gate presents reliability concerns related to the gate becoming stuck partially closed or failing in a closed position.

Radial/Tainter Gates

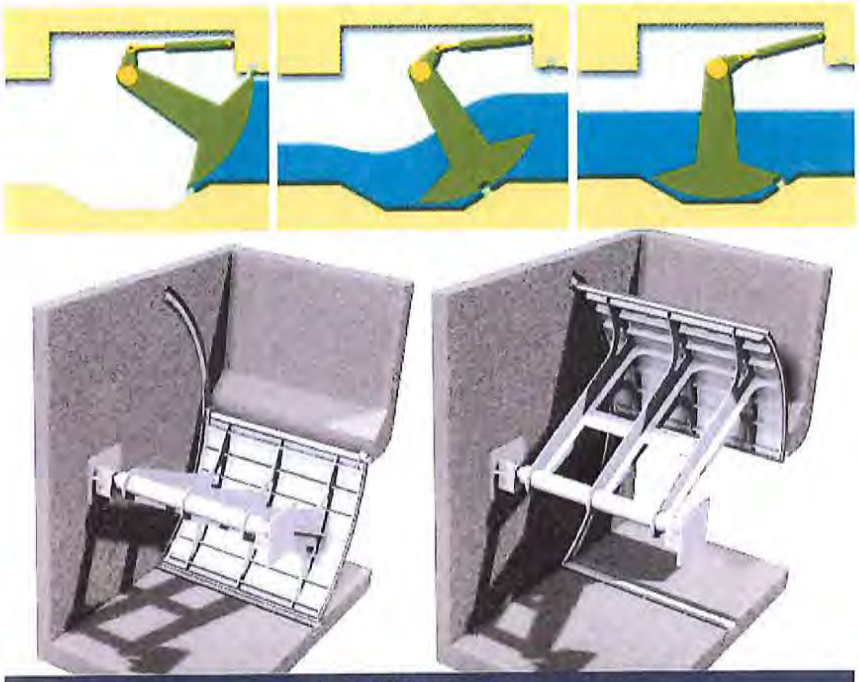
Radial or Tainter gates are commonly used for control of surface waters and are capable of being used for the development of in-line storage. The gates can be lower-to-open systems but are more typically raise-to-open systems. The lower to open systems are more likely to experience debris and silting issues. The gates typically use wire rope or a hydraulic system to hoist the gate.



Sluice Gate System:
Figure shows pipe cross section view of low flow gates. Redundant sluice gates ensure dewatering is possible. Peak flow must be conveyed in a separate sidestream around these gates.



Moving Weir System



Radial / Tainter Gates:
Top: Lower-to-Open System / Bottom: Raise-to-Open System

Moving Weir System

A moving weir system specifically for use in sewer systems is depicted at top right. Since the weir opens downward, it requires excavation deeper than the pipe to install.

The system is pneumatic and has fail safes that do not require external power in case of emergencies. The system is billed as maintenance free and can be used to generate a flushing wave to wash sediment downstream.

Passive (Sidestream) Overflow Options

In Tetra Tech's experience, constructing control structures in-line is a reliable strategy. However, MCPWO may wish to consider designing and constructing passive overflows to provide a fail-safe option should a control fail in a closed position. Options that construct a side stream to divert high flows are the most expensive to construct because they require new infrastructure be built to convey high flows efficiently around a control device and returned to the pipe. However, they can also be the easiest to construct because much of the construction can occur while maintaining flow in the existing pipe.

A passive overflow alternative involves allowing dry weather flows to continue in the pipe. As the flow increases, gates close and water is stored in the pipe. The passive weir provides a relief for high flows in the event that the gates can not open. Thus, gates (and probably multiple small gates in parallel) will be necessary across the pipe. These gates could be sluice gates or tainter gates and will be powered by an above-grade control building.

The passive overflow options include using weirs to shunt flow, diverting into a parallel pipe, or building an overflow pipe at a higher elevation.

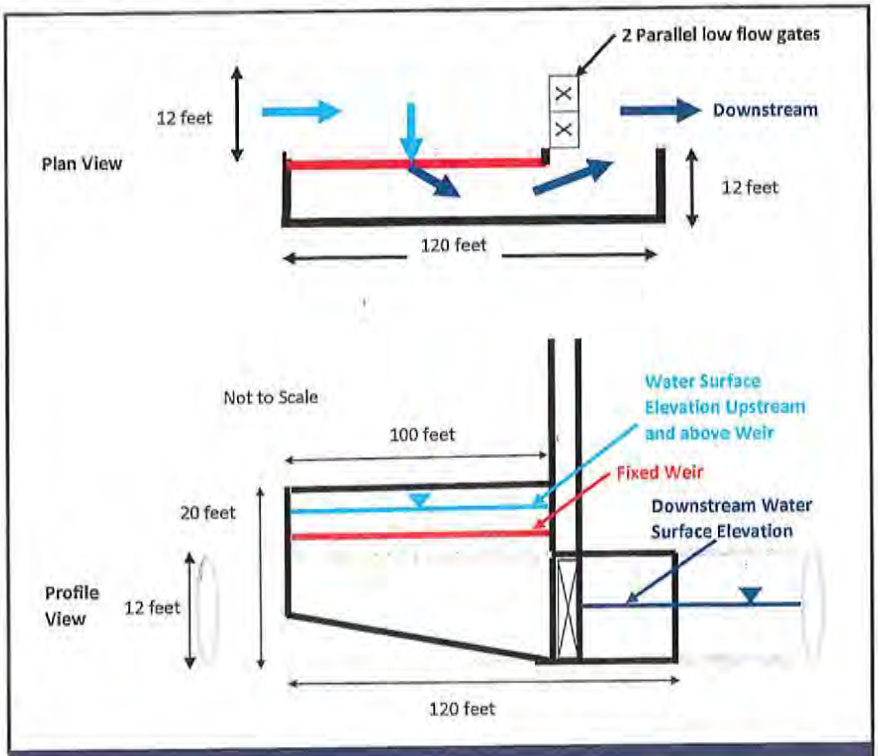
Weirs to Shunt Flow

In this alternative, weirs are installed within the chamber as the device to control the maximum water surface elevation and corresponding storage volume. Water flows over the weirs to get up and around the bottleneck created by the in-pipe gates and then flows back into the pipe on the downstream side of the gates.

One of the biggest challenges with this alternative is managing the energy loss. For instance, the flow rate in the 8½ Mile Drain is so large, the length of the weir also needs to be large. Assuming we can allow 2 feet of energy loss over the weir, the weir length to convey the entire peak flow would need to be approximately 150 feet on the 8½ Mile Drain. Passive weir chambers capable of housing weirs of that length will require significant construction cost and space to construct.

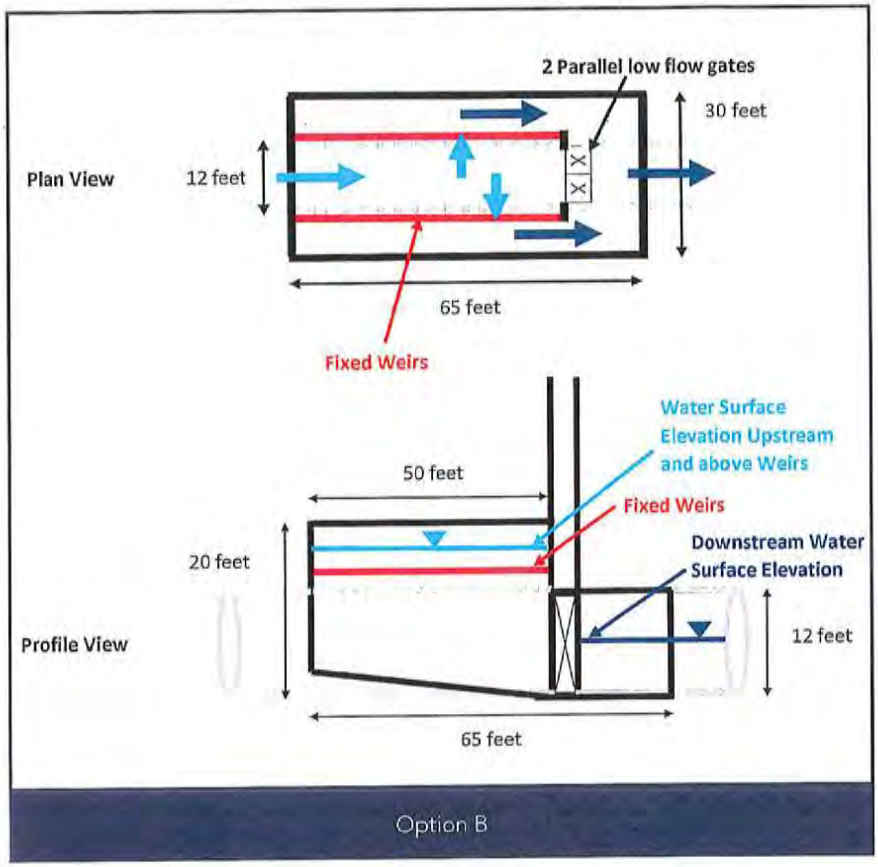
The major design consideration for any weir chamber design will be balancing the trade-offs between maximizing storage volume, minimizing weir chamber size, and ensuring the peak overflow water elevation is at a safe elevation relative to basements. Since the sites have different flow and storage goals, we have identified several weir chamber concepts to further explore during the basis of design.

Option A – This option consists of a single straight fixed elevation weir installed parallel to the existing pipe on one side only. Whenever the two parallel gates close to create storage, excess flow is diverted up and out of the pipe and into the new structure. When the water is high enough it spills over the weir and flows back down to the invert of the pipe on the downstream side of the gates. The length of the weir chamber could be reduced some by replacing the straight weir shown in the image with a serpentine weir design similar to Option C.



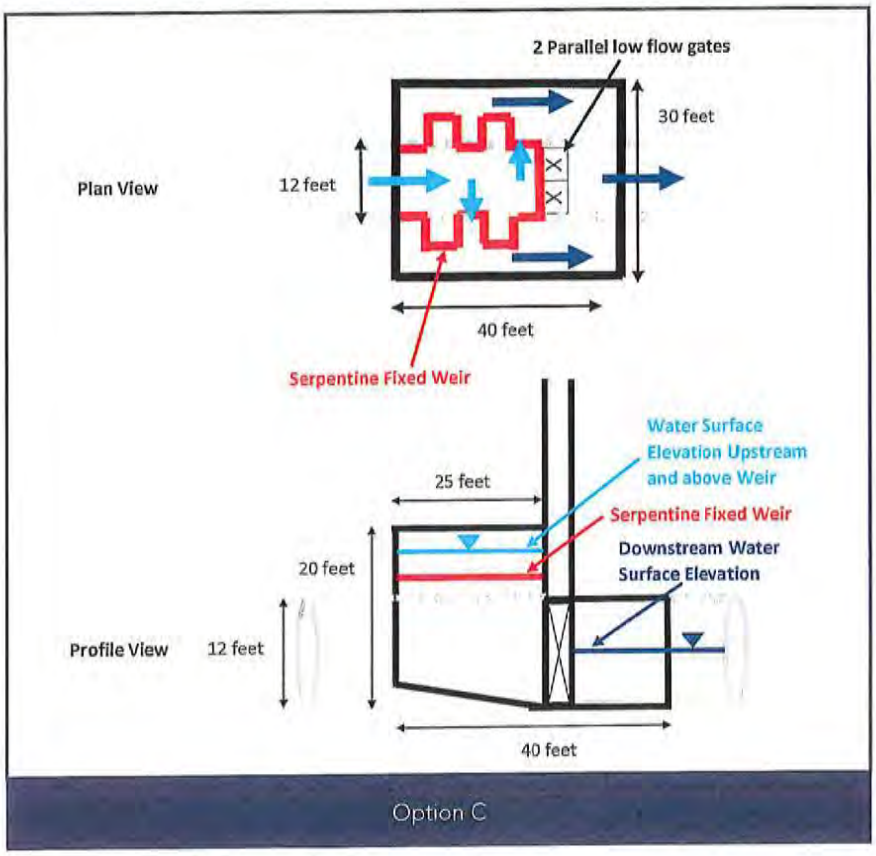
Option A

Option B – This option is similar to Option A but is shorter because it uses two parallel fixed elevation weirs. The overall width of the chamber is greater though, since it requires roughly 10 feet of sidestream channel construction on both sides of the existing pipe rather than just 1 side.



Option B

Option C – This option is similar in concept to Option B but it requires a shorter length of chamber due to the layout of the fixed elevation weir in a serpentine pattern. A 3D image of this option has been prepared, which also shows features such as access shafts. The 3D image of Option C is shown on page 41.

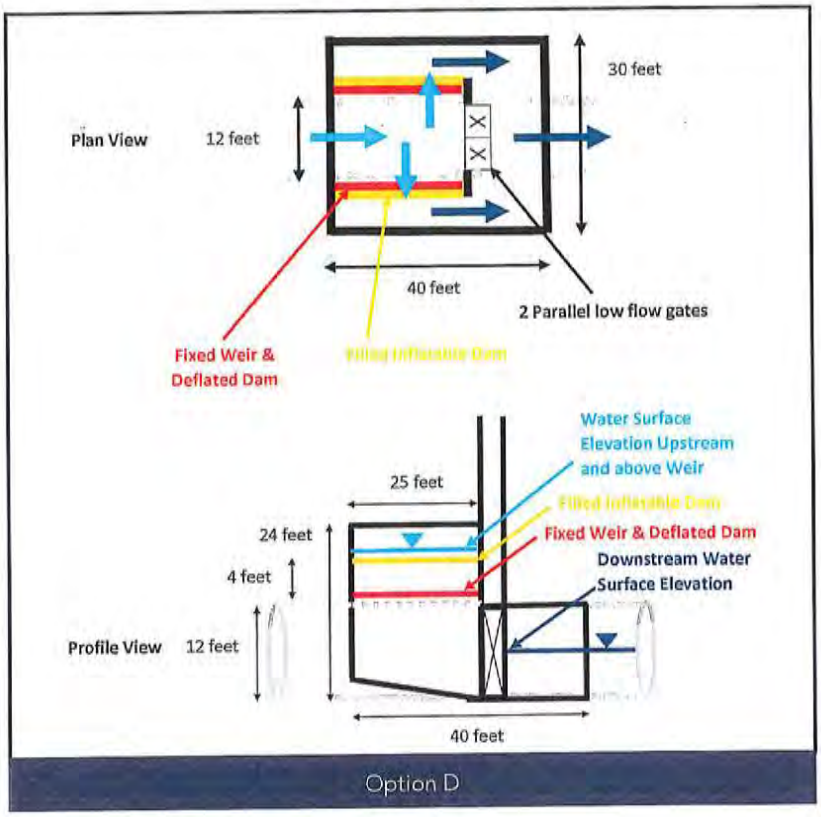


Option C

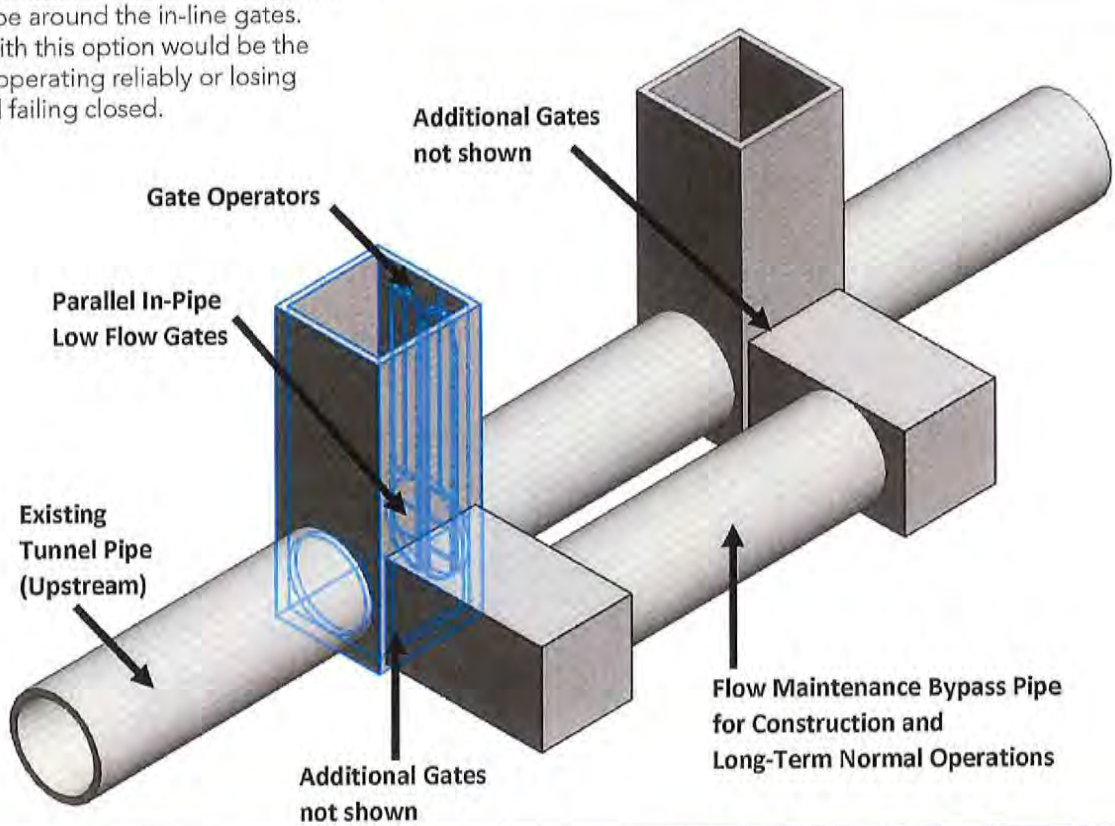
Option D – This option has similarities to Option B but achieves the compact footprint of Option C through its adjustable weir height. The elevation adjustment of the two parallel weirs is feasible using either inflatable dams or pneumatically-actuated hinge gates installed above a lower fixed elevation weir. These devices could be inflated to create the maximum storage and then deflated if peak flows need be conveyed over the weirs and through the in-pipe gates.

Parallel Pipe to Shunt Flow

This option consists of two vertical chambers installed around the existing tunnel pipe connected by a new 12 foot parallel pipe at the same elevation as the Drain. Water is stored upstream and dewatered or diverted as necessary by operating three sets of gates. One set of gates is in line with the existing pipe, the other two sets of gates are essentially in line with the side wall of the existing tunnel. These side stream gates control if and when water is diverted through the parallel pipe around the in-line gates. One risk with this option would be the gates not operating reliably or losing power and failing closed.

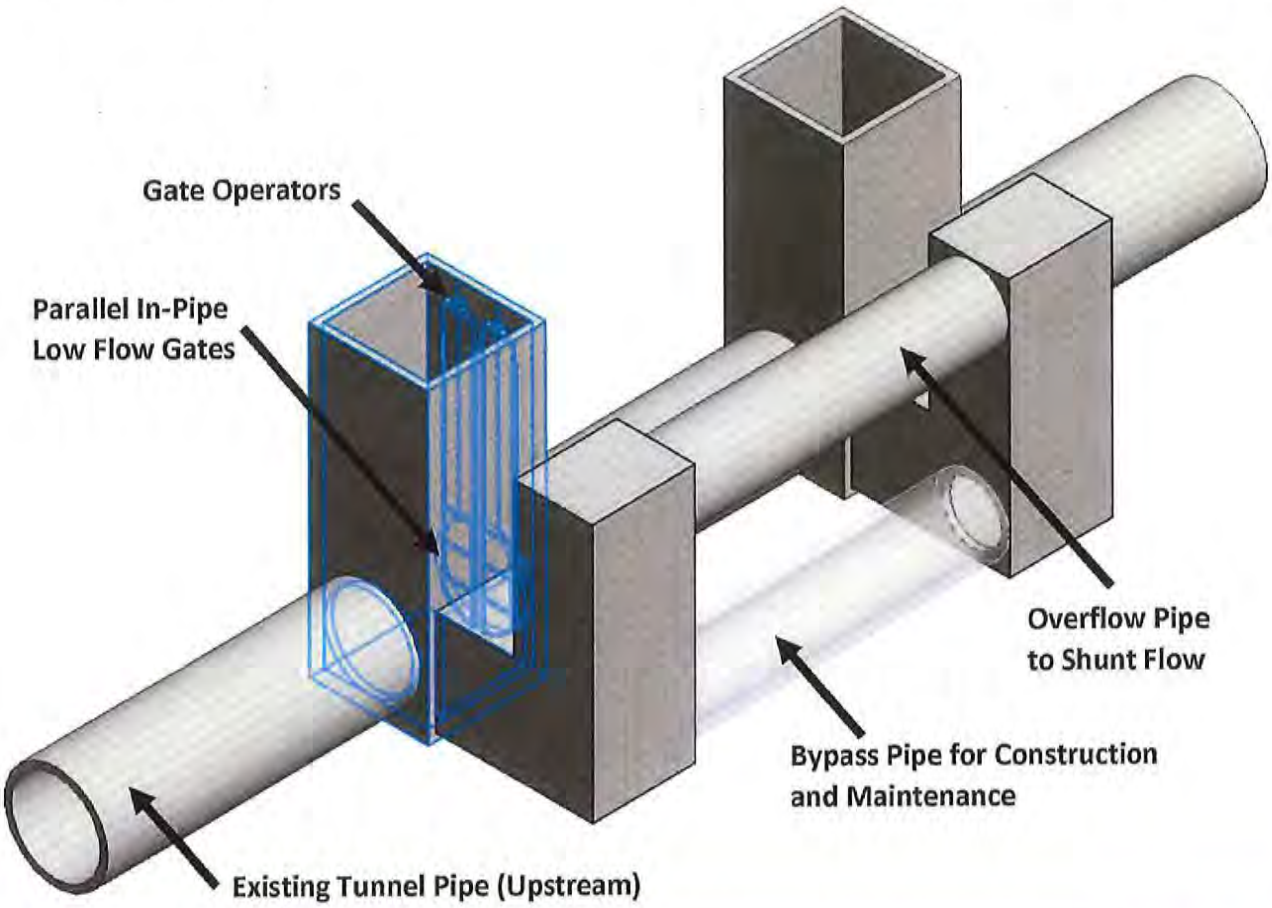


Option D



Passive Overflow Option: Parallel 12-foot pipe

Note: This image is a conceptual rendering to lay out most major components for visual clarity only. Actual design will aim to fit all components within the smallest cost-effective and constructible footprint possible.



Passive Overflow Option: Pipe to Shunt Flow

Note: This image is a conceptual rendering to lay out most major components for visual clarity only. Actual design will aim to fit all components within the smallest cost effective and constructible footprint possible.

Overflow Pipe(s) to Shunt Flow

Overflow pipes can either be used as a complement to or alternative to weir chambers. With the closure of gates to force storage, the capacity of an overflow pipe may need to replicate up to the full capacity of the existing 12-foot diameter 8½ Mile Drain Tunnel. If full redundancy is needed, an overflow pipe 12-foot in diameter (or perhaps two parallel pipes approximately 10-foot in diameter) will be needed to pass the high peak flow in the 8½ Mile without creating additional risk of basement backups. The rendering for this option is shown above.

If redundancy concerns or weir energy loss constraints arise during design, including one or more overflow pipes will be the simplest way to guarantee flows can be conveyed downstream. To save costs, the elevation of any new, parallel overflow pipe can be higher (i.e. installed shallower) than the existing tunnel pipe. Modeling will determine the maximum elevation of the invert (and crown) of this parallel pipe so the water surface (i.e. hydraulic grade line) can be maintained below the risk to basement elevations. Cost opinions, easement considerations, constructability and O&M will all be considered in evaluating the feasibility of such an alternative.

By using the overflow pipe to control upstream water levels, the operating band of the upstream water level will vary from the invert of the pipe to above the crown. This operating band can be reduced to a narrow band to better utilize upstream storage by installing a weir chamber on the overflow pipe. This comes with additional cost that must be balanced with the benefit derived and will be evaluated during the Basis of Design phase.

Technology Evaluation and Recommendation

Tetra Tech will evaluate the available options with MCPWO to determine a recommended course of action. This evaluation will consist of developing a set of criteria and evaluating each option including meeting with equipment suppliers.

The following are some criteria we feel should be included for each option:

- Constructed of materials capable of withstanding the combined sewer environment for at least 20 years (warrantied for this application)
- Able to withstand the pressures produced by storage of CSOs
- Readily available for distribution in the United States
- Capable of controlling upstream flow level for storage within a reasonable deadband limit
- A proven history of similar use as a means to control flow in combined sewer systems
- Rapid operation without failure
- Redundancy and reliability
- Easy to maintain
- Constructability while maintaining service
- Life cycle costs (capital and O&M)

Real-Time Control Technologies

Concurrent with determining the locations and types of control structures, the means to control moving equipment will be evaluated. Controlling these devices in real-time promises the best opportunity to increase storage at the lowest cost.

Determining the RTC technologies to optimize and control system components will be critical to achieving better and less risky solutions. RTC uses a combination of real-time measurements and predictive modeling to produce operational rules that increase storage while managing risks the high water surface elevations create.

RTC Process

Control logic and rules will be developed and modeled to better define and test the overall control strategy. It is the operational rules that define the relationship between observed and predicted system status (i.e., water elevation) and the desired response (e.g., closing or opening a gate).

Computer models are used to confirm that the proposed RTC strategy is compatible with the expected hydraulic conditions. The schematic at right shows the inter-relationship of the possible components, while the following text introduces the RTC concepts in more detail.

All RTC applications use observed conditions to produce operating changes. However, the level of RTC will vary depending on the complexity of the system, the skills of the operators, and the goals of the utility. The level of RTC can be described generally as follows from simplest to most complex (and reliable) in terms of controlling overflows:

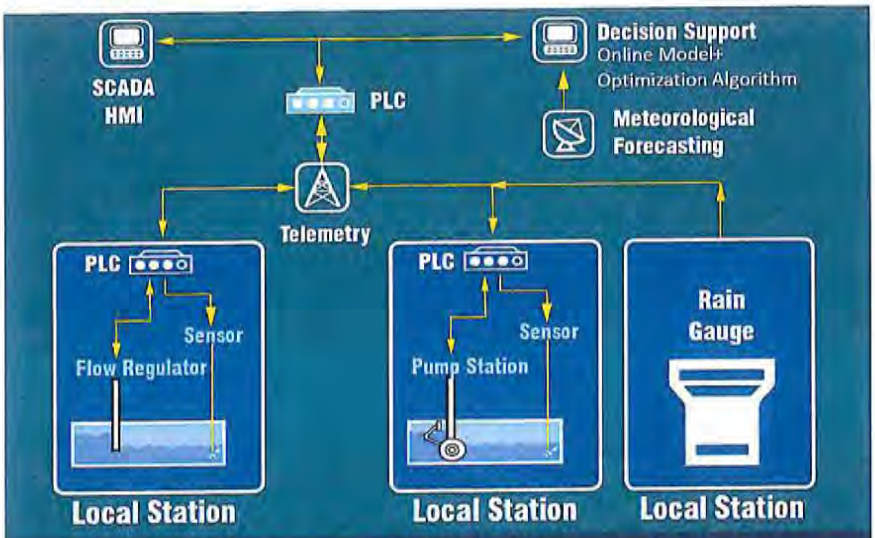
- **Local Reactive** – Control activated by flow or level close to the site. A VFD – controlled pump is an example of local reactive control.
- **Extended RTC** – Control activated by flow or level which may be geographically located away from control.
- **Regional/Global RTC** – Control activated by both observed conditions and rules determined by previous modeling. The data processing can be done in regions or globally in a central location.
- **Predictive RTC** – Control activated throughout system by both observed conditions and models executed in real time to forecast conditions.

Tetra Tech has been the international leader at using computer model analysis in real-time to **predict future conditions** and use these

Keys to RTC Project Success During Basis of Design

These keys to success have been learned through Tetra Tech's multiple RTC implementation projects, nearly 20 years of operational experience, and feedback from clients who benefited from the projects.

- Understand MCPWO's priorities and issues in the collection system with regards to hydraulics and O&M
- Maximize MCPWO's and our local knowledge of the system and chosen sites
- Select locations of instrumentation (gates, dams, monitoring meters) to take into consideration the O&M requirements and life-cycle costs to ensure the RTC facility will be cost-effective, safe, and reliable



Schematic of sewer system operated with Real-Time Control

predictions to implement operating changes ahead of observed conditions.

Predictive Control capability will be evaluated during the study for any benefit for the filling and the dewatering process. Rainfall or flow prediction could be particularly useful during back to back rainfall events to ensure conveyance capacity is quickly restored to minimize flood risks.

Our evaluation will identify potential prediction horizon, triggers (i.e., rainfall, water level, rate of rise or a combination of triggers) for the change of operational strategy (i.e., dry weather flow to wet weather flow to critical events), addition of rain gauges (if required) and the type of level or flow prediction (if required). The end result will be a complete control methodology which suits the goals and capabilities of Macomb County. Our experience suggests that the operational scheme is generally to first actuate upstream structures and sequence to downstream structures. By operating in this sequence, MCPWO can deliver the downstream flow to treatment before the upstream flow reaches the downstream structures.

Fail-safe Design for Reliable Operation

The level of functionality, redundancy, safety, and reliability of all control facility components will be defined based on the requirements of the operating modes as well as the impacts of a component failure on the control structure sites, upstream collector sewers, the downstream Nine Mile Regulator, Chapaton RTB, and Chapaton Pump Station. Critical components may require a redundant or backup system.

Other components may need increased functionality or reliability compared to industry standards, etc. During the Basis of Design, Tetra Tech will use hydraulic computer model scenarios to help MCPWO learn the advantages that each type of RTC strategy could provide. We have experience with both basic and complex RTC systems and can provide recommendations regarding the level of complexity and optimization that is best for MCPWO.

RTC and Instrumentation Requirements

An RTC strategy will involve the maximization of in-line storage in the 8½ Mile and 9 Mile Relief Drains, based on managing the water surface elevation.

Hydraulic Design, Mechanical Pre-design of Dynamic Flow Control Structures and Final Modeling Assessment – Control structures will be sized to minimize hydraulic losses. Modulating gates will be sized to provide the required precision and efficient modulation under site-specific hydraulic conditions for the design flow range and to minimize energy losses.

Models will provide range and frequency curves of flows and depths for better determination of gate sizes and monitoring device locations. Accuracy must be validated for extreme flow conditions: very low in dry weather or very high in wet weather.

Although hydraulic modeling allows for the detailed set-up of programmed control loops and process and gate movement characteristics, control needs and requirements will be further refined through the instrumentation, control, and equipment detailed design process.

Other Design Considerations – Based on our experience with previous RTC implementation projects, Tetra Tech will review and define the requirements and/or mitigation measures for the following components:

- **Minimizing flood risk is an important consideration during the design of a safe control structure.** We will evaluate how each control structure configuration can be adapted with a strategy to reduce the risk of flooding and provide for additional conveyance capacity or storage to mitigate flood risks.
- In-line storage can be seen as a potential negative impact on sedimentation since the flow velocity will be reduced for brief periods of time. **Experience shows RTC does not usually increase sedimentation**; however, RTC may not always flush out sediments where problems existed prior to its implementation. We will assess the sedimentation issue as part of the study to determine whether mitigation measures are necessary.

Monitoring Plan – Instrumentation requirements, such as sewer level monitoring, RTB level, and lake level, will be addressed as part of this project to fulfill post-construction monitoring and environment reporting needs. These needs will be defined with the MCPWO and the instrumentation required to respond to those needs will be identified as part of the study phase.

Operational Flexibility and Remote Control – The RTC control process will offer operational flexibility where the operator can take control of the operation at any time, whether to override the entire control process or to impose a gate opening or a new set point at a specific local station. The central station operator

CASE STUDY

Macomb County, MI Chapaton Flow Metering Study

FTCH completed a study to determine the feasibility of adding flow meters to the Chapaton RTB influent and effluent systems to better estimate filling and draining rates. A reliable flow metering system for Chapaton RTB will be critical to a RTC system and the knowledge gained by FTCH will be invaluable to the proposed In-line Storage project.

will interact with the control process through the human machine interface (HMI) of the central SCADA. The operator will also be able to control each site manually. The manual mode provides control flexibility and an additional level of security. In general, the manual mode is typically used to divert flows for maintenance or repair purposes.

Operator Confidence In and Acceptance of RTC Facility – A RTC facility should be considered an operations tool. Therefore, operator acceptance and ownership of the tool is mandatory to the success of the RTC venture. This requires the tool be reliable, integrated seamlessly into the SCADA system, and should not increase the level of complexity and maintenance of the operation beyond that which is manageable or sustainable. The control facility must be designed with the operators' input. The design team must thus involve operators and SCADA personnel throughout design development.

The figure below shows that the amount of control issued to the automated system can be progressively increased as the operators gain confidence in the RTC system.

Innovations and Value Added – Tetra Tech has designed and implemented fail-safe control facilities, safe and reliable RTC strategies, and has made them operate seamlessly. We have highlighted some of our innovations that will bring added value when designing MCPWO's RTC facilities:

- **Data validation processes are necessary for every successful RTC project.** Tetra Tech has developed a series of verification checks, including loss of echo, discrepancies between measurements, and bias. A data validity status is subsequently used to determine control and management modes, to pick up cases of measurement errors, bias, or equipment failures. If erroneous measurements were to be used in the control process, it is likely that poor performance will result and undesired or even risky hydraulic conditions may develop. Our team has developed numerous means of effectively validating data and responding safely to invalid inputs. The complexity of the algorithms will depend on the control configuration as well as the redundancy provided with the measuring equipment.
- Estimate of system flow rate is a critical part of the RTC System, yet flow meters are expensive to install and maintain. Tetra Tech has developed a flow under the gate calculation is a **low-cost and accurate flow measurement solution** we have applied and verified in multiple applications. It is based on using measured depths on each side of a gate to calculate flow rate. For several projects, the relative error was under 5 percent during dry flow conditions and approximately 15 percent in wet weather flow conditions. This is a low-cost solution compared to the high cost of flow measurement technologies that would come close to the same level of accuracy. It is especially cost-effective given it makes use of equipment and sensors already required for control purposes.
- Fall back operation mode management **enables an RTC facility to adapt to real conditions when a failure occurs within the collection**

Gate installation at control structure

Progressive Optimization

- Operators start with low set points
- Gain confidence over time
- Raise set points without adverse impacts to customers
- Skeptics to believers

Progress approach to developing RTC operating rules

system. This feature is particularly important to protect the system from critical events when the network is not in an optimal condition(i.e., gate/pump/sensor failure, maintenance of facilities). On this basis, Tetra Tech has developed several concepts for an efficient RTC facility to implement fall back modes at different levels to manage all potential deficiencies that could occur in the network.

RTC Reference Installations – Prior to finalizing an RTC control scheme, Tetra Tech will facilitate a dialog with MCPWO and our clients currently using our RTC control. The purpose of this discussion is so MCPWO can confirm the methodology proposed for this project was successful for other communities and enhance the proposed MCPWO project-based on lessons learned elsewhere. Tetra Tech believes Louisville, Kentucky and Wilmington, Delaware are the most comparable to the proposed MCPWO project.

Instrumentation – A key outcome of I&C component design, including integration to the SCADA system, is to recommend improvements to ease operation of the proposed control sites. Among the improvement features, we will propose modifications to the current SCADA system to enable remote and automatic control of the control structures so operators can supervise and take over the control site when needed, considering in real-time the network hydraulic conditions unique to each rainfall event.

I&C design must incorporate control features associated with the reliability of the equipment, the operational flexibility and adaptability of the control facility, and the robustness of the control scheme. Safety and reliability is an investment, so they must be applied at strategic, cost-effective locations. Furthermore, process narratives must provide all of the necessary control functions and reliability features necessary to implement the RTC scheme and to incorporate equipment failure scenarios. We will fully consider these constraints in our design approach and the following sections provide more specific descriptions of design elements.

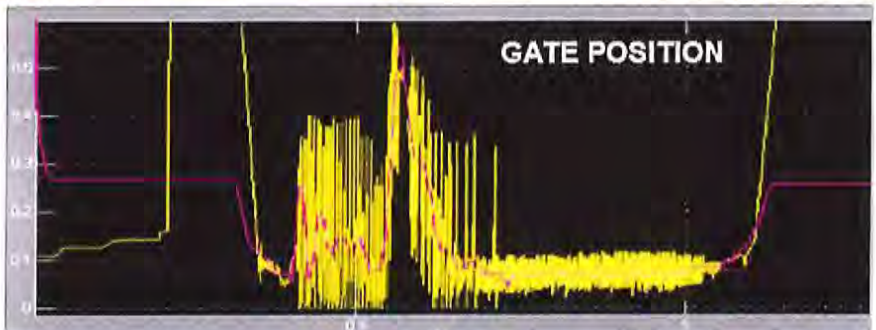
I&C Requirements – The I&C requirements will be specifically defined and adapted to each in-line control structure to ensure performance, simplicity, robustness, and ease of O&M. Each control site will need to be independently operational with its own PLC and control devices. Information and commands will be transferred between each site and the central SCADA system. Operators will monitor and have remote control access to the control sites through their SCADA system. Communication requirements and data exchanged between sites and the central SCADA will be defined as part of this project.

Preliminary process narratives will be provided and will describe the various operating modes, process monitoring, controls and alarms, as well as their respective functionality. Normal operating modes will optimize the site storage capacity. Fall back control modes will adopt the appropriate behavior in reaction to the failure of various instruments, equipment or site components such as power loss. A data validation procedure will be programmed to ensure only valid information is used in all process controls and decision-making. With level measurement and detection being critical information required by operation modes, the proper technology (hydrostatic, ultrasonic, radar, float, vibrating fork, etc.) will be selected with regards to accuracy, reliability, cost, versatility, and ease of maintenance. Constraints such as space, access to instruments for maintenance, difficulty during installation (i.e., wiring and mounting) will have a definite impact on technology selection and installation concerns. Final selection will be in compliance with MCPWO's design and installation standards, such as the prevailing electrical code for potential explosive and classified areas and SCADA standards. The minimum requirements will be defined based on these evaluations.

CASE STUDY

Edmonton, AB In-Line Storage Control

City implemented in-line storage in their deep interceptors to reduce CSOs. However, the control sites demonstrated operational issues, such as instability in the process and excessive gate movements, which persisted through previous attempts to stabilize control by other consultants. Tetra Tech reviewed the control, hydraulic and mechanical behavior, identified causes, and implemented a new control strategy that successfully resolved all operational and control issues without costly capital improvements.



Yellow = Previous gate movement; Magenta = Improved gate movement

The actuator types will be evaluated and selected taking into consideration the following:

- Modulation needs (positioning accuracy, position monitoring accuracy, duty cycle, torque, speed, etc.);
- Operational needs (remote, local, and manual operations and monitoring);
- Space constraints;
- Operating environment;
- Function (back-up, isolation or modulating).

A simple rule to follow is that the worst-case scenario should be to fall back to a behavior equivalent to the situation before the introduction of RTC. Equipment failures must be recognized as a given. It is essential to devise strategies to improve the control structure reliability, where necessary. Many strategies to increase system reliability should consider:

- Gate redundancy (i.e., two smaller gates versus one large gate when feasible);
- Secondary power source to activate a gate actuator to a safe position during power failure;
- Redundancy in water level sensors at strategic locations;
- Equipment interlocks;
- Data validation;
- Equipment behavior on invalidated data;
- Multi-channel or multi-path communication;
- PLC or computer redundancy and fault detection;
- Robust but simple control processes.

Animated 3D Model

Upon completion of the conceptual control structure design and preliminary hydraulic model, Tetra Tech will create a 3D computer model to animate the filling and draining of the sewer system. This model will provide a tool to demonstrate the value of the construction to the sewer users, municipal officials, and other community groups. Such a model will be a key agenda item for the neighborhood meetings we have outlined during the design and construction phases.

Enhancing Communities

The project will involve complex construction that may disrupt locations within St. Clair Shores and

Eastpointe. The areas identified are open areas of street rights-of-way or parks. Specifically, St. Clair Shores' Welsh Family Park is one location for a proposed structure. While the disruptions will be short-term, **the opportunity exists to create long-term improvements for the affected communities**. The restored areas can be designed to create improved park or landscaped areas. We have broken our discussion of restoration into our vision for the St. Clair Shores park and green spaces.

Welsh Park - *The Vision*

Welsh Park is a quiet, two-acre neighborhood pocket park off Alice Street in an older, established neighborhood. The park consists of playground equipment (play structure, swing sets, a slide, picnic tables, and barbecue grills) and several large mature, deciduous trees that provide significant shade for park users. The 8½ Mile Relief Drain project will impact Welsh with a potential In-System Storage Device located within the park's boundary. This will require significant excavation within the park. It will be dangerous for the public to use the park during construction and closing the park for one construction season and using its space as a construction staging area may be needed.

However, we view the disruption to the park as an opportunity. Specifically, it is an opportunity to restore the park to a condition better than what exists today. It will allow the park to be restored to the City's vision in the Parks and Recreation Master Plan. Furthermore, our vision allows amenities to be included such as sustainable stormwater practices that not only promote the MCPWO, but will make portions of the project eligible for principal forgiveness with the Michigan SRF Loan program. Pragmatic design and serviceable rain gardens, bioswales, and permeable paving are a few of the best management practices that will be explored during the restoration and design of the park.

The St. Clair Shores Parks and Recreation Department has been working with the neighborhood for several years to replace play structures with new, exciting and challenging play experiences. Additionally, a new St. Clair Shores Park Master Plan was adopted by the City in early 2019 that addresses several deficiencies found in the Welsh Park.

Currently, the main entrance into the park is not well-defined and is hard to see from the street in a passing vehicle. It lacks internal parking that could otherwise accommodate barrier-free parking near amenities and play structures. The park appears underused, which might be attributed to some of its unattractive recreational amenities which are in poor condition and scattered throughout the park. In addition, some of the play equipment does not meet ADA requirements.

By engaging the neighborhood residents to further understand their needs and desires of what would make a successful park is a necessary step in the planning and design process as the drain improvements begin. Developing a post-drain construction site improvement and restoration plan will respond to these needs and desires to create a beautiful park that is accessible to all age groups and abilities.

Existing entrance to Welsh Park

Welsh Park - *The Approach*

ECT prepared the City of St. Clair Shores' Parks and Recreation Plan and will lead the park planning and design efforts. ECT's approach is to listen carefully, respond in a manner that is both holistic and sustainable, and meet their commitments.

Neighborhood Workshop

We will facilitate a workshop to engage the surrounding neighborhood to collect additional information on needs and desires and to confirm program elements and deficiencies identified through the public input process during the recreation master planning phase.

Preliminary Concepts

All information will be reviewed and a site analysis will be conducted to determine the optimum layout of park elements, with the understanding the main project goals from the recent City of St. Clair Shores Recreation Master Plan 2019–2023 are to:

- Replace playground equipment and playground surface;
- Provide ADA accessible pathways to park amenities;
- Consider a natural playground;
- Add walking path; and
- Improve entrance identity with plantings.

ECT will prepare alternative concepts for the park's restoration and proposed site layout. The alternatives will be provided graphically with narratives summarizing proposed

CASE STUDY

Oakland County, MI Perry Street Pump Station

One example of Tetra Tech blending architecture into a park setting is our work for the Oakland County Water Resource Commissioner and the Perry Street Pump Station. This pump station blends in seamlessly with the park and was a pivotal component of Oakland County being able to treat more wastewater at the Pontiac WWTP and lower their dependence on GLWA for treatment. In 2016, the project won a MERIT award from the Michigan American Council of Engineering Companies.

concepts along with conceptual cost estimates. These documents will address any design issues, describe the size, character, and layout of each program element and solution as they relate to materials, plantings, and amenities to achieve project objectives.

ECT has supplied their preliminary vision for the restored Welsh Family Park in this proposal. These visions will be refined through community meetings and conversations with MCPWO. The vision will balance the need to access and maintain the newly constructed control structures while keeping the park available to St. Clair Shores residents.

The construction will more than likely need to include an above-ground control building housing electrical and control equipment. Tetra Tech architects have specialized in creating buildings that minimize footprint and blend in with the surrounding architecture. It may even be possible for the building to house restrooms further providing value to the community.

Example of typical control building designed to blend in with the surrounding neighborhood

Beaconsfield Locations

Maps show that Beaconsfield is owned by Macomb County Department of Roads. Thus coordination for construction and restoration will need to occur with this agency.

The right-of-way (ROW) is large and structures likely will be constructed in the eastern part of the ROW between Beaconsfield and the MDOT ROW. The ground surface currently consists of grass.

The restored area should likely be returned to grass with some site enhancements. The control buildings will be conceived to blend into the residential neighborhood along the west side of Beaconsfield Avenue. Landscaping will be designed to soften the edges of the control building. There will be significant site work to support O&M activities at the location such as driveways.

There is space at these locations to include park-like amenities. However, these areas are not currently used as parks, do not have infrastructure to support parks, and neighbors may be opposed to their creation. Our team will explore adding additional amenities beyond the O&M requirements but feel the Beaconsfield sites do not support the same community enhancement opportunities as exist at Welsh Park.

Model and Transient Evaluation Structures

Model Structures

We will use the calibrated hydraulic model supplied by MCPWO to confirm the locations and preliminary layouts of the control structures. The primary purpose of the model is to confirm the energy losses to be expected by the structures in relation to critical control elevations in the collection system such as overflow weirs or low basements.

The model will be used in an iterative manner to define the sizes and capacities of the control structures. Water surface elevations will be prepared for a number of different storm sizes to fully define the performance of the devices in both increasing storage and protecting basements.

The model likely will be run in a continuous mode to fully define the volume and frequency improvements to be expected and these results will be published in the BOD report.

CASE STUDY

Jefferson Interceptor Relief Sewer

Tetra Tech and Dr. Wright worked together in the 2000s to identify the cause and conceive a solution for transients occurring along the Jefferson Interceptor after construction of the Jefferson Relief Sewer. Immediately after construction completion, a manhole cover located near the Chapaton RTB was turned into a projectile, creating a dangerous condition. It was conceived that air was becoming trapped in the pipe and as the pipe filled, the air compressed until the air pressure exceeded the weight of the manhole cover. The solution was to create a controlled vent to release entrapped air prior to the air pressure increasing to a level where manhole covers were displaced.

Transient Analysis and Control

The County's calibrated SWMM will provide an estimate of the time series of flow rate and water surface elevations to be expected in the 8½ Mile and 9 Mile Drains. However, it will not be able to estimate the transient impact of sudden changes that may be imposed by the proposed structures to force the pipes to fill.

As an initial evaluation of transients, the SWMM data can be imported into the Illinois Transient Model (ITM), which is one of the few models commercially available to simulate transients.

This approach will provide a rough idea of the impact of the structures and allow fine tuning of initial layouts to be evaluated relatively quickly. However, while the ITM software accounts for transients in the wastewater, it does not account for the effects of trapped air in the system. Thus, an additional level of analysis is needed.

The flow in rapidly filling sewers has traditionally been considered as a case of filling an empty conduit while the reality is that the air that originally occupied the space must be vented during the filling process. If there is restricted ventilation capacity due to either the system geometry and/or the details of the filling process, the potential exists for the entrapment of significant amounts of air within the conduit which can then contribute to various operational issues such as violent geysering of the sewage and displaced manholes. A combination of experience from laboratory experiments on filling systems, troubleshooting systems that have experienced these problems, application of numerical models, and design review for proposed large-scale systems indicates that problems are usually more severe when large discrete air volumes are trapped during the filling process. Studies have indicated a variety of mechanisms that can result in this occurrence and these have been described in some detail recently.

Sewer transient geyser studied by Professor Wright

A typical approach to the identification of potential air ventilation problems involves a careful review of system geometry to identify locations where air entrapment is possible. Predictions of potential filling scenarios are reviewed to determine the likelihood of occurrence of these events. In cases where problems are identified, solutions for providing additional ventilation capacity can be developed.

This additional evaluation of the potential for entrapped air to impact the system will be performed by Steven Wright, Professor Emeritus of the University of Michigan. Dr. Wright studied this entrapped air phenomena for several metropolitan sewer districts, including creating physical models to simulate both the causes and alternative solutions to transient problems.

FKE staff inspecting tunnel system

Geotechnical Investigations

During the study phase, FKE will conduct a limited (Phase I) geotechnical investigation to determine the general conditions in the likely locations in which flow control structures will be built. This effort will begin with a review of available geotechnical and tunnel data in the vicinity; a data gap analysis to determine additional data necessary to make concept-level decisions regarding the proposed flow control structures; and preparation and completion of the initial study.

For this project, we have planned that the Phase I geotechnical study will involve drilling test borings at four locations, together with analysis to determine appropriate earth retention systems, approximate earth and hydrostatic loading for the purpose of conceptual design; and development of concept level pros/

cons/costs for various options. In tunnel examination will be deferred to the design phase.

FKE will provide overall analysis of risk and feasibility of the proposed construction, together with potential mitigation approaches for such risks. This effort will involve preparation of a risk registry, that will be reviewed with the 8½ Mile Relief Drain Drainage District to select and develop the most appropriate and cost-effective design and construction approaches.

Identify Permit Requirements

Tetra Tech's vision for obtaining permits is described below with the MDEQ coordination described in a subsequent section.

St. Clair Shores Parks – Construction in Welsh Family Park involves close coordination with St. Clair Shores. We propose one or two introductory meetings with the City to confirm the feasibility and likely constraints of using the Park. We have included time for ECT to complete some preliminary sketches of the improved park to facilitate these discussions.

City Street Closures – These will need to be coordinated with the Cities of St. Clair Shores and Eastpointe depending upon the locations selected. Needs will be defined at this stage with the actual permit applications and discussion developed during design.

County Road Impacts (Beaconsfield Avenue) – Beaconsfield is under the jurisdiction of the Macomb County Department of Roads. Construction along Beaconsfield will create significant impact and need coordination with the County.

MDOT – Construction of structures adjacent to I-94 may involve coordination with MDOT. As Tetra Tech and FTCH are two of the largest consultants used by MDOT in terms of annual fees, we have the relationships to fully define the design and construction approval process to coordinate this project.

Construction Permits – There are other permits needed that will be defined in the construction contract documents such as soil erosion and building codes. The requirements to obtain these will be specified in the bid documents.

Identify Easement Needs

Upon conclusion of the utility survey, the easement needs will largely be understood. However, as the design proceeds and the structure dimensions are further defined, the amount and locations of easements will be adjusted. Our work will include supporting MCPWO preparing easement sketches and descriptions during the design phase.

MDEQ Coordination

Acquiring early approval of the project from MDEQ (now the Michigan Department of Environment, Great Lakes, and Energy) will be extremely important for the progress of this project. Our team is experienced at working with the staff at MDEQ in both the Warren and the Lansing headquarters. We have built good relationships by delivering consistent and clear information on-time and by being true and fair advisors to our client communities.

During the Basis of Design Phase, we anticipate having three meetings with MDEQ. The first to explain the overall project and our preliminary ideas. This will include preliminary sketches and a discussion on the effects of the project on the NPDES Permit. This will be our chance to understand MDEQ's concerns and allow us to design concepts around that.

The second meeting will likely occur as we near the end of the task. This meeting will be when we provide MDEQ with the proposed layout, equipment used, and the anticipated sequencing and controls. Adjustments to the NPDES Permit may be needed for filling and especially dewatering of the system after a rain event. Redundancy in the system to prevent basement backups will be provided. System operation during construction will also be reviewed at this time.

Typical bypass pumping operation

The third meeting will likely occur once the BOD is complete and presented to MDEQ for review and approval. This meeting will be held to answer any outstanding questions MDEQ may have on the final concept prior to the start of design.

Our team is familiar with MCPWO's NPDES Permit. We will assist in providing recommendations to update the permit if needed. We will also assist in reviewing any revisions that MDEQ will propose and provide MCPWO with supporting documents to facilitate permit updates.

Risk Analysis

The project promises benefit to the quality and health of Lake St. Clair. However, it also brings risk if not properly designed and managed. Tetra Tech brings a comprehensive plan to manage this risk. We have identified the following risks and control measures to protect Macomb County residents.

Basement Backups – By allowing the water surface elevations to rise and create storage, the risk of basement backups increase. The approach to manage this includes numerous techniques in understanding the system and developing alternatives.

Basement Survey – Key basement elevations must be understood; particularly those along 9 Mile, where the sewer is not deep. These elevations present a design constraint in which we must keep the sewer water surface (hydraulic grade line) below. FTCH will lead a comprehensive survey of approximately 20 homes in the service area. These homes will be selected based on their relation to the predicted water surface by the model.

Tetra Tech's Approach to Providing Value by Reducing Risk

Risk	Approach
Basement Backups	• Obtain surveys of lowest basements and connecting sewers • Use computer model for preliminary design structures • Prepare physical model to confirm design • Prepare tight, but realistic, bypass pump/maintenance of flow specification • Design failsafe structures • Consider real-time control to actuate gates to provide additional capacity during large events
Construction Change Orders	• Thoroughly inspect condition of sewer prior to design • FK Engineering prepared excavation specification to protect against excavation concerns
Impact on Residents	• Comprehensive boundary survey to confirm sewer locations and real estate needs • Monitor for settlement at structures adjacent to construction • Obtain residential feedback prior to construction
Odor	• Design air release structures • Install odor treatment canisters at these locations

Flow Control During Construction – Flow control during construction can be managed by constructing gravity bypasses or by temporary pumping. Our thoughts on each follow.

Gravity Bypass. Some of our control structure bypass sketches have already demonstrated examples of these. These may be constructed with prefabricated sewer pipe or by cast-in-place channels and flumes. Gravity bypasses have a high capital cost, but are highly reliable. If a gravity bypass can be constructed to have functionality after construction, the value of a gravity bypass increases dramatically. The rendering on page 43 depicts how a passive weir chamber may be constructed with a gravity bypass.

Temporary Pumping. Bypass pumping involves temporarily diverting flow in pipes across the ground surface. With the design flows in the 8½ Mile Drain exceeding 1,000 cfs, bypass pumping will be a major and costly operation. Bypass pumping must be specified with instruments and telemetry to alert the contractor if the pumping fails to keep pace with incoming flow to prevent basement backups.

Combination. Tetra Tech believes the cost-effective approach to maintaining flow during construction may be to combine a gravity bypass with temporary pumping. Our experience is that once the pumping rate exceeds 300 cfs, the bypass pumping cost gets extremely expensive. Therefore, by combining the two approaches, it may be possible to get both the lowest construction cost and a permanent bypass arrangement that MCPWO can use during O&M practices.

Modeling (Computer/Physical) – Modeling will be critical to developing alternatives and completing reliable designs. SWMM modeling will provide preliminary dimensions and elevations for chambers/weirs, but has limitations in accurately estimating head losses for complex hydraulic devices.

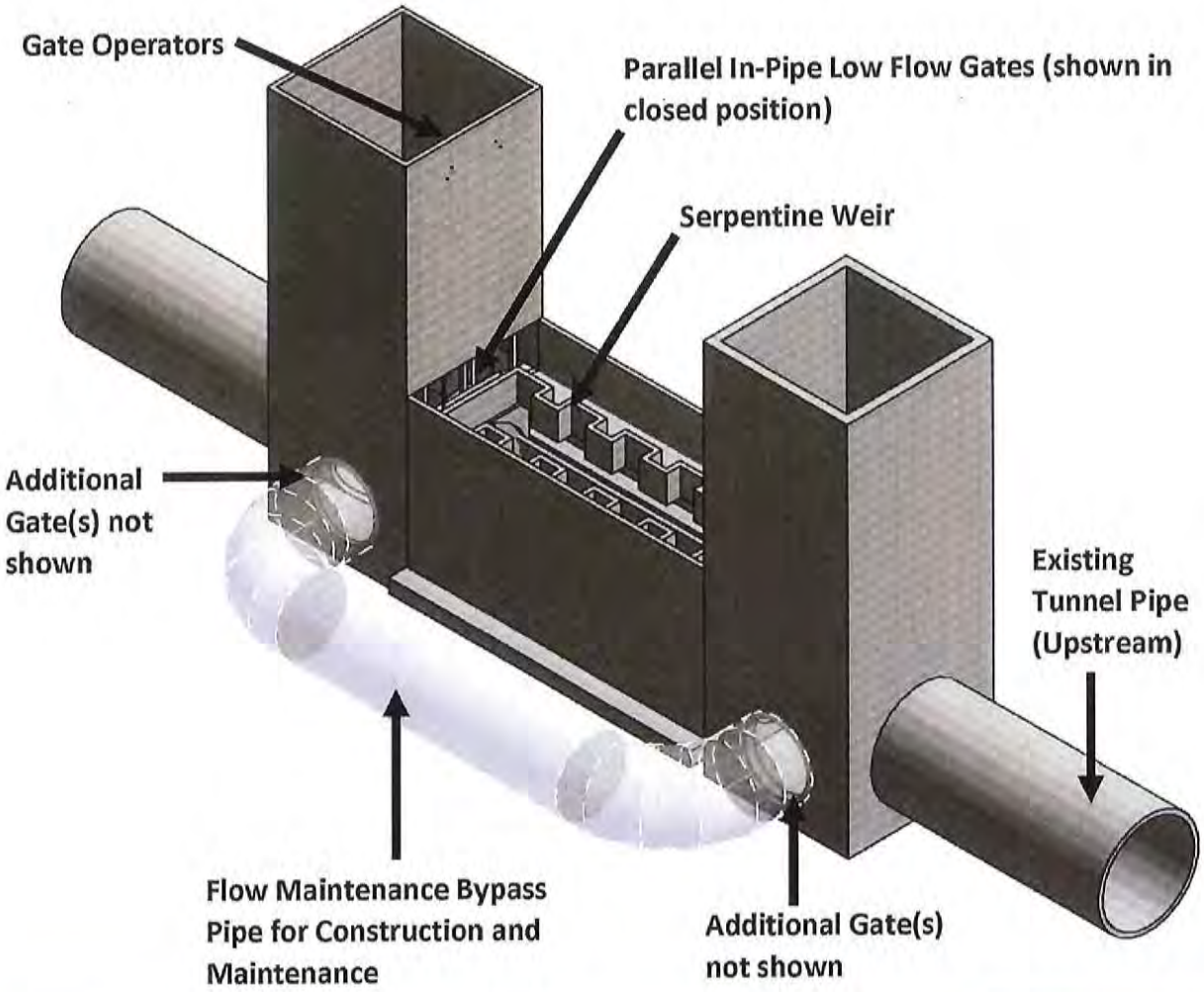
During the design phase, additional analysis to control risk will be performed. Computerized Fluid Dynamics modeling will expand upon what SWMM can provide.

Tetra Tech has teamed with Clemson Engineering Hydraulics, Inc., (CEH) to construct a physical model of the chambers to accurately predict the energy losses of the proposed structures. A physical model involves constructing a scale model of the final chambers. By measuring the energy losses of the model, highly accurate energy losses created by the prototype can be predicted. Through this modeling, the dimensions and elevations of the prototype can be optimized to reduce cost, lower energy losses, and protect properties.

Physical Dimensions – The 8½ Mile Drain was constructed by tunneling, is more than 50 years old, and could have corroded with time. Each of these factors creates uncertainty on the precise dimensions of the sewer internal diameter.

Our team includes RedZone Robotics to internally inspect the sewer in the vicinity of the proposed construction. RedZone will accurately measure the internal dimensions of the sewer in precisely the locations of the proposed construction to minimize surprises, which could lead to redesign and change orders.

Air Release and Odor Control – By forcing the sewer to fill, air may be released at higher rates and at different locations than occurs in the sewer. The computer model will assist in identifying locations and rates of air release. If not controlled, manhole covers could be forcibly



Passive Overflow Example - Option C: Serpentine Weirs

Note: This image is a conceptual rendering to lay out most major components for visual clarity only. Actual design will aim to fit all components within the smallest cost effective and constructible footprint possible.

CASE STUDY

Louisville, KY
RTC Control

Tetra Tech completed the same technology evaluation proposed for Macomb County. That evaluation considered the control devices mentioned within this section and concluded that sluice gates provided the most reliable and cost-effective approach to utilize the available storage in the pipe. The design allowed the Metropolitan Sewer Department to utilize an additional 16 MG of storage that was otherwise underused.

displaced. Such events occurred along the Jefferson Interceptor Relief Sewer and Tetra Tech was retained by Macomb County to identify air release locations and sizes. By having designated air release points, air pressures within the sewer system can be controlled so manhole covers are not displaced.

Controlling odors will involve creating locations for this air to be released. Locations away from residences will be preferred, where possible. Odor control canisters will be installed to treat foul air before it is released. While there are multiple air treatment technologies, the technology that is best for intermittent releases such as this is activated carbon.

Construction Impacts on Adjacent Properties – All such designs will consider the presence of the many adjacent residential structures and will be developed to minimize ground movements and related damage to these structures, as well as to the tunnels. Foundation and related structural designs will be developed for the proposed in-line structures, to protect from differential movements and potential structural distress. FKE will also be responsible for analysis and design of foundations for any related ancillary structures.

As part of our design, FKE will develop a detailed program for monitoring ground movements during construction, so that any potentially damaging movements can be detected, and mitigating actions can be taken, before significant damage occurs. This "observational approach" will include pre-determined action levels (typically green, yellow and red), whereby specific levels of movement will require the Contractor to stop, and/or adjust construction methods, to stop unacceptable movements.

The geotechnical instrumentation program designed will include inclinometers adjacent to new shafts, ground and structure monitoring points, vibration monitoring, tell-tales to protect infrastructure, and other instruments as appropriate.

Risk Register – The above risks and others that may present themselves will be recorded in a risk register and reviewed at progress meetings. The risk register will be an invaluable tool to both reduce risk during design/ construction and properly budget for the risk that remains.

CASE STUDY

Brighton, MI Water Reservoir and Edmonton, AB Storage Tank

Tetra Tech needed to locate a ground-level water reservoir in a residential neighborhood. We designed a control building around the tank to resemble a home to blend in with the neighborhood architecture and the tank is indistinguishable from the houses around it. In Edmonton, Tetra Tech designed playgrounds on top of underground infrastructure. In this case, on top of an underground RTB.

Feasibility Analysis

Many features of the project feasibility were previously discussed with the exception of a control building. For moving equipment, a control building to house electrical equipment and other systems is almost a necessity. With the control structures likely located in residential neighborhoods, the aesthetics of the building becomes critical.

We have included the credentials of our architects, electrical engineers, mechanical engineers and site designers who routinely design buildings to fit within the aesthetics of the neighborhoods.

In particular, the size, roof line and architectural treatments of the building are key to the building blending into the neighborhood.

In park locations on past projects, Tetra Tech staff worked with park owners to design restroom facilities into the buildings. Thus, while park footprint may be lost to the building, the community receives an amenity to use after project completion.

Management and Reporting

Tetra Tech believes monthly meetings between the consultant and client facilitate communication and are critical to delivering a project on-time while meeting client needs. Meetings will be a critical part of the work plan including delivering agendas a week before the meeting so Tetra Tech and MCPWO are prepared.

The basis of design report will be prepared in draft and final forms. Our approach is to prepare text and figures for the report during the completion of the basis of design so by the time MCPWO sees the final report, it is more a formalization of concepts previously reviewed at progress meetings than a new product. The report will be completed in sufficient detail that the design can be quickly started without repetition.

A critical part of the report is preparing a concept-level cost opinion. Our goal for this is to provide a conservative cost opinion so that costs decrease during the design stage. Our approach is to define costs for all major components using quantity take-offs. However, we will also use contingencies to account for costs that cannot be well defined until after design is initiated.

Comparable projects is always the best way to validate a cost opinion. Tetra Tech is fortunate to have completed projects involving similar elements in East Lansing and Toledo and these costs will be invaluable to validate the costs for a project in Macomb County.

E. FINAL DESIGN

Task E Objectives

- ✓ *Complete bid documents*
- ✓ *Obtain needed permits*
- ✓ *Engage affected public*
- ✓ *Obtain grants and low interest loans*

This section outlines our approach to the design. In most cases, design details are determined during the basis of design. However, there are some new approaches and thoughts that occur in the design stage of the project. This section starts by outlining important needs such as verifying the design by physical modeling. It also outlines Tetra Tech's vision to engage the public who may be impacted by the project. After these discussions, the section transitions to discuss the work requested in the RFP.

Envision Sustainability Rating

Many of us are familiar with the LEED rating for sustainable building design. However, there is also a sustainable rating for public works projects called Envision. This rating is administered by the Institute for Sustainable Infrastructure.

Public works projects can achieve Envision ratings based on sustainable features. A Sustain-certified project will improve the quality of life for its users. It will also generate positive publicity for the project owner. Envision awards projects credits in 60 categories based on the environmental stewardship that the project exists. The credits are grouped into these categories:

- Quality of Life
- Leadership
- Resource Allocation
- Natural World
- Climate and Risk

For instance, enhancing public spaces is a potential credit in the Quality of Life category. The County could potentially get credit for enhancing Welsh Family Park.

At the beginning of the design process, Tetra Tech will review the Envision program with Macomb County to decide if this program is desired by Macomb County. The cost of Envision is nominal compared to the construction costs and the impact on the environment and the public's perception of this project could be immeasurable.

Keys to RTC Project Success During Design

These keys to success have been learned through Tetra Tech's multiple RTC implementation projects, nearly 20 years of operational experience, and feedback from clients who benefited from the projects.

- Involve MCPWO engineering staff and operators throughout the design stage. Gaining operator acceptance of the in-line storage control facilities will ensure successful implementation and optimal operation
- Specify instruments and other hardware compatible with MCPWO equipment in other facilities, simplifying future O&M

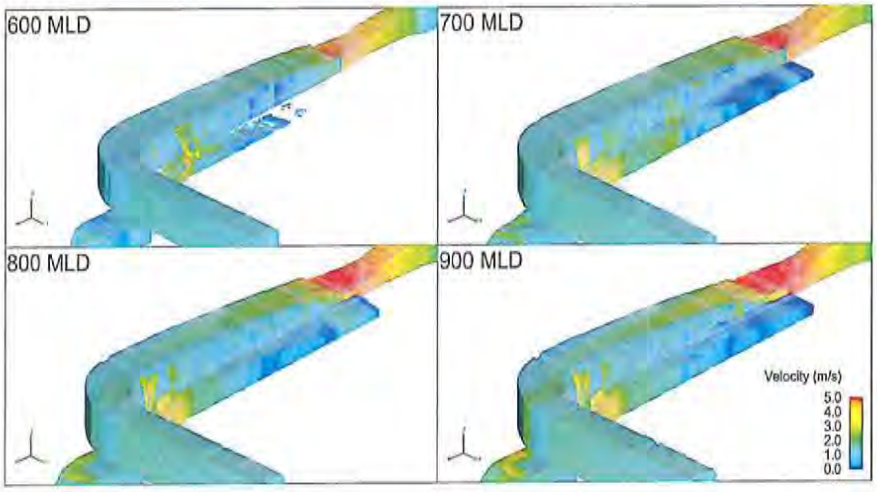
RedZone Robotics Condition Assessment (to be determined)

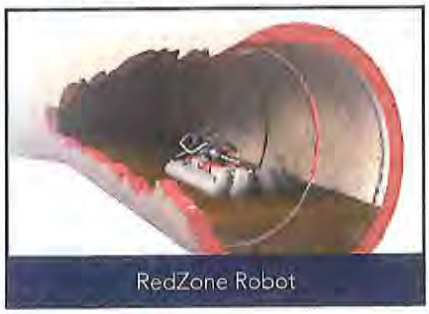
At design initiation, there may be a need to understand even more about the tunnel pipe at the proposed control structure locations. While the infrastructure survey will take 3D scans at approximately 150-foot intervals, we may wish to learn more about the pipe condition in between these intervals to confirm if there is any deterioration of the tunnel wall. Furthermore, if there are any alignment concerns that cannot be determined by the infrastructure survey, the RedZone approach can

CASE STUDY

Edmonton WWTP

For our service to the Edmonton sewer utility, Tetra Tech used FLOW-3D® to create a three-dimensional model of the WWTP headwork to predict the amount of flow that would spill across a side overflow weir. The physics of this situation were impossible to model any other way than CFD and were made more complex due to the presence of a hydraulic jump. The CFD results are pictured graphically below for differing flows expressed in units of MLD (millions of litres per day).





RedZone Robot

add value. RedZone has agreed to be on the Tetra Tech team to perform this inspection, if needed.

RedZone would complete a MSI LIDAR scan to determine both the condition of the sewer as well as create an alignment drawing. The deliverable for the project will include a PACP Database with videos and an MSI report, including an Alignment Drawing. Each line segment will include a rating score following the NASSCO PACP rating system.

Computational Fluid Dynamics (CFD) Modeling

SWMM software provides excellent approximations for almost all questions that can be asked in a sewer system. However, SWMM does not handle complicated structures and multiple flow dimensions as well as will be needed to answer some design questions for complex in-line storage control structures. In particular, side overflow weirs are notoriously difficult to analyze.

CASE STUDY

Fort Wayne, IN Pump Station

Working as part of the design team, CEH refined the proposed pump station that improved the hydraulics of the wet well by shrinking the size of the structure. These adjustments reduced the construction cost by more than $1 million, thereby saving the client many more times then CEH's fee.

As the project proceeds into the design phase, the structures should be modeled with CFD software.

Tetra Tech will use FLOW-3D® software to create a 3D model of the structures. This software allows us to model flow through the structures in 3D so we can accurately understand the distribution of flows and energy losses created by the structures.

The model creates a finite element grid consisting of millions of grid points in three dimensions and solves hydraulic equations across all of these grid points. The model will be used iteratively to refine structure dimensions to best protect upstream property owners. These adjustments also allow our design team to minimize the structure footprint so the project costs can be controlled.

Physical Modeling

Moving one step beyond CFD is creating a physical model of the proposed structures to further refine the energy losses. The proposed structures will provide value in protecting Lake St. Clair but must be designed and constructed carefully so as not to create an adverse condition for the sewer users. Structures of this significance should be evaluated with physical modeling so the function, particularly energy losses they create, are well known prior to construction. Creating a physical model to verify the proposed layouts and their performance is critical to develop this understanding. The physical model will be constructed in CEH's laboratory in South Carolina. Tetra Tech will work with CEH remotely to fine tune the design.

CEH will construct a physical model of the chambers to accurately predict the energy losses of the proposed structures. A physical model involves constructing a scale model of the final chambers, as shown in the photo at right.

Model testing is carried out in four phases; baseline, modification, witness, and documentation tests.

A CEH physical model of a weir.

Model water level in each phase is recorded with an accuracy of 0.01 feet or better. By measuring the model energy losses, highly accurate energy losses created by each proposed structure can be predicted. Through this modeling, the dimensions and elevations of the prototype can be optimized to reduce cost, lower energy losses, and protect properties. CEH prepares a project report including methodology, procedures, conclusions and recommendations, as well as all data and documentation acquired during the testing. Upon completion of the model, representatives of Tetra Tech and MCPWO will visit the laboratory to witness the final tests.

Finalize Real-Time Control

The results of CFD modeling and physical modeling will be used to confirm previously outlined RTC schemes and to confirm final instrumentation and control system selection. The validation of the design features enables detailed design of RTC monitoring device locations, elevations, and control strategies.

Public Engagement

Public engagement is key to providing stakeholders with important project updates and allowing them to provide input on topics that involve them and their community. Successful public engagement builds trust on two levels: 1) trust in the project team's technical competence; and 2) the project team's willingness to listen to the stakeholders. A well-publicized timeline, clearly established

milestones, and competently facilitated meetings will create a collaborative environment to discuss complex topics in a safe space. The key steps in a successful public engagement project include:

1. Creating a safe space for the public to raise and discuss the issues relating to the project.
2. Acknowledging feedback and showing how it is being utilized by the Project Team.
3. Preparing for meetings with a relevant agenda and providing facilitation to allow all voices to be heard.
4. Disseminating information in various methods to be sure that it is reaching a wide audience.
5. Translating complex technical language into simplified and easy to digest documents.
6. We have tasked TWN Consulting, LLC to handle the public engagement aspect of this project.

Public Engagement Work Plan

Prepare Public Engagement Strategy

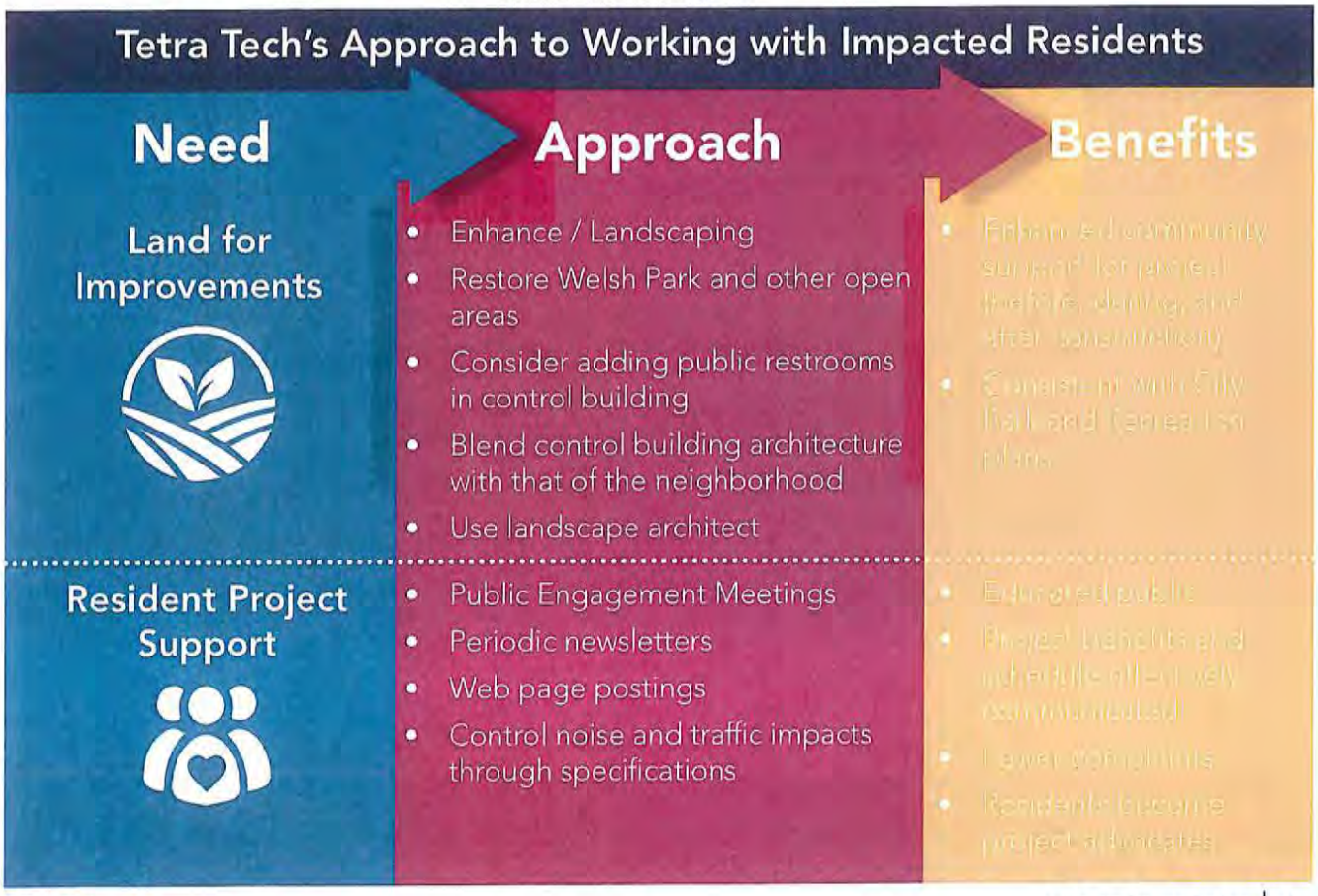
The Public Engagement Strategy will follow guidelines for early and effective citizen participation in planning major projects. In addition to citizens, our approach can extend to groups such as city councils or parks commissions if we can confirm that this level of involvement is desired.

To effectively engage interested stakeholders and communicate progress throughout the project, the key components of the strategy should include:

- Situation Analysis – input from the County regarding key issues to be addressed.
- Communication Objectives – clarify the objectives for dissemination of information and engagement.
- Message Model – identify messages that must be communicated to ensure stakeholder awareness.
- Target Audience Lists – develop list of stakeholders, County staff, media, and other influencers.
- Engagement Timeline – timing to conduct meetings and provide interim and final reports.
- Risk Analysis – identification of and outreach to aggrieved stakeholder groups.
- Media Strategy – establish a balanced strategy to disseminate information.
- Public Engagement Milestones – depict the interaction points of the above-mentioned strategy.

Engaging the Public

We anticipate conducting six neighborhood meetings in the construction areas. Three design phase meetings and three construction phase meetings are anticipated in each of the three potential areas.



Teresa Weed Newman (second from right) at a GLWA Public Engagement function.

Create and Distribute Public Engagement Materials

The team is prepared to create, distribute, and archive the materials suggested by the County, including but not limited to project overview/ updates, printed announcements, and website updates.

Document Public Engagement Results

The following documents will be created, distributed, and archived as part of the public engagement process: public engagement plan; public meeting announcements and agendas; meeting summaries; supporting handouts; and public engagement report summary at the close of the project.

30/60/90 and 100% Submittals

Detailed drawings and specifications will be developed at these stages and reviewed with Macomb County. This progression allows the county to develop comfort with the current state of the design before proceeding to the next.

Tetra Tech will utilize a Building Information Management (BIM) tool such as REVIT to prepare all drawings. The preliminary sketches in this proposal were created in REVIT, which excels as creating 3D design spaces. Presenting the design in 3D allows the County and the public to better visualize the completed work while allowing the designer to better understand conflicts that may be present, reducing construction contract changes. The completed work can be converted to AutoCADD 2017 at the completion of the project for Macomb County's records.

Specifications will be prepared in MasterFormat 2014 as requested. As mentioned previously in the risk management discussion, a successful project will require thorough specifications be developed for such items as coordination with MDOT (Beaconsfield work) bypass pumping, vibration monitoring at adjacent parcels, and excavation.

This project will require large equipment and equally as large staging areas. The vacant right-of-way east of Beaconsfield Avenue can support work for project constructed in that location. Welsh Park will not need the whole park area for construction but the park may be closed for both staging space but to also for safety purposes.

At each of these project stages, cost opinions will be developed. Accurate cost opinions are important to provide proper budgeting for the county and to make informed decisions about project components.

Construction sequencing will be a critical consideration. The sewers cannot be taken out of service so construction planning needs to consider how the contractor may choose to maintain flow. A suggested sequence will be included in the specifications, although the contractor may decide on a different approach.

With this tight contracting market and rapidly increasing prices, Tetra Tech will treat these as more than just a formality. We will involve senior staff in their review including validating costs against recent bids. At key stages, we will solicit input from contractors regarding constructability and costs. Our QA/ QC procedure outlines our approach to reviewing the constructability of our designs and leads to better bids and lower costs for our clients.

The Basis of Design report will also be modified as the design progresses. The MDEQ will require the computer model be defined in more detail for the structure being designed. Furthermore, the alternative analyzed or evaluated during the earlier project phases can be dropped for the report submitted to permit the design.

Geotechnical During Design

During the design phase and on the basis of the selected design concepts, FKE will conduct a Phase II geotechnical investigation as necessary to conduct detailed design of structures. This will include two to three test borings at the proposed structures, together with in-situ testing (vane shear and in-situ permeability testing to determine appropriate design parameters). FKE will conduct laboratory soils testing, conduct data analysis, develop lateral earth pressures, and prepare a geotechnical report summarizing the investigation and analysis.

FKE will provide soil-structure design details including requirements for temporary earth retention systems, safely tapping and/or modifying the tunnels without compromising them, controlling groundwater during construction, controlling and monitoring ground movements (via geotechnical instrumentation), and development of specifications to address underground construction.

Shaft designs will include TERS tunnel tap details, fluming of flow through the proposed construction areas, structural analysis of tunnel (finite element analysis, soil structure interaction, lining design if needed, etc.), and related design.

Permit Applications

By the time the project is in design, hopefully, MDEQ has already approved the concept. At this point our team will prepare the necessary permit applications and submit them on behalf of your office. Further refinement of the concept and construction sequence will be provided. If MCPWO intends to use SRF funds to construct the project, then included in our scope will be coordination with the MDEQ SRF Office to review the plans and specifications for SRF funding.

Permits from other agencies such as the Macomb Department of Roads, and local agencies will also be acquired during the design phase,

O&M Protocols

Reliable Operations – A reliable operating scheme will consider several components. We have discussed dewatering, managing solids, and equipment operation within this section but will certainly expand that to other items as the project proceeds.

Dewatering – The design will consider an operational plan to lower the water surface after storms. This will be part of the real-time control logic and instrumentation plan that will be developed during the BOD phase. For instance, it is probable that the sewers need to be drained from upstream to downstream in a controlled manner so as not to create transient conditions at the downstream structure. The suggested sequence and durations will be defined.

Sewer Cleaning and Solids Management – Storing wastewater will also interrupt the means for solids within the water to be transported downstream. Our plan will consider how to either maintain the flow of solids or return captured solids to the flow stream. For instance, opening one parallel gate after a capture may increase velocity locally to the gate and better move sediment downstream. However, Tetra Tech's experience is that accumulation is typically minor.

The way stored water is released during dewatering will impact sediment and debris management. The final design will need to consider the consistency of sediment Chapaton RTB gets now, including the amount of gravel, sand, trash and floatables. If sediments and debris are a concern then grit pits may be required. Since vactor truck suction lines may not function well at a depth of 30 feet, alternative sediment removal methods such as clamshell buckets will be considered.

Equipment and Equipment Access – As is standard with wastewater treatment, it is preferred to have two of any piece of moving equipment. Most of the concepts presented earlier show parallel pieces of equipment for the sole purpose of having redundancy in case one component fails to operate.

All equipment will need a means to remove it from service for replacement or repair. Thus, access hatches or shafts will be placed over locations of moving equipment to facilitate future work.

With the depths involved in this project, shafts designed by the Tetra Tech/FKE team and not a simple standard manhole detail will be required. Openings need to be designed to accommodate O&M equipment entering the space.

Management and Meetings

We envision monthly progress meetings during the design and construction phases just as described in the basis of design phase.

SRF Compliance

MCPWO desires to use Michigan's State Revolving Fund (SRF) Load to finance this project. This is a good choice and will require a consultant experienced in designing and administering a project in accordance with SRF's particular requirements. Such things as American Iron & Steel requirements need to be included in the bid documents and tracked through construction. Tetra Tech's 30-plus years of experience administering SRFs makes us ideally suited for this project.

Furthermore, with team member FTCH who prepared the project plan, no consultant is better positioned to keep MCPWO eligible for this funding than the Tetra Tech team.

Cost Savings

Green Reserve Principal Reduction Experience

Tetra Tech has succeeded in assisting clients obtain Green Reserve Principal Reduction. As of 2018, the total amount of principal reduction awarded was over $5,300,000 per the table on the left.

Recent Tetra Tech Green Reserve Principal Forgiveness Projects

Loanee	Description	Green Project	Principle Forgiveness	Cat.	Bus. Case
Wayne Co. (Milk River)	**Pump Station / RTB Improvements**	**$1,957,000**	**$150,000**		**X**
East Lansing	WWRF Sludge Handling Improvements with Digestion	$12,111,000	$1,938,000		X
	Headworks and Interceptor	$18,761,000	$1,500,000	X	
Saline	WWTP Improvements and PS Equipment, SCADA, Energy Reduction	$1,853,000	$300,000		X
Dundee	Replace/Improve MBR, Screening, and Extended Relief Sewer	$455,000	$50,000		X
	I/I Removal, Improve Conveyance and WWTP Storage	$479,000	$150,000		X
Tecumseh	Energy Efficient Blowers	$450,000	$200,000		X
Grand Rapids	North Aeration Tank Blowers	$2,060,419	$1,030,210	X	

F. BIDDING

Task F Objectives

- ✓ *Comply with SRF bidding requirements*
- ✓ *Obtain competitive contractor bids*

The RFP outlines such steps as:

- Prebid meeting
- Prepare addenda and clarify questions
- Review the bids, conduct reference checks, and other bidder evaluation
- Conduct a pre-award meeting

These steps follow the approach typically used by Tetra Tech. Given the tight construction market southeastern Michigan is experiencing, we also believe that recruiting contractors may be beneficial for MCPWO so that adequate competition is achieved.

Tetra Tech, FTCH and FKE have developed relationships with all of the large contractors in the area who are qualified to complete this work. These relationships will be invaluable to invite and encourage competent contractors (even before bids are formally advertised) to bid the project.

Tetra Tech endorses the use of contractor prequalification whenever allowed. By only opening bids from prequalified contractors, contractors without the credentials to successfully complete this important project will not bid.

Tetra Tech has found that owner satisfaction with the finished project is much higher when a qualified contractor is used. However, projects funded by SRF may not use contractor prequalification.

Construction of the Perry Street Pump Station, Oakland County, MI

G. CONSTRUCTION ADMINISTRATION

Task G Objectives

- ✓ *Administer the construction contract*
- ✓ *Ensure contractor completes work in accordance with contract documents*
- ✓ *Educate and engage public during construction*
- ✓ *Commission RTC system and train operators*
- ✓ *Update MCPWO's asset database*

The RFP outlines such steps as:

- Pre-construction meeting
- Submittal review
- RFI review
- Pay application review
- Construction progress meetings
- Staking
- Construction observation
- Record drawings
- Close-out

The County proposed approach is in line with Tetra Tech's standard approach. However, on this project with significant underground work proposed in neighborhoods, we feel that having strong construction management is critical.

We have a proven track record of working with clients to determine a role for construction professionals that fit the client's needs. Some examples include:

- Providing experienced engineering and construction professionals to represent clients as expert witnesses on their behalf.
- Emailing daily reports to clients.
- Using laptops to reference record drawings useful to the project.
- Conducting post construction review meetings with client staff to identify and document issues discovered during construction that lead directly to improved design documents/construction procedures.
- Meeting with commercial businesses and private homeowners in affected areas to educate, inform, and discuss project issues such as access, safety, etc.
- Preparing newsletters, press releases, and letters for the public and businesses that may be affected by the construction activities

Daily construction observation is performed by a resident project representative. Some responsibilities include:

- Observe/Monitor contractor's installation methods and operations to ensure

conformance with contract requirements/approved submittals.

- Liaison between the contractor and the public.
- Review shop drawings to verify materials on site are correct per specifications.
- Coordinate material testing and survey staking.
- Perform quality checks on staking/cut sheets
- Observe and maintain settlement instrumentation at adjacent properties
- Monitor material testing and assure that they are completed in accordance to standards.
- Review contractor's proposed costs for changes in work.

RTC Training

There is a need to help users understand and accept RTC and to properly train staff so they are comfortable working with the RTC system. To ensure the longevity of a functional RTC system, there should be a long-term commitment to training needs and functional tools to sustain the continuous transfer of knowledge as staff changes.

Our experience shows that a large part of the operator training can be completed during the commissioning period where the design team personnel will need to be involved to operate and test the system alongside the sewer network operators. In addition to conducting live, real-time training for operations staff, we are prepared to offer the training in a format of web-based E-training to facilitate the ease and completion of sustainable training and to prepare a program tailored to train four different types of personnel, including management, system administrators, maintenance staff, and operations staff. The training materials and documentation will be developed in close collaboration with MCPWO staff.

Keys to RTC Project Success During and After Construction

- Involve the design team during construction to ensure a smooth transition during start-up
- Consider IT requirements, SCADA upgrades, communication, and data management needs for post- construction monitoring services to provide operational performance results and assist future planning and adaptive management
- Use a PLC and HMI programmer trusted by MCPWO to assist in future system optimization
- Train staff and operators in the RTC system prior to commissioning
- Continue to support MCPWO after commissioning as the operators become comfortable with the system

Material Testing

Our team brings the ability to provide independent material testing to the project. Such materials as concrete, backfill, and paving materials should be tested. Furthermore, proper soil compaction will be needed and our team can perform QA/QC services on compaction.

Public Engagement During Construction

Our team member, TWN Consulting, will play a key role to engage the neighborhoods before and during construction. Only through this coordination do we feel the residents adjacent to this project will become project advocates and not opponents. TWN's approach to perform this work was well described in earlier parts of this proposal.

Interactive Multi-Media O&M Manuals

Tetra Tech has excelled at preparing O&M manuals that go beyond a three-ring binder. This project will involve complex structures and complex procedures to maintain them. The use of video modules to document the O&M and pass these practices on to the next generation of O&M workers is ideal.

Tetra Tech has worked with equipment vendors and sewer service specialists to complete interactive O&Ms on past projects. We have also prepared bids to pass the requirements for multi-media O&Ms onto the contractor to include in their bids. We can discuss the pros and cons of each approach with MCPWO if this service is desired.

Updating Asset Database

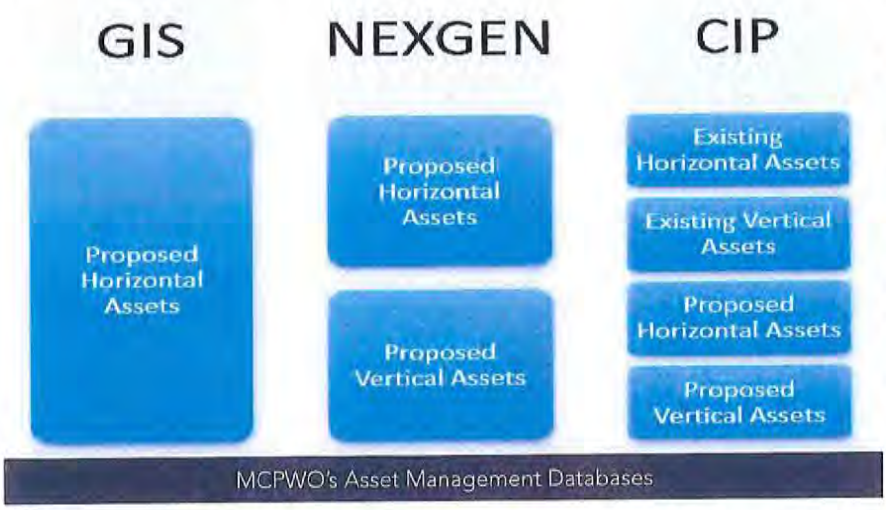
FTCH helped MCPWO construct the backbone of the NEXGEN database by first developing the overall organizational structure of the database and then the descriptions and attribute guidelines for approximately 230 different asset classes and subclasses.

FTCH performed a detailed inventory of the 8½ Mile Relief Drain Drainage District and generated over 860 assets including manholes, pipe segments, and chambers (horizontal assets), and facility equipment (vertical assets). Attribute information was collected for each asset (diameter, material, installation date, replacement cost, etc.) and incorporated into the NEXGEN.

FTCH performed a condition assessment of most of the assets, developed a preventative maintenance program by asset, and created a workorder schedule in NEXGEN that notifies the staff weekly of tasks. FTCH helped to develop the short- and long-term Capital Improvement Plan for the District.

For this project, once under construction, we propose to update not only NEXGEN, but the GIS database and the MCPWO's CIP Plan with the new assets.

We will begin by working with your GIS Technician to incorporate the as-built survey assets into GIS and add the needed attribute information.



MCPWO's Asset Management Databases

We will develop a hierarchy list of the assets in accordance with NEXGEN asset hierarchy and asset class list, including using the appropriate naming convention for each asset. If an asset class does not currently exist in NEXGEN for a certain piece of equipment (such as control structures), we will work with your office to develop the asset class and associated attribute guidelines. For each asset, we will then input the information into NEXGEN including the attribute information and installation dates and costs.

Using the equipment shop drawing and manufacturer's guidelines, we will work with your office to develop a preventative maintenance program that fits into your staff's schedule.

Finally, we will work with your office to add the assets into the MCPWO's 20-year CIP.

The new in-system storage may have two impacts on the CIP. First, the new assets will require some major maintenance/rehabilitation/upgrade over the next 20 years that must be included in the long-term CIP. These will be based on manufacturer's recommendations as well as our knowledge of the existing system and its operation.

PLC and SCADA Screen Programming

Tetra Tech is one of the few consultants who can internally complete PLC programming. Many of our competitors leave this up to a low bid contractor.

Our clients universally prefer this approach. By retaining Tetra Tech, clients tell us the collaboration that goes into this important project component allows them to customize and simplify the operation of their facilities.

Most importantly, our clients know that any revisions to the program are just a phone call to Tetra Tech away. With contractor-led programming, clients are often left unable to even locate the programmer six months after project completion.

Typical SCADA Control Room

Post-Construction Performance Monitoring, Evaluation, and Support

Tetra Tech feels our value shines even after the project is constructed. By remaining as a partner to assist in implementing the RTC system, performance and operator acceptance improves. The following post-construction services can be considered for RTC projects:

- Systematically review system performance
- Provide yearly compliance reports
- Provide a comprehensive report for improvements
- Meet with staff on quarterly basis

These are all in the effort to ensure the system functions properly and optimally to provide continuing value for the MCPWO's investments towards protecting Lake St. Clair.

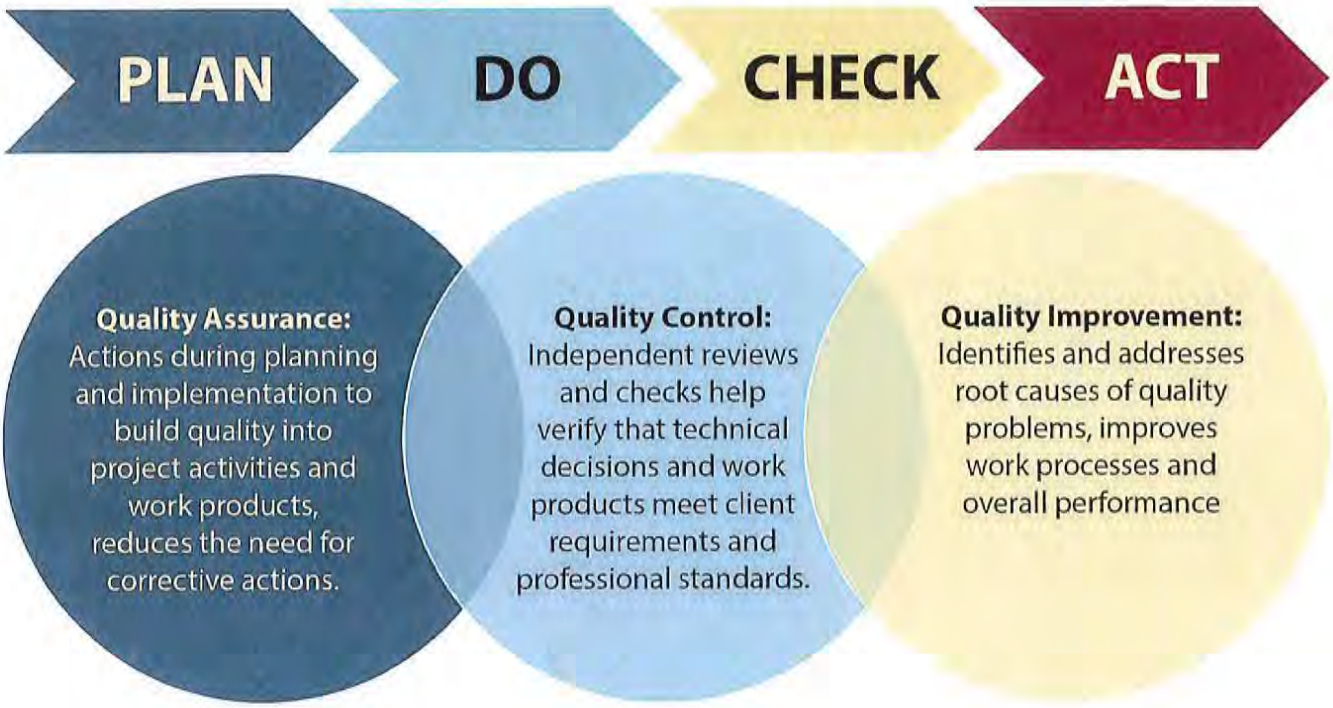
CELEBRATING our SUCCESS

This project will be a **world-class** project, significantly **improving the quality of life** for Macomb County residents. Throughout the project, we will identify methods to call attention to our results such as the following:

- Social media postings
- Articles for periodic newsletters and reports
- Ribbon-cutting ceremonies
- Animated graphics for use on web pages and public presentations
- Award applications (MACDC, APWA, MWEA, WEF, ACEC and more)
- Technical papers
- Envision Sustainability Certification

Award-Winning Project Design

Tetra Tech and Louisville MSD are pleased to announce that in April 2019 we were awarded the Franz Edelman **Award for Achievement** in Advanced Analytics, Operations Research, and Management Science from the International Association for Operations Research and Analytics Professionals. This award was presented for the RTC project that Tetra Tech led to control overflows on the Louisville, Kentucky Combined Sewer System.



QUALITY CONTROL PROCESS

All deliverables created by Tetra Tech initiated through this contract including work plans, designs, etc., will go through a rigorous Quality Assurance Program. Rest assured that Tetra Tech deliverables and work produces and adheres to the corporate Quality Practices Manual (QPM), which describes Tetra Tech's quality program policy and requirements for all our consulting, engineering, and construction services. The purpose of the QPM is to define basic quality assurance and control requirements that will guide, as applicable, all Tetra Tech programs and projects during planning, implementation, work product preparation, and field activities supported by Tetra Tech.

The QPM describes:

1. Tetra Tech quality program organization, including the roles and responsibilities of Tetra Tech and all affiliate business units in implementing this QPM;
2. Basic quality management system requirements to be addressed by all affiliate business units and described in business unit or program-specific quality management plans; and
3. Basic quality assurance and control requirements applicable to environmental data collection, work product preparation, engineering design and construction support, and construction services; to be addressed within all programs and projects supported by Tetra Tech.

The Tetra Tech QPM will also be used as the basis for developing more detailed program or project specific quality assurance and control plans and to describe Tetra Tech's fundamental requirements for ensuring quality service and product performance for Chapaton RTB Canal Upgrade project.

Consensus standard American National Standards Institute/ American Society for Quality (ANSI/ ASQ) E4-2004, "Quality Systems for Environmental Data and Technology Programs," provides the basis for the quality standards related to environmental programs addressed in the QPM. The ANSI/ASQ E4 standard combines various federal agency Quality Assurance/ Quality Control (QA/QC) requirements to make a uniform and consistent set of QA/QC requirements to manage the quality of environmental programs. The Tetra Tech quality program also embraces the quality management principles outlined in International Standard ISO 9000. The effective implementation of the QA/QC requirements of the QPM, coupled with business-unit specific plans and project-specific Quality Assurance Project Plans (QAPPs), will ensure the quality of our environmental and engineering programs. Tetra Tech's Quality Program emphasizes continual improvement by planning, doing, checking and acting throughout all phases of the project.

Quality Assurance / Quality Control

The Tetra Tech's QA/QC program is applied on all projects to ensure a solution that meets or exceeds our clients' needs. Our goal is to provide deliverables that are

technically sound, high quality, cost-effective, and tailored to specific project objectives. The QA/QC program consists of two distinct, but interdependent components, as described as follows.

Quality Assurance (QA) is a process used to ensure we understand the project from the client's perspective and that their goals and objectives have been met. QA representatives consist of individuals not directly involved in the project who provide an independent perspective. Each team has a checklist or questionnaire to document the results, which are then shared with the Project Manager and entire Project Team for possible implementation. This provides a means to continually identify opportunities for improvement. Components of the QA process are:

- Client Satisfaction Process (CSP) Interview: The CSP representative meets with the client at the beginning of the project to establish measurables and periodic milestones to evaluate our performance against these measurables. The representative also performs follow-up CSP interviews with the client at the mid-point and project completion to confirm that we met or exceeded their expectations for the project.
- Report Enhancement Process (REP): The REP representative reviews the report outline and draft report. This review compares the client's objectives with our approach to ensure clarity and thoroughness. The focus is clarity, completeness, and appropriateness.
- Key Concept Review (KCR): The KCR representative reviews design drawings and specifications to confirm the lead discipline concepts. They look for alternatives that may not have been considered or for potential innovative solutions to enhance the project.
- Constructability Review (CR): The CR differs from the KCR in that the reviewer will look specifically for cost-avoidance opportunities to ensure that the design (e.g., details on the drawings) promotes the most cost-effective construction operations.
- Quality Control (QC) consists of detailed checking procedures and is performed by experienced professionals who are familiar with the client's standards and practices. Components of the QC process are:
- Calculations: We review all calculations to ensure proper application of design criteria and technical standards and to verify the mathematical correctness of the results.
- Checklists: We use checklists during the reviews to ensure proper application of city, state, and federal design criteria and standards.
- Report Consistency: All report documents developed are reviewed for consistency of format, appearance, and standards.
- Construction Documents: We check construction plans and specifications for correctness, completeness, consistency, constructability, and conformance with the standards of our clients.

Tetra Tech's project manager will lead and coordinate this multi-disciplined team through each phase of every project by utilizing superior, world-class project management. In general, each project will have the following Project Management phases:

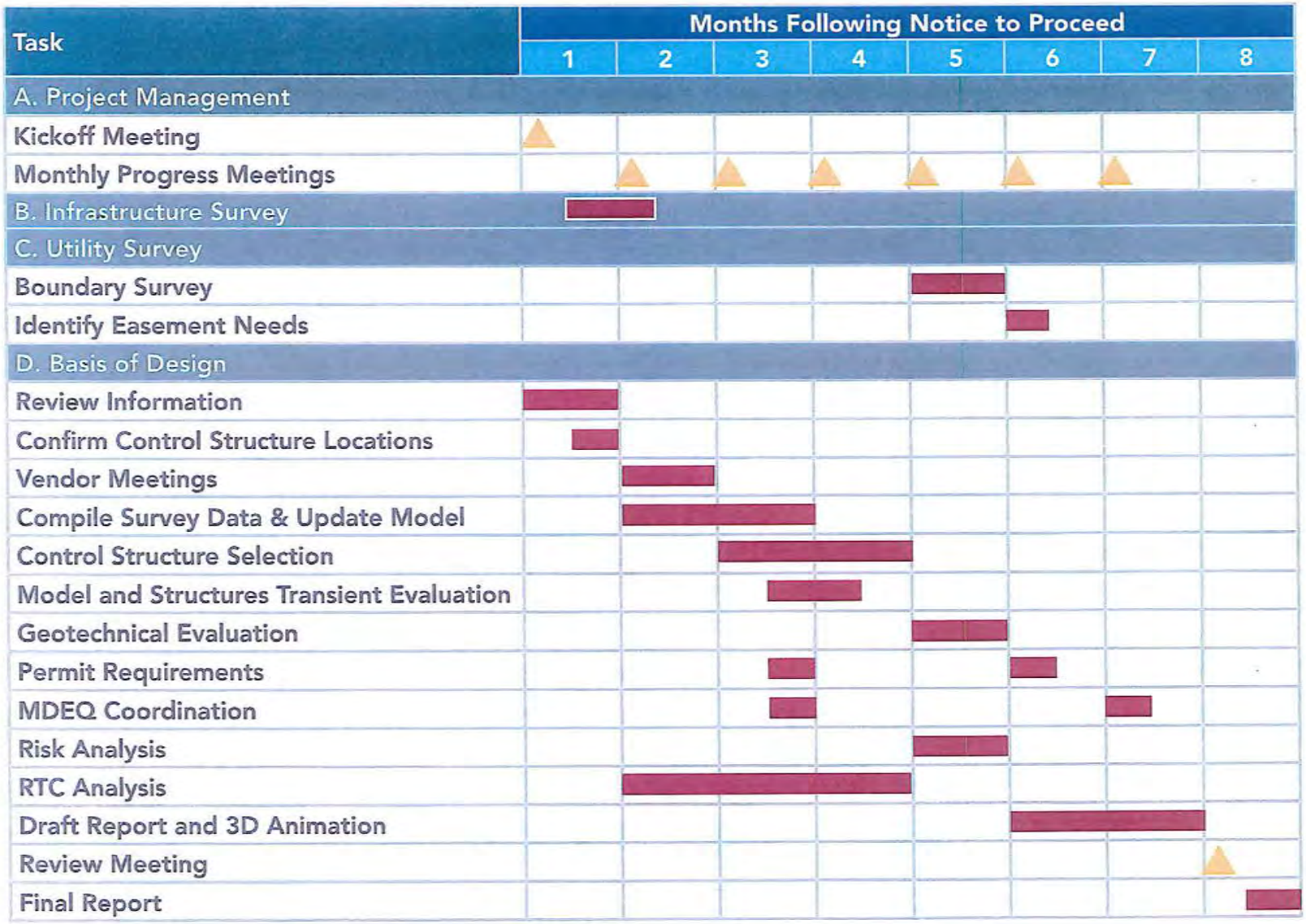
- Study Phase
- Design Phase
- Bidding Phase and
- Contract Administration Phase

PROJECT SCHEDULE

Our proposed schedule on the following page is enclosed which will allow a draft report to be completed early in 2020 and design to begin immediately thereafter.

As demonstrated, the schedule has numerous overlapping tasks needed to converge on the recommended solution. The team members are committed to effectively working together and with MCPWO to keep the project moving on a fast-track.

With the team's past experience on RTC and relationships with stakeholders (permitting authorities, vendors, etc.), we feel no other consulting team can complete this project as quickly and thoroughly as our team.


Task
Months Following Notice to Proceed
1
2
3
4
5
6
7
8
A. Project Management
Kickoff Meeting
Monthly Progress Meetings
B. Infrastructure Survey
C. Utility Survey
Boundary Survey
Identify Easement Needs
D. Basis of Design
Review Information
Confirm Control Structure Locations
Vendor Meetings
Compile Survey Data & Update Model
Control Structure Selection
Model and Structures Transient Evaluation
Geotechnical Evaluation
Permit Requirements
MDEQ Coordination
Risk Analysis
RTC Analysis
Draft Report and 3D Animation
Review Meeting
Final Report

Candice S. Miller
Public Works Commissioner
Macomb County

To: Candice Miller, Macomb County Public Works Commissioner

CC: Brian Baker, Chief Deputy

From: Vincent Astorino, Operations & Flow Manager

Date: May 31, 2019

Subject: SRF Project Plan Board Resolution Recommendation

The Macomb County Public Works Office (MCPWO) has been diligently working to identify all funding opportunities possible for the two upcoming Chapaton projects. These projects consist of Phase 1 – Canal Expansion and Phase 2 – In-System Storage. Outside of the potential grant opportunities we are looking to submit for a State Revolving Fund (SRF) loan which is a 2% and 20-year loan in the amount of $30,293,000.

By submitting for this loan, the 8 ½ Mile Relief Drain Drainage District is not required to take the loan or even the full amount of that loan. This project plan submission, if accepted, will put the drain district in the queue for funding at what is currently the lowest possible interest rate available on the market for these projects.

This project plan was put together by Fishbeck, Thompson, Carr, & Huber which was approved by the board. The DRAFT project plan was put out for public review starting on April 23, 2019 and was listed in the Macomb Daily. Copies of the plan were placed at the front desk in MCPWO and at the Chapaton Pump Station. On May 29, 2019, a public hearing was held which went through a presentation of the project. No members of the public were in attendance. If approved today, the final project plan will be submitted by July 1, 2019. The results for funding and the SRF priority list should be published by the end of 2019.

The recommendation for the board is that 8 ½ Mile Relief Drain Drainage District formally adopts said Project Plan and agrees to implement the selected alternative (Alternative 1). Be it further resolved, that the Chief Deputy Macomb County Public Works Commissioner, a position held by Brian Baker, is designated as the authorized representative for all activities associated with the project referenced above, including submittal of said Project Plan as the first step in applying to the State of Michigan for a revolving fund loan to assist in the implementation of the selected alternative.

Attachments: Board Resolution for Adoption of the Final Project Plan.

A RESOLUTION ADOPTING A FINAL PROJECT PLAN FOR WASTEWATER SYSTEM IMPROVEMENTS or NPS POLLUTION CONTROL/STORMWATER IMPROVEMENTS AND DESIGNATING AN AUTHORIZED PROJECT REPRESENTATIVE

WHEREAS, the Eight and One-Half Mile Relief Drain Drainage District recognizes the need to make improvements to its existing wastewater treatment and collection system or its existing NPS pollution control/stormwater treatment system; and

WHEREAS, the Eight and One-Half Mile Relief Drain Drainage District authorized Fishbeck, Thompson, Carr & Huber, Inc. to prepare a Project Plan, which recommends the construction of Chapaton RTB East Canal Control Structure and 8 ½ Mile Relief Drain and 9 Mile Drain In-System Control Structures; and

WHEREAS, said Project Plan was presented at a Public Hearing held on May 29, 2019, and all public comments have been considered and addressed;

NOW THEREFORE BE IT RESOLVED, that the Eight and One-Half Mile Relief Drain Drainage District formally adopts said Project Plan and agrees to implement the selected alternative (Alternative No. 1).

BE IT FURTHER RESOLVED, that the Chief Deputy Macomb County Public Works Commissioner, a position currently held by Brian Baker, is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a revolving fund loan to assist in the implementation of the selected alternative.

Yeas:

Nays:

Abstain:

Absent:

I certify that the above Resolution was adopted by Intra-County Drain Board for the Eight and One-Half Mile Relief Drain on June 10, 2019.

BY: Candice S. Miller, Chair, Macomb County Public Works Commissioner

Signature Date

Candice S. Miller
Macomb County Public Works Commissioner

8 ½ Mile Relief Drain
State Revolving Fund
Public Hearing

May 29, 2019

1

Agenda

Candice S. Miller
Macomb County Public Works Commissioner

1. Informational Presentation
   5:00 P.M. to 5:20 P.M.

2. Public Hearing
   5:20 P.M. to completion of public comment record

2

Information Presentation

Candice S. Miller
Macomb County Public Works Commissioner

- SRF Process
- System Operations
- Proposed Projects
- Project Impacts
- Project Costs & Financing
- Schedule
- Questions

3

SRF Process

Candice S. Miller
Macomb County Public Works Commissioner

State Revolving Fund (SRF) Program

Low interest loan that the State provides to communities within the State of Michigan for improving wastewater systems, including wastewater treatment plants and sewer collection systems.

4

SRF Process

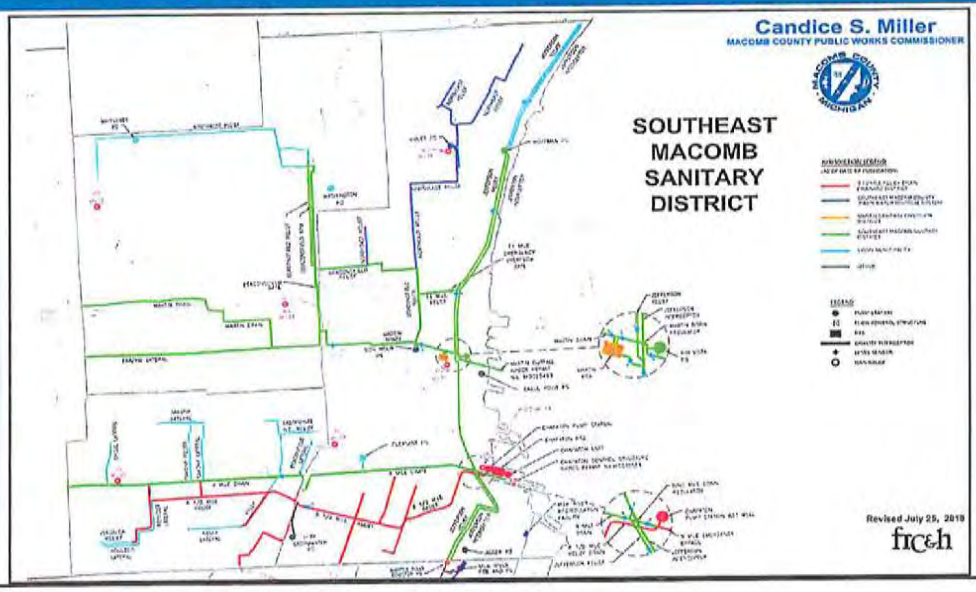
Candice S. Miller
Macomb County Public Works Commissioner

- Prepare a Draft SRF Project Plan - *Completed*
- Advertise for Public Hearing – *Completed*
- Public Hearing - Tonight; May 29, 2019
- Drain Board Resolution - June 10, 2019
- Submit Final Project Plan - June 28, 2019

5

System Operations

Candice S. Miller
Macomb County Public Works Commissioner



6

What is a CSO?

Candice S. Miller
Macomb County Public Works Commissioner

Combined Sewer Overflow (CSO)

Combined sewer systems are sewers that are designed to collect rainwater and sewage in the same pipe.

Most of the time, combined sewer systems transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a water body.

During periods of heavy rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant resulting in an overflow of excess combined sewage directly to nearby streams, rivers, or other water bodies.

7

What is a CSO?

Candice S. Miller
Macomb County Public Works Commissioner

Combined Sewer Overflow (CSO)

DURING DRY WEATHER
Normal sewage flow is contained within the system and flows to the Wastewater Treatment Plant.

DURING STORMY WEATHER
The combination of stormwater and sewage can exceed normal capacity and overflows into area waterways.

8

Need for Project

Candice S. Miller
Macomb County Public Works Commissioner

- Reduce the number and frequency of CSOs
- Improve Water Quality in Lake Saint Clair
- Continue to Meet MDEQ NPDES Requirements

9

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

Project 1:

Chapaton Retention Treatment Basin
East Canal Control Structure

10

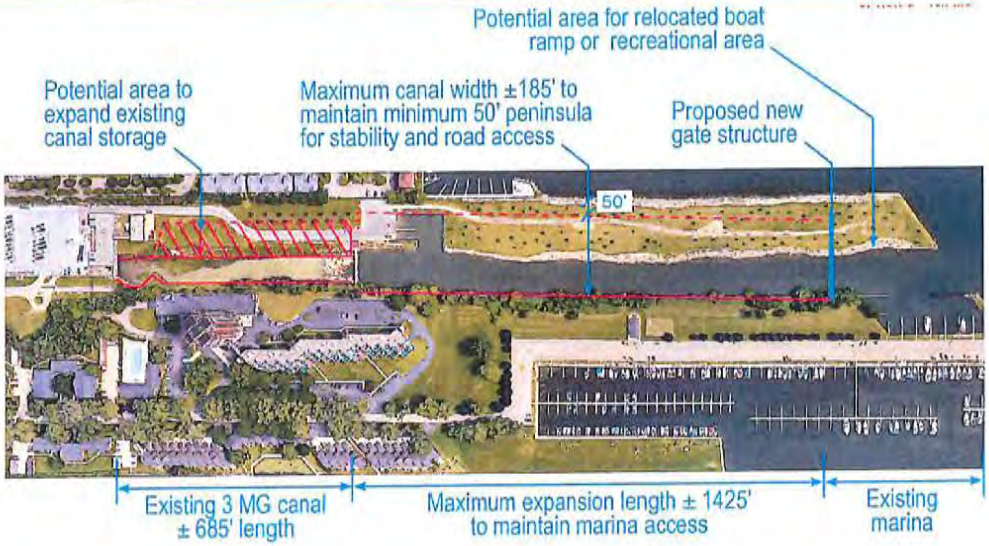
Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

11

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner



12

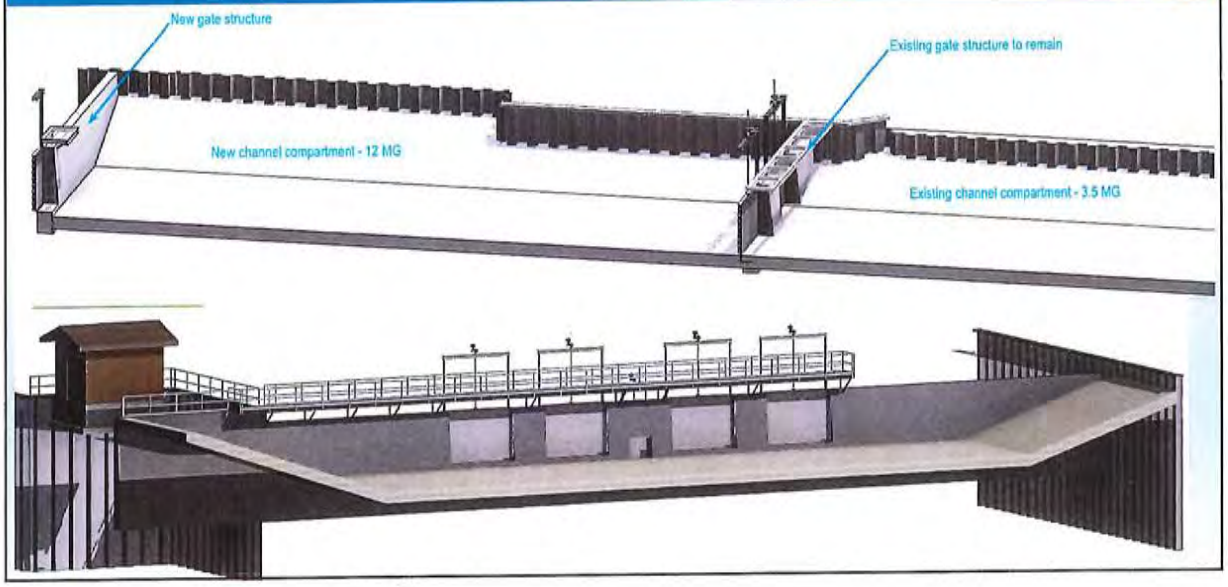
Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

13

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner



14

Proposed Projects

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Macomb County Public Works Commissioner

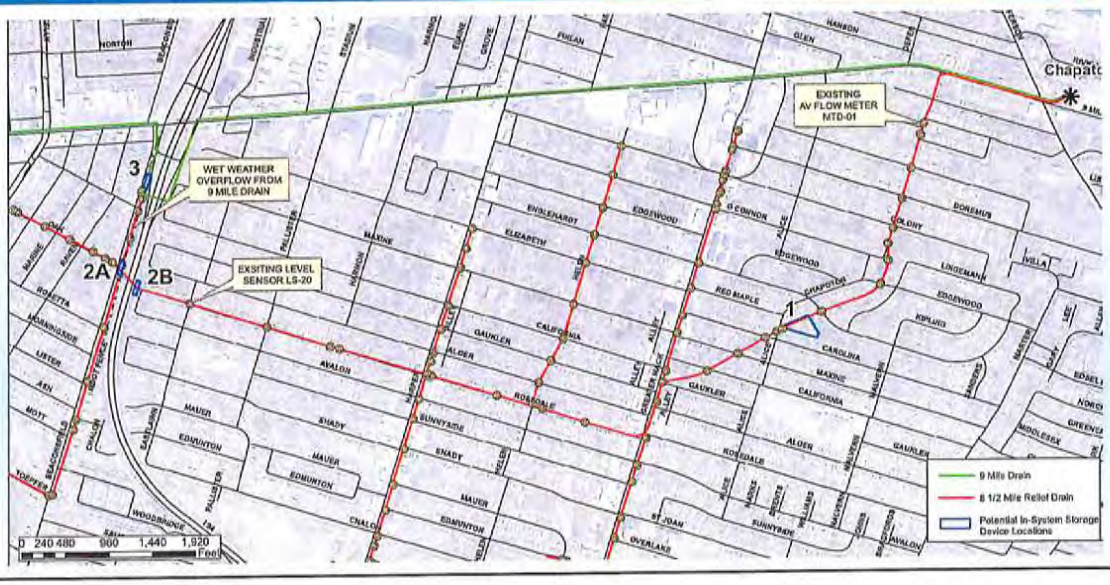
Project 2:

8 ½ Mile Relief Drain and 9 Mile Drain
In-System Storage Control Structures

15

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

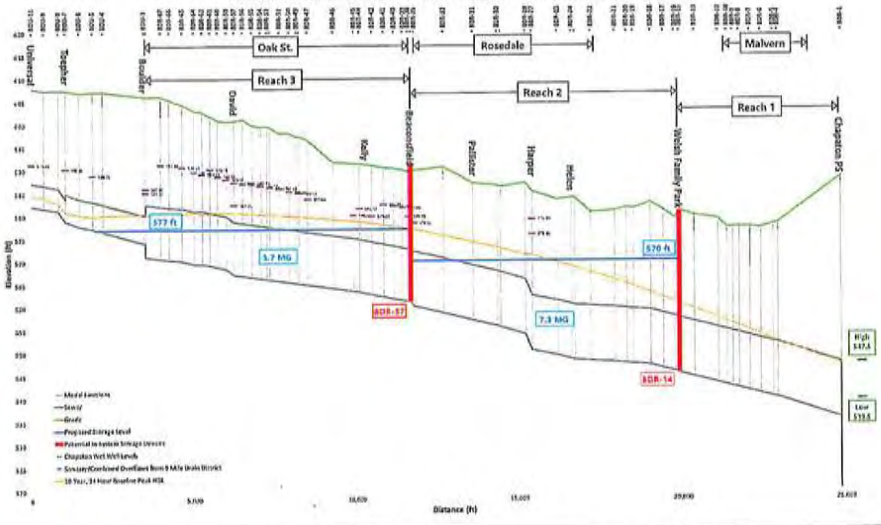


16

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

Potential In-System Storage Devices along the 8½ Mile Relief Drain



17

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

In order to be eligible for an SRF Loan, an analysis of available alternatives for each construction project must be performed and the selected alternative must be the one that is most "cost-effective" (i.e., least expensive).

SRF rules require that the analysis be performed using a net present worth comparison of costs.

18

Proposed Projects

Candice S. Miller
Macomb County Public Works Commissioner

Principal Alternatives Monetary Evaluation

Category	Alternative 1: System Storage		Alternative 2: 28 MG RTB Expansion	Alternative 3: Sewer Separation
	Project 1: Chapaton RTB East Canal Control Structure	Project 2: 8DR and 9MD In-System Storage Control Structures		
Capital Cost	$19,100,000	$11,193,000	$98,800,000	$338,000,000
O&M Cost	$96,000	$56,000	$1,450,000	$1,690,000
Salvage Value	$4,488,000	$384,000	$14,690,000	$143,300,000
Present Worth of O&M Cost	$1,870,000	$1,096,000	$29,100,000	$33,100,000
Present Worth of Salvage Value	$4,312,000	$369,000	$14,200,000	$137,700,000
20-Year Total Present Worth	$16,700,000	$11,920,000	$113,800,000	$232,600,000
	$28,620,000 Total			

19

Project Impacts

Candice S. Miller
Macomb County Public Works Commissioner

- Temporary Construction Impacts
- Long Term - Improve Water Quality in Lake Saint Clair
- Side Benefit
  - Possible Upgrades to Welsh Family Park
  - New Wetland/Green Infrastructure Habitat Area at Chapaton Canal

20

Project Costs and Financing

Candice S. Miller
Macomb County Public Works Commissioner

- Estimated Total Cost

Project 1:	$19,100,000
Project 2:	$11,193,000
Total:	$30,293,000

- Annual Apportionment

Entity	Apportionment	Annual Cost
City of Eastpointe	54.33%	$16,459,602
City of St. Clair Shores	25.13%	$7,612,243
Macomb County	4.50%	$1,363,109
State of Michigan	16.04%	$4,858,046
	Total Capital Cost	$30,293,000

21

Schedule

Candice S. Miller
Macomb County Public Works Commissioner

Project 1: Chapaton Retention Treatment Basin - East Canal Control Structure

Design:	Proceeding
Construction:	March 2020

Project 2: 8 ½ Mile Relief Drain and 9 Mile Drain - In-System Storage Control Structures

Design:	Proceeding
Construction:	January 2021

22

Funding Source	Apportionment	Manager	Vendor	Amount	Invoice Detail	Project Summary	Project Balance
8 1/2 Mile Relief	Chapter 20 State of MI – 16.04% County of Macomb – 2.25% Dept. of Roads – 2.25% Eastpointe – 54.33% St. Clair Shores – 25.13%						
		Astorino	DTE Energy	$ 13,195.77	Invoice #19-230 - 05.09.19	Monthly Electric - 04.09.19 - 05.08.19	
		Astorino	De-Cal, Inc.	$ 625.70	Invoice #WO91908491 - 05.21.19	Boiler Inspection - Chapaton West	
		Astorino	Fishbeck, Thompson, Carr & Huber, Inc.	$ 13,922.80	Invoice #383245 - 05.28.19	Facility Study	$ 137,996.20
		Astorino	Hank's Auto Service	$ 539.84	Invoice #58654 - 05.01.19	Wheel Bearing/Hub Assembly for vehicle Chap 09-402 2009 GMC Sierra K1500	
		Astorino	JCI Jones Chemicals Inc.	$ 4,189.20	Invoice #788309 - 05.07.19	Hypochlorite Solution - 4,630 gallons for Chapaton	
		Astorino	JCI Jones Chemicals Inc.	$ 4,185.60	Invoice #788207 - 05.06.19	Hypochlorite Solution - 4,626 gallons	
		Astorino	Lardner Elevator	$ 5,260.36	Invoice #186234 - 05.23.19	Elevator Repairs - Chapaton West	
		Astorino	Macomb County Treasurer	$ 189,890.17	Invoice #AR190400 - 05.01.19	Reimbursement to Macomb County for 8 1/2 Mile Relief Personnel	
		Astorino	OHM Advisors	$ 1,777.50	Invoice #203816 - 05.10.19	Chapaton TRC Monitoring through 04.27.19	$ 3,992.50
		Astorino	Wade Trim	$ 123,741.89	Invoice #M2014760 - 05.31.19	Chapaton RTB Canal Upgrades 04.20.19 - 05.24.19	$ 780,632.49
			Total	$ 357,328.83			

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/16/19

4. SET ID	5. POST DATE
VP19517MUA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
DTE Energy	V01270	08	19-230	5/9/2019	$ 13,195.77

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	92101	CC0004	92101		8 1/2 Mile Relief	Acct #9100-0005-3785, 4/9-5/8	$ 13,195.77	GEN		
B											
C											
D											
E	99										
F											
G											

REV 09/2018

23. Total: $ 13,195.77

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

25. Finance Officer:	BM	30. Drain:	8 1/2 Mile Relief
26. Chief Deputy:	BB	31. Project Balance:	N/A
27. Engineers:		32. Staff Date:	5/21/2019
28. Managers:	WA	33. Board Date:	6/10/2019
29. Coordinator:	KL	34. Select For Pay Date:	

910000053785 00001319577 B

DTE

Payment Coupon

19.230

Account Number	910000053785
Due Date:	June 04, 2019
Total Due:	$13,195.77

MACOMB COUNTY
MACOMB COUNTY DRAIN COMM
21777 DUNHAM RD
CLINTON TWP MI 48036-1005

Mail Payments to:
DTE Energy
P.O. Box 630795
Cincinnati OH 45263-0795

Please detach and return coupon with account number on check. Agencies are not authorized to accept payment of this bill.

Account Information

MACOMB COUNTY
MACOMB COUNTY DRAIN COMM
21777 DUNHAM RD
CLINTON TWP, MI 48036

Account Number	**9100-0005-3785**
DTE-Energy Federal ID No.	38-3217752

Programs you are enrolled in:

How to contact us:

Power Outage	See Detail Charges
Billing Inquiry	1-734-397-4309

Please make any inquiry or complaint about this bill to DTE Energy before the Due Date.
DTE Energy is regulated by the Michigan Public Service Commission, Lansing, Michigan

Important Information

For the average Michigan residential customer, renewable energy is estimated to avoid $3.08 per month of new coal-fired generation costs.

Detail Charges

For Service at: 23001 E 9 Mile Rd, St Clair Shores, MI 48082 **Outage Contact Number:** 1-313-235-1300
Invoice: 200001528705 **Billing Period:** 04/09/2019 through 05/08/2019 **Days Billed:** 30

Metering Information

Meter Number	Start Date	Start Read	Stop Date	Stop Read	Read Difference	Units Multiplier	Usage Used	Type
6321448	04/09	336.1A	05/08	344.4A	8.3	6,400.0000	53,120.0	P - In-V
6321448	04/09	421.0A	05/08	436.4A	15.4	6,400.0000	98,560.0	P - In-W
6321449	04/09	1.0A	05/08	1.1A	0.1	- 6400.000	640.0	P - Out-V
6321449	04/09	0.0A	05/08	0.0A	0.0	- 6400.000	0.0	P - Out-W
6321451	04/09	0.5A	05/08	0.5A	0.0	6,400.0000	0.0	P - In-V
6321451	04/09	0.5A	05/08	0.5A	0.0	6,400.0000	0.0	P - In-W
				Total KVARH			**53,760.00**	
				Total KWH			**98,560.00**	

Invoice: 200001528705 **Service Name:** Chapaton Pumping Station
Item: 7004376662 **Cycle:** 05 **General Service Municipal Pumping-Net Metering Cat1**

Billing Status Information

1	On-peak Billing Demand	845	KW	ESTABLISHED	05/01/2019	11:30
3	65% High OP Bill Dmd June-Oct prec 11 mths	2246	KW	ESTABLISHED	10/01/2018	12:00
8	Highest Single Billing Demand	4956	KW	ESTABLISHED	05/01/2019	04:30
A	Current PV High Monthly Demand	4956	KW	ESTABLISHED	05/01/2019	04:30
B	50% of the Contract Capacity for PV	0	KW			
C	Primary Voltage Maximum Demand	4956	KW	ESTABLISHED	05/01/2019	04:30
	Contract Capacity for Location	6738	KW	ESTABLISHED	08/16/2016	05:00
	Power Factor (ratio) for all voltages	88	PCT			
	Total Number of days in the Billing Period	30	DAYS			
	Avg Kilowatthours Used Per Day This Period	3285	KWH			
	Avg Kilowatthours Used Per Day A Year Ago	2606	KWH			
	kWh percentage change from a year ago	26	PCT			
	Metered outflow	0	KWH			
	Net Delivery Billed (inflow)	98560	KWH			
	Net Inflow (In - Out)	98560	KWH			

Charges for 04/09/2019 through 05/08/2019

Power Supply Charges:						
Power Supply Energy:						
Power Supply Energy Charge	98,560	KWH			Per Total KWH	0.00
Power Supply Capacity Charge	98,560	KWH	@ $	0.0299700	Per Total KWH	2,953.84
Power Supply Non Capacity Charge	98,560	KWH	@ $	0.0478000	Per Total KWH	4,711.17
Surcharges:						
Power Supply Cost Recovery Factor	98,560	KWH	@ $	0.0018100	Per Total KWH	178.39
Sub Total:						7,843.40
Delivery Charges:						
Service Charge						11.25
Distribution:						
Distribution Energy	98,560	KWH	@ $	0.0361400	Per Total KWH	3,561.96
Surcharges:						
Tax Credit B	98,560	KWH	@ $	-0.0055360	Per Total KWH	- 545.63
U-18255 SIR	98,560	KWH	@ $	-0.0033430	Per Total KWH	- 329.49
Nuclear Surcharge	98,560	KWH	@ $	0.0007650	Per Total KWH	75.40
Energy Waste Reduction	2	MTR	@ $	38.5100000		77.02
LIEAF Factor	2	MTR	@ $	0.9300000		1.86
Sub Total:						2,852.37
Special Facilities Charge						2,500.00
Invoice Subtotal						**13,195.77**
Michigan State Sales Tax On Taxable Portion						0.00
Invoice Total						**$13,195.77**

Summary Of Charges

Account Number 9100-0005-3785

Previous Balance as of 04/11/2019	9,051.78
Payment(s) and Credit(s)	- 9,051.78
Remaining Balance	$0.00

Current Charges

Service Location	Item	Service Type	Rate	Bill Period	Amount
23001 E 9 Mile Rd	7004376662	General Service Municipal Pumping-Net Metering Cat1	EFCND3_WP	04/09 - 05/08/19	13,195.77

Taxes	0.00
Miscellaneous Charges	0.00
Current Bill	$13,195.77

Amount Due on or before Due Date of 06/04/2019 **$13,195.77**

Your current charges are due on June 4, 2019. A 2% late payment charge will be applied if paid after the due date.

DTE

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/28/19

4. SET ID	5. POST DATE
VP19529MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
De-Cal, Inc.	V59694	01	WO91908491	5/21/2019	$ 625.70

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	93001	CC0004	93001	WO18006	8 1/2 Mile Relief	Job #91908491 Boiler inspection	$ 625.70	GEN		
B											
C											
D											
E	70										
F											
G											

REV 09/2018

23. Total: $ 625.70

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

25. Finance Officer:	bfm	30. Drain:	8 1/2 Mile Relief
26. Chief Deputy:	BB	31. Project Balance:	N/A
27. Engineers:		32. Staff Date:	6/4/2019
28. Managers:	LVA	33. Board Date:	N/A
29. Coordinator:	KK	34. Select For Pay Date:	

DE-CAL, Inc.
24659 Schoenherr Rd.
Warren, MI 48089-4775
Service Phone: 586-619-0281
Service Fax: 586-486-5242

Service Invoice

Invoice #: WO91908491
Date: 05/21/2019

Billed To: Macomb County Chapaton
23001 E. 9 Mile Rd.
St. Clair Shores MI 48080

Attn: Accounts Payable

Location: Macomb Chapaton Pumping
23001 E. 9 Mile Rd.
St. Clair Shores MI 48080

Client PO#:	Employee: Rob Murphy	Due Terms: 30DY

Assembly#	Part#	Description	Quantity	Price	Ext Price	Sales Tax
		See Attached	1.0000	625.700000	625.70	N

Notes:
See work order for details

Chap W. Boiler

De-Cal Service Group is a division of De-Cal, Inc.

Please Make Checks Payable to: De-Cal, Inc.

Thank you for your prompt payment!

Amount Due: $ 625.70

De - Cal Service Group

Heating, Cooling, Plumbing, Electrical
24659 Schoenherr Rd.
Warren, MI 48089
Phone: 586-619-0281

Location: Macomb Chapaton Pumping	PO #	Invoice/Job # 9190849

Description of work performed:

Perform CSD-1 inspection on lochinvar boiler

LABOR HOURS

Labor Type	*Dates, Technicians*	*Total Hours*	*Total*
Technician		4.0	$ 450.00
Chiller			$
Boiler/Controls			$
OT/Holiday			$
Veh/Tool Allowance		1.0	$ 75.00

MATERIALS/SUBCONTRACTORS UTILIZED

Unit #	*Description & Make*	*Part #*	*Quantity*	*Price*
	Consumabeles Fee		1.0	$ 20.00
	Combustion Analyzer Fee		1.0	$ 75.00
				$
				$
				$
				$
				$
				$
				$
				$
				$
				$
				$
				$
				$
				$
				$
			Material Tax %	$ 5.70
			Sell For	
			TOTAL BILLING:	$ 625.70

Service Report

Service Report No : 9190849-1

Date: April 08, 2019

Client P.O. #.: N/A

HVAC Service

Ready to Invoice/Work Complete

Site:

Macomb Chapaton Pumping
23001 E. 9 Mile Rd., St. Clair Shores , MI , 48080

Client:

Macomb County Chapton
23001 E. 9 Mile Rd., St. Clair Shores , MI , 48080

Reason for Call:

Perform csd-1 inspection on Lochinvar boiler

Description of Service:

Completed the csd-1 inspection on the Lochinvar boiler. Drained both expansion tanks and flushed. Flushed the condensate drain. Checked combustion and made the necessary adjustments to bring the combustion readings within the factory specifications.

Technician Work

Name	Date	Reg. hrs	Prem. hrs
Rob Murphy	Apr 1, 2019	4	0

MACOMB COUNTY MICHIGAN
Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/31/19

4. SET ID	5. POST DATE
VP19531MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
FTCH	V44063	01	383245	5/28/2019	$ 13,922.80

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	80138	CC0004	80138	WO19005	8 1/2 Mile Relief	Pjt #190051 through 5/17/19	$ 13,922.80	GEN		
B											
C											
D											
E											
F											
G											

74

REV 09/2018

23. Total: $ 13,922.80

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

As Needed Services through 5/17/19

25. Finance Officer: bhm

26. Chief Deputy: BO

27. Engineers:

28. Managers: MA

29. Coordinator: KC

30. Drain: 8 1/2 Mile Relief

31. Project Balance: $137,996.20

32. Staff Date: 6/4/2019

33. Board Date: 6/10/2019

34. Select For Pay Date:

Fishbeck, Thompson, Carr & Huber, Inc.
engineers | scientists | architects | constructors
Federal I.D. No. 38-1841857 | Incorporated

Payment Options
Remit Wire/ACH payments to Acct: 100094457 ABA: 072413829
Remit checks to: 1515 Arboretum Drive, SE | Grand Rapids, Michigan 49546

Attention: Mr Vincent Astorino
Macomb County Public Works Commissioner
21777 Dunham Road
Clinton Township, MI 48036
United States

Invoice : 383245
Invoice Date : 5/28/2019
Project : 190051
Project Name : Macomb Co PW/8.5 As-needed Engineering
Bill Term : 1

For Professional Services Rendered Through 5/17/2019

WO19005

		Fee	Available	Billings To Date	Billings Previous	Billings Current
1 - Task 1 - Genral As Needed		42,500.00	42,500.00	0.00	0.00	0.00
1.A - 8.5 Relief Drain - Chapaton Structural Study		60,663.00	60,663.00	0.00	0.00	0.00
1.B - Task 1c - 9 Mile Pipe Repair		16,256.00	16,256.00	0.00	0.00	0.00
1.D - Task 1d - Office Improvements		25,000.00	25,000.00	13,922.80	0.00	13,922.80
Rate Labor	13,696.00					
Unit Rate Expense	226.80					
1.E - Task 1e - Maps		7,500.00	7,500.00	0.00	0.00	0.00
				Current Billings		13,922.80
				Amount Due This Bill		13,922.80

1.D - Task 1d - Office Improvements

Rate Labor

Class	Hours	Rate	Amount
Senior Architect	30.50	164.0000	5,002.00
Senior Engineer	31.00	164.0000	5,084.00
Senior Estimator	2.00	160.0000	320.00
Staff Architect	25.00	86.0000	2,150.00
Staff Estimator	15.00	76.0000	1,140.00
Total Rate Labor			***13,696.00***

Unit Rate Expenses

Account / Unit	Quantity	Rate	Amount
Mileage			
Mileage - Employee Vehicle	324.00	0.7000	226.80
Total Unit Rate Expenses			***226.80***

Total Bill Task: 1.D - Task 1d - Office Improvements **13,922.80**

Total Project: 190051 - Macomb Co PW/8.5 As-needed Engineering **13,922.80**

MACOMB COUNTY PUBLIC WORKS OFFICE
ENGINEERING INVOICE COVER SHEET

WORK ORDER NUMBER	WO19005
PROJECT NUMBER	WWS-2019-001
PROJECT NAME	As-Needed General Engineering Services
DRAINAGE DISTRICT	Eight and One-Half Mile Relief Drain Drainage District
CONSULTANT NAME	FTC&H
INVOICE DATE	5/24/2019
INVOICE START DATE	3/23/2019
INVOICE END DATE	5/17/2019

ORIGINAL CONTRACT AMOUNT	$	**151,919.00**
CHANGE ORDER TOTAL	$	-
Change Order No. 1		
Change Order No. 2		
Change Order No. 3		
Change Order No. 4		
TOTAL REVISED CONTRACT AMOUNT	$	**151,919.00**
(includes all approved change orders only)		
TOTAL AMOUNT PREVIOUSLY INVOICED	$	-
TOTAL AMOUNT DUE THIS INVOICE	$	**13,922.80**
TOTAL BUDGET REMAINING	$	**137,996.20**
(Includes Total Revised Contract Amount Less Total Invoiced Previously and Total Invoiced Current)		

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/13/19

4. SET ID	5. POST DATE
VP19513MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
Hank's Auto Service	V02040	01	58654	5/1/2019	$ 539.84

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	93003	CC0004	93003		8 1/2 Mile Relief	Wheel Bearing Assmbly - 064 x 359	$ 539.84	GEN	MIDDD	
B											
C											
D											
E	78										
F											
G											

REV 09/2018

23. Total: $ 539.84

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

Wheel Bearing & Hub Assembly - 064 x 359

25. Finance Officer: BHM

26. Chief Deputy: [signature]

27. Engineers:

28. Managers: UA

29. Coordinator: KK

30. Drain: 8 1/2 Mile Relief

31. Project Balance: N/A

32. Staff Date: 5/21/2019

33. Board Date: 6/10/2019

34. Select For Pay Date:

STATE REG. F147002

HANK'S AUTO SERVICE

AIR CONDITIONING - ELECTRICAL - FUEL INJECTION
LIGHT & HEAVY REPAIR

(586) 783-2274 (586) 783-2380

44020 Groesbeck Hwy. • Clinton Twp., MI 48036

INVOICE
58654
Org. Est. # 094387

Date: 05/01/2019

INVOICE

MaComb County Public Works - Maddison

2009 GMC - Sierra 1500 -
Lic # :

Odometer In : 114705

Fax 586-469-7693 – 586-783-0964 Maddi

VIN # : 9Z258607

Part Description / Number	Qty	Sale	Ext
Wheel Bearing & Hub Assembly - Front *27102201*	1.00	287.66	287.66
SWAY BAR LINK *K700432*	2.00	23.59	47.18
Shop Supplies			3.00

Labor Description	Hours	Ext
Inspect Front End. Symptom: Noise, Pull, or Vibration	0.50	nc
WHEEL HUB - Remove & Replace - 1500,4WD Front,One Side LEFT	1.50	120.00
STABILIZER BAR CONTROL LINK - Remove & Replace - At Control Arm,Link Kit,Both	1.00	80.00
Hazardous Materials		2.00

64x359
09402

Org. Estimate 539.84 Revisions 0.00 Current Estimate 539.84

Labor:	200.00
Parts:	337.84
HazMat:	2.00
SubTotal:	539.84
Tax:	0.00
Total:	539.84
Bal Due:	$539.84

ALL VEHICLES WILL BE ASSESSED A $10.00 PER DAY STORAGE CHARGE 48 HRS. AFTER COMPLETION OF WORK. NOT RESPONSIBLE FOR LOSS OR DAMAGE TO CARS, OR ARTICLES LEFT IN CARS, IN CASE OF FIRE, THEFT OR ANY OTHER CAUSE BEYOND OUR CONTROL.
WARRANTY: PARTS AND LABOR ARE GUARANTEED FOR 12 MONTHS OR 12,000 MILES, WHICHEVER, COMES FIRST, UNLESS OTHERWISE NOTED. CUSTOMER IS RESPONSIBLE FOR RETURNING VEHICLE TO OUR FACILITY WE ARE NOT RESPONSIBLE FOR ANY TOWING OR ROAD SERVICE CHARGES. COMMERCIAL VEHICLES EXEMPT.

All REPAIRS AND PARTS USED WERE FURNISHED IN COMPLIANCE WITH MICHIGAN AUTO REPAIR ACT (PA 300)
AS REQUIRED BY LAW, AN ESTIMATE FOR PARTS, LABOR AND TIME CAN BE WRITTEN ON THIS FORM YOU ARE ENTITLED TO A COPY OF THIS ORDER AT THE TIME YOU SIGN.
I, the registered owner, authorize you to preform the above repairs and furnish necessary materials. I understand any cost quoted herfofore is an estimate only Your employees may operate vehicle for inspection, testing, delivery at my risk. You will not be responsible for any loss or damage to vehicle or articles left in it. An express Mechanic's Lien is acknowledged on above vehicle to secure the amount of repairs thereto, including those from any prior work or repair contact on this vehicle. In the event an attorney is retained to foreclose this lien or bring suit for collection of any sums I agree to pay costs of collection and any reasonable attorney fees. Receipt of a copy of this order is hereby acknowledged.

[Payments -]

Customer Number : 8946

Vehicle Received: 5/1/2019

Signature _____ Date _____

YOU ARE ENTITLED BY LAW TO THE RETURN OF ALL PARTS REPLACED EXCEPT THOSE WHICH ARE TOO HEAVY OR LARGE AND THOSE REQUIRED TO BE SENT BACK TO THE MANUFACTURER OR DISTRIBUTOR BECAUSE OF WARRANTY WORK OR AN EXCHANGE AGREEMENT. YOU ARE ENTITLED TO INSPECT THE PARTS WHICH CANNOT BE RETURNED TO YOU. ☐ RETURNED PARTS ☐ DISCARD PARTS INITIALS _____

MACOMB COUNTY MICHIGAN
Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/9/19

4. SET ID	5. POST DATE
VP19513MUA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
JCI JONES CHEMICALS INC	V65297	01	788309	5/7/2019	$ 4,189.20

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200072M	72650				~~Martin~~ 8.5	Order #581584, 5/7/19	$ 4,189.20	GEN		
B											
C											
D											
E	80										
F											
G											

REV 09/2018

23. Total: $ 4,189.20

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

25. Finance Officer: bam
26. Chief Deputy: BB
27. Engineers:
28. Managers: MA
29. Coordinator: MC

30. Drain: Martin
31. Project Balance: N/A
32. Staff Date: 5/21/2019
33. Board Date: 6/10/2019
34. Select For Pay Date:

www.jcichemicals.com

INVOICE

Inv Date	Invoice #
05/07/2019	788309
Date Shipped	**Order/BOL #**
05/07/2019	581584

*** ORIGINAL ***
JCI JONES CHEMICALS, INC..
RIVERVIEW BRANCH LOCATION
18000 PAYNE AVENUE
RIVERVIEW , MI 48192
Phone: (734) 283-0677
Fax: (734) 283-0979
email: cs@jcichem.com

Customer Number
21543215

SOLD TO
MACOMB COUNTY
ATTN: ACCTS PAYABLE
23001 9 MILE ROAD
Saint Clair Shores , MI 48080-
USA

SHIP TO
ID # : 1
CHAPATON PUMPING STATION
23001 NINE MILE RD
ST CLAIR SHORES , MI 48080-
USA

Customer PO #	FOB Remark	Freight Terms	Sales ID
VERBAL PETE	Destination	Delivered	NORTH

Release #	Ship Via	Terms	Due Date	Discount Due Date
	JCI	N 30	06/06/2019	6/6/2019

Units	Package	Product Name	Total Quantity	Unit Price	Amount
4,630.00	1 Gal Bulk	HYPOCHLORITE SOLUTION, SS150 1201-001 BULK ($85 Stop Fee) (+ fsc)	4,630.0000/Gal	0.9000 /Gal	4,167.00
General Remarks:		<> EMAIL INVOICE TO: michelle.houvener@macombgov.org <> OUTSIDE CARRIER: HAROLD AMRCUS NET WEIGHT: 46720 FSC			
		Fuel Surcharge			22.20

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Total: 4,189.20

PLEASE PAY
THIS AMOUNT

Remit To: **JCI Jones Chemicals, Inc.**
MSC# 729
PO BOX 830674
Birmingham, AL 35283-0674 USA

JCI Welcomes payments via ACH, EFT and WIRE

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/8/19

4. SET ID	5. POST DATE
VP19508MUA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
JCI JONES CHEMICALS INC	V65297	01	788207	5/6/2019	$ 4,185.60

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	72650				8 1/2 Mile Relief	Order #581583, 4/22/19	$ 4,185.60	GEN		
B											
C											
D											
E	82										
F											
G											

REV 09/2018

23. Total: $ 4,185.60

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

25. Finance Officer: bfm

26. Chief Deputy: BB

27. Engineers:

28. Managers: VA

29. Coordinator: KC

30. Drain: 8 1/2 Mile Relief

31. Project Balance: N/A

32. Staff Date: 5/21/2019

33. Board Date: 6/10/2019

34. Select For Pay Date:

JCI
Jones Chemicals Inc.

www.jcichemicals.com

*** ORIGINAL ***
JCI JONES CHEMICALS, INC..
RIVERVIEW BRANCH LOCATION
18000 PAYNE AVENUE
RIVERVIEW , MI 48192
Phone: (734) 283-0677
Fax: (734) 283-0979
email: cs@jcichem.com

INVOICE

Inv Date	Invoice #
05/06/2019	788207
Date Shipped	Order/BOL #
05/06/2019	581583

Customer Number
21543215

SOLD TO
MACOMB COUNTY
ATTN: ACCTS PAYABLE
23001 9 MILE ROAD
Saint Clair Shores , MI 48080-
USA

SHIP TO
ID # : 1
CHAPATON PUMPING STATION
23001 NINE MILE RD
ST CLAIR SHORES , MI 48080-
USA

Customer PO #	FOB Remark	Freight Terms	Sales ID
VERBAL PETE	Destination	Delivered	NORTH

Release #	Ship Via	Terms	Due Date	Discount Due Date
	JCI	N 30	06/05/2019	6/5/2019

Units	Package	Product Name	Total Quantity	Unit Price	Amount
4,626.00	1 Gal Bulk	HYPOCHLORITE SOLUTION, SS150 1201-001 BULK ($85 Stop Fee) (+ fsc)	4,626.0000/Gal	0.9000 /Gal	4,163.40
General Remarks:		<> EMAIL INVOICE TO: michelle.houvener@macombgov.org <> OUTSIDE CARRIER: HAROLD MARCUS NET WEIGHT: 46,680 FSC			
		Fuel Surcharge			22.20

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Total: 4,185.60

PLEASE PAY
THIS AMOUNT

Remit To: **JCI Jones Chemicals, Inc.**
MSC# 729
PO BOX 830674
Birmingham, AL 35283-0674 USA

JCI Welcomes payments via ACH, EFT and WIRE

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/28/19

4. SET ID	5. POST DATE
VP19529MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
Lardner Elevator	V02788	01	186234	5/23/2019	$ 5,260.36

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	93001	CC0004	93001	WO18006	8 1/2 Mile Relief	Acct#00-6198-4, Job 3110	$ 5,260.36	GEN		
B											
C											
D											
E	84										
F											
G											

REV 09/2018

23. Total: $ 5,260.36

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

25. Finance Officer: bm

26. Chief Deputy: KB

27. Engineers:

28. Managers: UA

29. Coordinator: KK

30. Drain: 8 1/2 Mile Relief

31. Project Balance: N/A

32. Staff Date: 6/4/2019

33. Board Date: 6/10/2019

34. Select For Pay Date:

LARDNER ELEVATOR

729 Meldrum, Detroit, MI 48207
Phone: (313) 568-1600 Fax: (313) 568-0488
Email: info@lardnerelevator.com
www.lardnerelevator.com

INVOICE

Invoice #
186234

V02788

Bill To:
Chapaton Pump Station
23001 E. Nine Mile
St. Clair Shores, MI 48080

Account: Chapaton Pump Station
23001 E. Nine Mile
St. Clair Shores, MI 48080

Account #: 00-6198-4

Date	May 23,2019	Terms	Upon Receipt	Route	Non-contract	Job #	3110
Inv #	186234	PO #	18-9318	Territory	LECO	Type	Repair

Quantity	Description	Taxable	Measure	Price	Amount
2.00	Mechanic R/T - #196	No	Each	215.00	$430.00
20.00	Mileage - #196	No	Each	0.98	$19.60
1.00	Zone - #196	No	Each	9.86	$9.86
10.00	Mechanic R/T - #221	No	Each	215.00	$2,150.00
12.00	Mileage - #221	No	Each	0.98	$11.76
1.00	Zone - #221	No	Each	49.30	$49.30
6.00	Helper R/T - #228	No	Each	180.00	$1,080.00
30.00	Mileage - #228	No	Each	0.98	$29.40
1.00	Zone - #228	No	Each	21.36	$21.36
1.00	Cartage - #228	No	Each	40.00	$40.00
4.00	Mechanic R/T - #198	No	Each	215.00	$860.00
1.00	Zone - #198	No	Each	26.04	$26.04
1.00	ICU	No	Each	533.04	$533.04

Chap ⇄ Elevator

Rev. 01/15/14

PLEASE DETACH THIS PORTION AND RETURN WITH PAYMENT

Lardner Elevator Company
729 Meldrum
Detroit, MI 48207

Account # 00-6198-4
Chapaton Pump Station

Invoice # 186234

Amount $ 5,260.36

Paid $

LARDNER ELEVATOR

729 Meldrum, Detroit, MI 48207
Phone: (313) 568-1600 Fax: (313) 568-0488
Email: info@lardnerelevator.com
www.lardnerelevator.com

INVOICE

Invoice #
186234

Bill To:
Chapaton Pump Station
23001 E. Nine Mile
St. Clair Shores, MI 48080

Account: Chapaton Pump Station
23001 E. Nine Mile
St. Clair Shores, MI 48080

Account #: 00-6198-4

Date	May 23,2019	Terms	Upon Receipt	Route	Non-contract	Job #	3110
Inv.#	186234	PO #	18-9318	Territory	LECO	Type	Repair

Quantity	Description	Taxable	Measure	Price	Amount

5/10/2019 TT# 150865 E# 11101
Traced problem to bad ICU. Ordered same. Left down for further service.
5/14/2019 TT# 151104 & 151105 E# 11101
Replace ICU and troubleshoot controller.
5/15/2019 TT# 151106 & 151107 E# 11101
Found bad contacts and adjusted timing resistors. Observe operation, return to service.

Material: ICU

Taxable	$0.00
Non-Taxable	$5,260.36
Sub-Total	$5,260.36
Sales Tax	$0.00
TOTAL	$5,260.36

Rev. 01/15/14

PLEASE DETACH THIS PORTION AND RETURN WITH PAYMENT

Lardner Elevator Company
729 Meldrum
Detroit, MI 48207

Account # 00-6198-4
Chapaton Pump Station

Invoice # 186234

Amount $ 5,260.36

Paid $

LARDNER ELEVATOR COMPANY 729 Meldrum St. • Detroit, MI 48207-4323 • Ph: 313-568-1600 • Fax: 313-568-0488

Customer Name Chapton Pump Station Customer I.D. No. Date 5-10-19

Address St Clair Shores Job No. Elevator No. 11101

Ticket No.	Employee Name and No.	Mileage	Zone	Parking	Cartage	Other
	Smith 196	20				

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		SUNDAY	
RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	OT	DT	OT	DT
												2						

Ticket No.	Employee Name and No.	Mileage	Zone	Parking	Cartage	Other

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		SUNDAY	
RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	OT	DT	OT	DT

Work Performed Traced problem to bad I.C.U. Ordered same left down for further check ~~operation and return to~~ service.

Recommendation

Materials

[ ] Exam [ ] Service Call [ ] Repair Work [ ] Construction [ ] Modernization [ ] FLT [ ] NLT [ ] Shop Chargeable Work [X] Yes [ ] No Job Completed [ ] Yes [X] No

Customer P.O. No. Customer Signature Print Name

We require our workmen to have their time approved by the customer or his representative. We allow our workmen actual time going to and from the job.

LARDNER ELEVATOR COMPANY 729 Meldrum St. • Detroit, MI 48207-4323 • Ph: 313-568-1600 • Fax: 313-568-0488

Customer Name Chapaton Pumping Station Customer I.D. No. Date 5/14/19

Address 23001 E 9 mile, St Clair Job No. Elevator No. 11101

Ticket No.	Employee Name and No.	Mileage	Zone	Parking	Cartage	Other
	Mike B 221	12				

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		SUNDAY	
RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	OT	DT	OT	DT
			6															

Ticket No.	Employee Name and No.	Mileage	Zone	Parking	Cartage	Other
	A-Aron 228	30			$40	

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		SUNDAY	
RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	OT	DT	OT	DT
			6															

Work Performed Replace ICU & troubleshoot controller

Recommendation

Materials

[ ] Exam [ ] Service Call [X] Repair Work [ ] Construction [ ] Modernization [ ] FLT [ ] NLT [ ] Shop Chargeable Work [X] Yes [ ] No Job Completed [ ] Yes [X] No

Customer P.O. No. Customer Signature X Print Name

We require our workmen to have their time approved by the customer or his representative. We allow our workmen actual time going to and from the job.

LARDNER ELEVATOR COMPANY 729 Meldrum St. • Detroit, MI 48207-4323 • Ph: 313-568-1600 • Fax: 313-568-0488

Customer Name Chapaton Pumping Station Customer I.D. No. [illegible] Date 5/15/19

Address 23001 E 9mile, St Clair Job No. [illegible] Elevator No. 1101

Ticket No	Employee Name and No.	Mileage	Zone	Parking	Cartage	Other
5116	Mike B 221		[illegible]			

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		SUNDAY	
RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	OT	DT	OT	DT
						4												

Ticket No.	Employee Name and No.	Mileage	Zone	Parking	Cartage	Other
5117	Jack V 198		[illegible]			

MONDAY			TUESDAY			WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		SUNDAY	
RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	RT	OT	DT	OT	DT	OT	DT
						4												

Work Performed found bad contacts & adjusted timing resistors. Observe operation, return to service.

Recommendation

Materials

[ ] Exam [ ] Service Call [X] Repair Work [ ] Construction [ ] Modernization [ ] FLT [ ] NLT [ ] Shop Chargeable Work [X] Yes [ ] No Job Completed [X] Yes [ ] No

Customer P.O. No. Customer Signature X Print Name [illegible]

We require our workmen to have their time approved by the customer or his representative. We allow our workmen actual time going to and from the job.

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/6/19

4. SET ID	5. POST DATE
VP19507MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
Macomb County Treasurer	V01085	26	AR190400	5/1/2019	$ 546,238.34

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	72100	CC0004	72100		8 1/2 Mile Relief	1st Qtr 2019 Personnel	$ 185,890.17	IPWK		
B	8200017M	72100	CC0004	72100		8 1/2 Mile Relief	1st Qtr 2019 Personnel	$ 3,750.54	IPWK		0
C	8200166M	72100	CC0018	72100		MIDDD	1st Qtr 2019 Personnel	$ 349,594.33	IPWK	MIDD	0
D	8200166M	72100	CC0018	72100		MIDDD	1st Qtr 2019 Personnel	$ 7,003.30	IPWK	MIDD	0
E	68										
F											
G											

REV 09/2018

23. Total: $ 546,238.34

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

Reimbursement to Macomb County for 8 1/2 Mile Relief and MIDDD Personnel

25. Finance Officer: BMM

26. Chief Deputy: AB

27. Engineers:

28. Managers: VR

29. Coordinator: KK

30. Drain: MIDDD/8 1/2 Mile Relief

31. Project Balance: N/A

32. Staff Date: 5/21/2019

33. Board Date: 6/10/2019

34. Select For Pay Date:

Due Upon Receipt | 05/01/2019 | AR190400

REF DATE	DESCRIPTION	AMOUNT
05/01/2019	1ST QTR 19 CHAPOTON-PERSONNEL	185,890.17
05/01/2019	1ST QTR 19 CHAPOTON-OPERATING	3,750.54
05/01/2019	1ST QTR 19 WASTE WTR-PERSONNEL	349,594.33
05/01/2019	1ST QTR 19 WASTE WTR-OPERATING	7,003.30
	Charges	546,238.34
	Amount Due	546,238.34

********** PLEASE RETURN THIS PORTION WITH YOUR PAYMENT **********

Finance Department Contact Number:
(586) 469-5251

Tax ID # / EIN Number:
38-6004868

Please email any questions about your account to:
Accounting@MacombGov.Org

Please remit your payment to:
COUNTY OF MACOMB
FINANCE DEPARTMENT
120 NORTH MAIN STREET, 2nd FLOOR
MOUNT CLEMENS, MI. 48043-5622

Customer Number: DPWK BA

Invoice Number: AR190400

Invoice Date: 05/01/2019

Amount Due: $546,238.34

90

port: GL80DCY
Fund: 101 General Fund
Key: 10144130 Public Works - Pumping Station

Macomb County, Michigan

Budget to Actual Report - By Org Key
1/1/2019 TO 3/31/2019

Fiscal Year: 2019
Fiscal Period: 03

L	Description	2019 Adopted Budget	2019 Final Budget	Encumbered	Actual	Variance	Pct Utilized
/enue Accounts							
'19	PERSONAL SERVICES	1,100,119.00	1,062,493.00	0.00	0.00	-1,062,493.00	0.00 %
	Total Reimbursements	1,100,119.00	1,062,493.00	0.00	0.00	-1,062,493.00	0.00 %
	Total Revenue Accounts	1,100,119.00	1,062,493.00	0.00	0.00	-1,062,493.00	0.00 %
oense Accounts							
00	SAL & WAGE - BASE PAY	507,201.00	483,929.00	0.00	98,868.85	385,060.15	20.43 %
03	SAL & WAGE-BUDGET PART TIME	46,639.00	46,639.00	0.00	5,795.46	40,843.54	12.42 %
08	SAL & WAGE -IN LIEU OF MED	0.00	0.00	0.00	357.38	-357.38	100.00 %
11	SAL & WAGE - OVERTIME	25,000.00	25,000.00	0.00	9,987.38	15,012.62	39.94 %
12	SAL & WAGE - STANDBY PAY	13,600.00	13,600.00	0.00	1,808.68	11,791.32	13.29 %
13	SAL & WAGE - HOLIDAY PAY	8,000.00	8,000.00	0.00	514.84	7,485.16	6.43 %
14	SAL & WAGE - LONGEVITY	2,200.00	2,200.00	0.00	150.00	2,050.00	6.81 %
16	SAL & WAGE - CAR ALLOWANCE	0.00	0.00	0.00	85.12	-85.12	100.00 %
98	SAL & WAGE - OTHER	0.00	0.00	0.00	343.70	-343.70	100.00 %
	Total Salaries and Wages	602,640.00	579,368.00	0.00	117,911.41	461,456.59	20.35 %
10	FICA - OASDI	37,364.00	35,921.00	0.00	7,310.53	28,610.47	20.35 %
15	FICA - MEDICARE	8,738.00	8,401.00	0.00	1,709.79	6,691.21	20.35 %
20	HOSPITALIZATION INSURANCE	124,402.00	115,532.00	0.00	25,765.85	89,766.15	22.30 %
21	DENTAL INSURANCE	7,480.00	6,947.00	0.00	1,408.30	5,538.70	20.27 %
29	RETIREE MEDICAL	67,292.00	67,292.00	0.00	12,936.00	54,356.00	19.22 %
30	LIFE INSURANCE - BASE	467.00	434.00	0.00	33.99	400.01	7.83 %
40	PENSION	50,643.00	47,071.00	0.00	12,663.00	34,408.00	26.90 %
42	PENSION DEFINED CONTRIB	11,948.00	13,538.00	0.00	2,975.96	10,562.04	21.98 %
60	WORKER'S COMPENSATION	1,507.00	1,449.00	0.00	293.07	1,155.93	20.22 %
80	LONG-TERM DISABILITY	1,195.00	1,145.00	0.00	206.74	938.26	18.05 %
90	COMPENSATED ABSENCES	14,932.00	14,234.00	0.00	2,675.53	11,558.47	18.79 %
	Total Fringe Benefits	325,968.00	311,964.00	0.00	67,978.76	243,985.24	21.79 %
04	VEHICLE-GASOLINE	0.00	0.00	0.00	527.25	-527.25	100.00 %
	Total Operating Expenses	0.00	0.00	0.00	527.25	-527.25	100.00 %

Macomb County, Michigan

Budget to Actual Report - By Org Key
1/1/2019 TO 3/31/2019

ey	Description	2019 Adopted Budget	2019 Final Budget	Encumbered	Actual	Variance	Pct Utilized
101	INSURANCE -LIABILITY	8,308.00	7,958.00	0.00	2,047.83	5,910.17	25.73 %
102	INSURANCE -PROPERTY	20,000.00	20,000.00	0.00	0.00	20,000.00	0.00 %
103	INSURANCE -FLEET	2,000.00	2,000.00	0.00	0.00	2,000.00	0.00 %
103	INTER SERV-TELEPHONE	5,450.00	5,450.00	0.00	1,175.46	4,274.54	21.56 %
101	INDIRECT COST ALLOCATION	135,753.00	135,753.00	0.00	0.00	135,753.00	0.00 %
	Total Internal Service Costs	171,511.00	171,161.00	0.00	3,223.29	167,937.71	1.88 %
	Total Expense Accounts	1,100,119.00	1,062,493.00	0.00	189,640.71	872,852.29	17.84 %

	Revenue	1,100,119.00	1,062,493.00	0.00	0.00	-1,062,493.00
	Expenses	1,100,119.00	1,062,493.00	0.00	189,640.71	872,852.29
	Net	0.00	0.00	0.00	-189,640.71	-189,640.71

10144130 - PW-Pumping Station	1st Quarter
Payroll	117,911.41
Fringe	67,978.76
(1) =	185,890.17
Operating Expense	527.25
Internal Svc Cost	3,223.29
(2) =	3,750.54
Total	189,640.71

Macomb County, Michigan

Budget to Actual Report - By Org Key
1/1/2019 TO 3/31/2019

y	Description	2019 Adopted Budget	2019 Final Budget	Encumbered	Actual	Variance	Pct Utilized
venue Accounts							
719	PERSONAL SERVICES	1,625,405.00	1,665,616.00	0.00	402,569.50	-1,263,046.50	24.16 %
	Total Reimbursements	1,625,405.00	1,665,616.00	0.00	402,569.50	-1,263,046.50	24.16 %
	Total Revenue Accounts	1,625,405.00	1,665,616.00	0.00	402,569.50	-1,263,046.50	24.16 %
pense Accounts							
200	SAL & WAGE - BASE PAY	995,190.00	1,021,684.00	0.00	210,004.91	811,679.09	20.55 %
203	SAL & WAGE-BUDGET PART TIME	39,742.00	39,742.00	0.00	6,393.88	33,348.12	16.08 %
208	SAL & WAGE -IN LIEU OF MED	0.00	0.00	0.00	110.22	-110.22	100.00 %
211	SAL & WAGE - OVERTIME	25,000.00	25,000.00	0.00	9,622.94	15,377.06	38.49 %
212	SAL & WAGE - STANDBY PAY	20,000.00	20,000.00	0.00	4,019.35	15,980.65	20.09 %
214	SAL & WAGE - LONGEVITY	3,200.00	3,200.00	0.00	200.00	3,000.00	6.25 %
216	SAL & WAGE - CAR ALLOWANCE	0.00	0.00	0.00	401.20	-401.20	100.00 %
298	SAL & WAGE - OTHER	0.00	0.00	0.00	70.32	-70.32	100.00 %
	Total Salaries and Wages	1,083,132.00	1,109,626.00	0.00	230,822.82	878,803.18	20.80 %
510	FICA - OASDI	67,154.00	68,796.00	0.00	14,244.40	54,551.60	20.70 %
515	FICA - MEDICARE	15,706.00	16,091.00	0.00	3,331.36	12,759.64	20.70 %
520	HOSPITALIZATION INSURANCE	188,266.00	192,701.00	0.00	42,640.18	150,060.82	22.12 %
521	DENTAL INSURANCE	11,320.00	11,587.00	0.00	2,609.51	8,977.49	22.52 %
529	RETIREE MEDICAL	86,288.00	86,288.00	0.00	17,247.00	69,041.00	19.98 %
530	LIFE INSURANCE - BASE	707.00	724.00	0.00	55.86	668.14	7.71 %
540	PENSION	81,038.00	85,105.00	0.00	20,259.00	64,846.00	23.80 %
542	PENSION DEFINED CONTRIB	31,306.00	32,896.00	0.00	11,742.70	21,153.30	35.69 %
560	WORKER'S COMPENSATION	2,708.00	2,774.00	0.00	575.21	2,198.79	20.73 %
580	LONG-TERM DISABILITY	2,224.00	2,281.00	0.00	406.87	1,874.13	17.83 %
590	COMPENSATED ABSENCES	29,601.00	30,396.00	0.00	5,659.42	24,736.58	18.61 %
	Total Fringe Benefits	516,318.00	529,639.00	0.00	118,771.51	410,867.49	22.42 %
6104	VEHICLE-GASOLINE	0.00	0.00	0.00	1,666.12	-1,666.12	100.00 %
	Total Operating Expenses	0.00	0.00	0.00	1,666.12	-1,666.12	100.00 %
1101	INSURANCE -LIABILITY	15,470.00	15,866.00	0.00	3,900.51	11,965.49	24.58 %

Macomb County, Michigan

Budget to Actual Report - By Org Key
1/1/2019 TO 3/31/2019

Fiscal Year: 2019
Fiscal Period: 03

	Description	2019 Adopted Budget	2019 Final Budget	Encumbered	Actual	Variance	Pct Utilized
03	INSURANCE -FLEET	4,500.00	4,500.00	0.00	0.00	4,500.00	0.00 %
03	INTER SERV-TELEPHONE	5,985.00	5,985.00	0.00	1,436.67	4,548.33	24.00 %
	Total Internal Service Costs	25,955.00	26,351.00	0.00	5,337.18	21,013.82	20.25 %
	Total Expense Accounts	1,625,405.00	1,665,616.00	0.00	356,597.63	1,309,018.37	21.40 %
	Revenue	1,625,405.00	1,665,616.00	0.00	402,569.50	-1,263,046.50	
	Expenses	1,625,405.00	1,665,616.00	0.00	356,597.63	1,309,018.37	
	Net	0.00	0.00	0.00	45,971.87	45,971.87	

94

10144150 - PW-Waste Water Services Div	
	1st Quarter
Payroll	230,822.82
Fringe	118,771.51
53 =	349,594.33
Operating Expense	1,666.12
Internal Svc Cost	5,337.18
Capital Outlay	-
54 =	7,003.30
Total	356,597.63

ort: GL80DCY

Macomb County, Michigan

Budget to Actual Report - By Org Key
1/1/2019 TO 3/31/2019

Fiscal Year: 2019
Fiscal Period: 03

und: 101 General Fund

Key: 10144150 PW-Waste Water Services Div

Description		2019 Adopted Budget	2019 Final Budget	Encumbered	Actual	Variance	Pct Utilized
Total General Fund							
	Revenue	2,725,524.00	2,728,109.00	0.00	402,569.50	-2,325,539.50	14.75 %
	Expenses	2,725,524.00	2,728,109.00	0.00	546,238.34	2,181,870.66	20.02 %
	Net	0.00	0.00	0.00	-143,668.84		

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/15/19

4. SET ID	5. POST DATE
VP19515MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
OHM Advisors	V67821	01	203816	5/10/2019	$ 1,777.50

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	80138	CC0004	80138	WO18333	8 1/2 Mile Relief	Pjt#0314-18-0010, thru 4/27/19	$ 1,777.50	GEN		
B											
C											
D											
E	96										
F											
G											

REV 09/2018

23. Total: $ 1,777.50

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:
Chapaton TRC Monitoring services throught 4/27/19

25. Finance Officer: BHM
26. Chief Deputy: MB
27. Engineers:
28. Managers: UA
29. Coordinator: KK

30. Drain: 8 1/2 Mile Relief
31. Project Balance: $3,992.50
32. Staff Date: 5/21/2019
33. Board Date: 6/10/2019
34. Select For Pay Date:

W018333

OHM Advancing Communities

Macomb County Public Works Office
Attn: Vincent Astorino
21777 Dunham Road
Clinton Township, MI 48036

Invoice Date: 05/10/2019
Invoice #: 203816
Project: 0314-18-0010

Project Name: Chapaton TRC Monitoring

Job # WWS 18-012
Email to michelle.houvener@macombgov.org

For Professional Services Rendered through: 4/27/2019

Description	*Fee*	*Prior Billed*	*Total Available*	*Current Billing*
Task 1 Understanding Facility and Site	6,500.00	6,478.75	21.25	0.00
Task 2 Performing Pilot Study	2,500.00	3,771.25	0.00	0.00
Task 3 Data Analysis and Summary	3,000.00	1,562.50	1,437.50	1,402.50
Task 4 Integrating Monitoring into Long-term Goals	4,000.00	1,420.00	2,580.00	375.00
Task 5 Deliverables	4,000.00	997.50	3,002.50	0.00
Amount Due This Invoice **	**20,000.00**	**14,230.00**	**5,770.00**	**1,777.50**

REMIT TO:
OHM Advisors
34000 PLYMOUTH RD
LIVONIA, MICHIGAN 48150-1512

T 734.522.6711
F 734.522.6427

OHMAdvisors.com

Macomb County Public Works Office
Attn: Vincent Astorino
21777 Dunham Road
Clinton Township, MI 48036

Invoice Date: 05/10/2019
Invoice #: 203816
Project: 0314-18-0010

Task 3 Data Analysis and Summary

Fixed Rates Labor

Classification	*Hours*	*Rate*	*Amount*
Graduate Engineer I	12.75	110.0000	1,402.50
Total Data Analysis and Summary			**1,402.50**

Task 4 Integrating Monitoring into Long-term Goals

Fixed Rates Labor

Classification	*Hours*	*Rate*	*Amount*
Graduate Engineer II	3.00	125.0000	375.00
Total Integrating Monitoring into Long-term Goals			**375.00**

Total Project: 0314180010 - Chapaton TRC Monitoring **1,777.50**

REMIT TO:
OHM Advisors
34000 PLYMOUTH RD
LIVONIA, MICHIGAN 48150-1512
T 734.522.6711
F 734.522.6427
OHM-Advisors.com

Mark A. Hackel
County Executive

ONESolution

ACCOUNTS PAYABLE CHECK REQUEST

PUBLIC WORKS DIVISION

1. PREPARED BY (Please Type)	2. PHONE #	3. DATE
Michelle Houvener	95966	5/31/19

4. SET ID	5. POST DATE
VP19531MA	

PARENT RECORD INFORMATION

6. VENDOR NAME (Check to be issued to)	7. VENDOR NUMBER	8. ADDR CODE	9. Invoice No (MAX = 16 CHARACTERS)	10. Invoice Date	11. Invoice Amount
Wade Trim	V09446	02	M2014760	5/31/2019	$ 123,741.89

CHILD RECORD DETAIL INFORMATION

Line	General Ledger 12. Org Key	General Ledger 13. Object	Job Ledger 14. Cost Center (CCNT)	Job Ledger 15. Object	16. Work Order Number	OPTIONAL 17. Secondary Reference (MAX = 16 CHARACTERS)	18. Description (MAX = 30 CHARACTERS)	19. Amount	20. DIV	21. MISC	22. Sep CK
A	8200017M	80138	CC0004	80138	WO18374	8 1/2 Mile Relief	Pjt #MCW200501T, 4/20 - 5/24	$ 123,741.89	GEN		
B											
C											
D											
E	66										
F											
G											

REV 09/2018

23. Total: $ 123,741.89

24. COMMENTS, INSTRUCTIONS OR ADDITIONAL NOTES:

Chapaton RTB Canal Upgrades, 4/20/19-5/24/19

25. Finance Officer: BJM

26. Chief Deputy: 183

27. Engineers:

28. Managers: JA

29. Coordinator: KC

30. Drain: 8 1/2 Mile Relief

31. Project Balance: $780,632.49

32. Staff Date: 6/4/2019

33. Board Date: 6/10/2019

34. Select For Pay Date:

Wade Trim

Wade Trim
25251 Northline Road • Taylor, MI 48180
734.947.9700 • FAX: 734.947.1380 • www.wadetrim.com
Federal ID 38-1802386

INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Macomb County Public Works
21777 Dunham Road
Clinton Township, MI 48036

Attention: Vince Astorino
Operations and Flow Manager

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Remit payment to : Wade Trim
P.O. Box 10
Taylor, MI 48180

Re: Chapaton RTB Canal Upgrades

For Professional Services rendered from 4/20/2019 through 5/24/2019

** All subconsultant invoices marked up 5% **

Total Salaries	$75,687.50
Total Expenses	$48,054.39
Professional Services Rendered	$123,741.89

Amount Due This Invoice	**$123,741.89**

Statement	
Prior Invoices	$73,236.62
This Invoice	$123,741.89
Total Invoiced	$196,978.51
Paid to Date	$73,236.62
Amount Outstanding	**$123,741.89**

Fee Summary	
Authorized Fee	$977,611.00
Total Invoiced	$196,978.51
Amount Remaining	$780,632.49 ✓

Wade Trim

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Federal ID 38-1802386

INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 100 -- Project Management

Task: 1A1 -- Project Management

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
Senior Professional				
	04/22/2019	1.00	$215.00	$215.00
	04/23/2019	1.50	$215.00	$322.50
	04/24/2019	2.00	$215.00	$430.00
	04/25/2019	1.00	$215.00	$215.00
	04/26/2019	4.00	$215.00	$860.00
	04/29/2019	2.00	$215.00	$430.00
	04/30/2019	1.00	$215.00	$215.00
	05/01/2019	0.50	$215.00	$107.50
	05/02/2019	2.00	$215.00	$430.00
	05/03/2019	3.00	$215.00	$645.00
	05/06/2019	2.00	$215.00	$430.00
	05/07/2019	1.00	$215.00	$215.00
	05/09/2019	4.00	$215.00	$860.00
	05/10/2019	2.00	$215.00	$430.00
	05/13/2019	2.00	$215.00	$430.00
	05/14/2019	3.00	$215.00	$645.00
	05/15/2019	3.00	$215.00	$645.00
	05/16/2019	2.00	$215.00	$430.00
	05/20/2019	3.00	$215.00	$645.00
	05/21/2019	2.00	$215.00	$430.00
	05/23/2019	2.00	$215.00	$430.00
		44.00		$9,460.00
Total Rate Schedule Labor				***$9,460.00***

Total Task : 1A1 -- Project Management

Labor : $9,460.00
Expense : $0.00

Task: 1A2 -- Project Management Support

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
Engineer I				
	04/23/2019	2.50	$100.00	$250.00
	04/30/2019	2.00	$100.00	$200.00
	05/07/2019	1.00	$100.00	$100.00
	05/09/2019	3.00	$100.00	$300.00
	05/10/2019	1.00	$100.00	$100.00

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INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 100 -- Project Management

Task: 1A2 -- Project Management Support

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
Engineer I				
	05/14/2019	0.50	$100.00	$50.00
	05/15/2019	2.00	$100.00	$200.00
	05/22/2019	1.50	$100.00	$150.00
	05/23/2019	2.50	$100.00	$250.00
	05/24/2019	1.00	$100.00	$100.00
		17.00		$1,700.00
Professional Engineer IV				
	05/22/2019	0.50	$190.00	$95.00
		0.50		$95.00
Total Rate Schedule Labor				***$1,795.00***

Total Task : 1A2 -- Project Management Support — Labor : $1,795.00; Expense : $0.00

Task: 1EXP -- Project Management Expenses

Unit Pricing Expenses

Vendor / Employee Name	Doc Nbr	Date	Units	Rate	Amount
Employee Mileage					
	669B22	05/01/2019	61.00	$0.640	$39.04
					39.04
Total Unit Pricing					***$39.04***

Total Task : 1EXP -- Project Management Expenses — Labor : $0.00; Expense : $39.04

Total Phase : 100 -- Project Management — Labor : $11,255.00; Expense : $39.04

Phase: 200 -- Preliminary Design

Task: 2A1 -- Rvw Existing Documents

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INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 200 -- Preliminary Design

Task: 2A1 -- Rvw Existing Documents

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
Professional Engineer IV				
	04/23/2019	0.50	$190.00	$95.00
		0.50		$95.00
Project Aide II				
	05/06/2019	1.00	$95.00	$95.00
		1.00		$95.00
Project Specialist II				
	04/22/2019	7.00	$150.00	$1,050.00
	04/23/2019	5.50	$150.00	$825.00
	04/24/2019	2.00	$150.00	$300.00
	04/25/2019	3.50	$150.00	$525.00
	04/26/2019	1.50	$150.00	$225.00
	04/29/2019	1.00	$150.00	$150.00
	04/30/2019	2.00	$150.00	$300.00
	05/01/2019	3.50	$150.00	$525.00
	05/07/2019	0.50	$150.00	$75.00
	05/17/2019	3.50	$150.00	$525.00
	05/20/2019	6.50	$150.00	$975.00
	05/21/2019	1.00	$150.00	$150.00
	05/22/2019	1.00	$150.00	$150.00
	05/24/2019	7.00	$150.00	$1,050.00
		45.50		$6,825.00
Senior Professional				
	04/22/2019	4.00	$215.00	$860.00
	04/23/2019	2.00	$215.00	$430.00
	04/24/2019	2.00	$215.00	$430.00
	04/25/2019	2.00	$215.00	$430.00
	04/29/2019	3.00	$215.00	$645.00
	04/30/2019	1.00	$215.00	$215.00
	05/01/2019	1.00	$215.00	$215.00
	05/03/2019	1.00	$215.00	$215.00
	05/06/2019	2.00	$215.00	$430.00
	05/07/2019	1.00	$215.00	$215.00
	05/08/2019	2.00	$215.00	$430.00
	05/09/2019	1.00	$215.00	$215.00
	05/10/2019	2.00	$215.00	$430.00

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Federal ID 38-1802386

INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 200 -- Preliminary Design

Task: 2A1 -- Rvw Existing Documents

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
		24.00		$5,160.00
Total Rate Schedule Labor				***$12,175.00***

Total Task : 2A1 -- Rvw Existing Documents — Labor : $12,175.00; Expense : $0.00

Task: 2A2 -- Survey

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
Professional Surveyor III				
	04/23/2019	1.00	$140.00	$140.00
	04/24/2019	1.00	$140.00	$140.00
	05/03/2019	0.50	$140.00	$70.00
	05/06/2019	1.00	$140.00	$140.00
	05/07/2019	1.00	$140.00	$140.00
		4.50		$630.00
Senior Professional				
	04/23/2019	2.00	$215.00	$430.00
	04/24/2019	1.00	$215.00	$215.00
	04/25/2019	1.00	$215.00	$215.00
	04/30/2019	1.00	$215.00	$215.00
	05/03/2019	1.00	$215.00	$215.00
		6.00		$1,290.00
Survey Technician V				
	05/06/2019	9.00	$105.00	$945.00
		9.00		$945.00
Total Rate Schedule Labor				***$2,865.00***

Unit Pricing Expenses

Vendor / Employee Name	Doc Nbr	Date	Units	Rate	Amount
Daily Vehicle Charge					
	28053	05/06/2019	1.00	$85.000	$85.00

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INVOICE

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18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 200 -- Preliminary Design

Task: 2A2 -- Survey

Unit Pricing Expenses

Vendor / Employee Name	Doc Nbr	Date	Units	Rate	Amount
					85.00
GPS Equipment					
	001968	05/06/2019	9.00	$20.000	$180.00
					180.00
Total Unit Pricing					***$265.00***

Total Task : 2A2 -- Survey — Labor : $2,865.00 / Expense : $265.00

Task: 2A4 -- Meetings

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
Professional LA III				
	04/23/2019	0.25	$150.00	$37.50
		0.25		$37.50
Senior Professional				
	04/23/2019	2.00	$215.00	$430.00
	04/30/2019	2.00	$215.00	$430.00
	05/07/2019	1.00	$215.00	$215.00
	05/09/2019	4.00	$215.00	$860.00
	05/15/2019	3.00	$215.00	$645.00
	04/22/2019	3.00	$215.00	$645.00
	04/25/2019	2.00	$215.00	$430.00
	04/26/2019	2.00	$215.00	$430.00
	05/01/2019	1.00	$215.00	$215.00
	05/02/2019	3.00	$215.00	$645.00
	04/30/2019	2.00	$215.00	$430.00
	05/08/2019	1.00	$215.00	$215.00
	05/09/2019	4.00	$215.00	$860.00
	05/10/2019	1.00	$215.00	$215.00
		31.00		$6,665.00
Total Rate Schedule Labor				***$6,702.50***

Wade Trim

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Federal ID 38-1802386

INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 200 -- Preliminary Design

Task: 2A4 -- Meetings

Unit Pricing Expenses

Vendor / Employee Name	Doc Nbr	Date	Units	Rate	Amount
Employee Mileage					
	0DA686	03/21/2019	36.00	$0.640	$23.04
					23.04
Total Unit Pricing					***$23.04***

Total Task : 2A4 -- Meetings — Labor : $6,702.50 / Expense : $23.04

Task: 2B1 -- Alt Analysis & Development

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
CADD Technician I				
	04/26/2019	8.00	$70.00	$560.00
	04/29/2019	8.00	$70.00	$560.00
	04/30/2019	4.00	$70.00	$280.00
	05/08/2019	8.00	$70.00	$560.00
	05/09/2019	6.00	$70.00	$420.00
	05/16/2019	3.00	$70.00	$210.00
		37.00		$2,590.00
Engineer IV				
	05/22/2019	2.00	$150.00	$300.00
	05/23/2019	5.00	$150.00	$750.00
	05/24/2019	3.00	$150.00	$450.00
	04/22/2019	3.00	$150.00	$450.00
	04/23/2019	5.00	$150.00	$750.00
	04/24/2019	7.00	$150.00	$1,050.00
	04/25/2019	6.00	$150.00	$900.00
	04/26/2019	4.00	$150.00	$600.00
	04/30/2019	6.00	$150.00	$900.00
	05/01/2019	7.00	$150.00	$1,050.00
	05/02/2019	8.00	$150.00	$1,200.00
	05/03/2019	8.00	$150.00	$1,200.00
	05/06/2019	8.00	$150.00	$1,200.00
	05/07/2019	5.50	$150.00	$825.00
	05/08/2019	8.00	$150.00	$1,200.00
	05/09/2019	3.00	$150.00	$450.00

Wade Trim

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Federal ID 38-1802386

INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 200 -- Preliminary Design

Task: 2B1 -- Alt Analysis & Development

Rate Schedule Labor

Class Name	*Date*	*Hours*	*Rate*	*Amount*
Engineer IV				
	05/10/2019	3.00	$150.00	$450.00
	05/13/2019	7.50	$150.00	$1,125.00
	05/14/2019	8.00	$150.00	$1,200.00
	05/15/2019	7.00	$150.00	$1,050.00
	05/16/2019	5.50	$150.00	$825.00
	05/20/2019	7.00	$150.00	$1,050.00
	05/22/2019	8.00	$150.00	$1,200.00
	05/23/2019	8.00	$150.00	$1,200.00
	05/24/2019	8.00	$150.00	$1,200.00
		150.50		$22,575.00
Senior Professional				
	04/30/2019	2.00	$215.00	$430.00
	05/01/2019	2.00	$215.00	$430.00
	05/13/2019	4.00	$215.00	$860.00
	05/14/2019	4.00	$215.00	$860.00
	05/15/2019	1.00	$215.00	$215.00
	05/17/2019	2.00	$215.00	$430.00
	05/20/2019	4.00	$215.00	$860.00
	05/21/2019	3.00	$215.00	$645.00
	05/22/2019	4.00	$215.00	$860.00
	05/23/2019	4.00	$215.00	$860.00
	05/24/2019	3.00	$215.00	$645.00
	05/24/2019	1.00	$215.00	$215.00
	05/14/2019	2.00	$215.00	$430.00
	05/15/2019	4.00	$215.00	$860.00
	05/17/2019	4.00	$215.00	$860.00
	05/20/2019	2.00	$215.00	$430.00
	05/21/2019	1.00	$215.00	$215.00
	05/22/2019	2.00	$215.00	$430.00
	05/23/2019	2.00	$215.00	$430.00
	05/24/2019	6.00	$215.00	$1,290.00
		57.00		$12,255.00
Total Rate Schedule Labor				***$37,420.00***

Total Task : 2B1 -- Alt Analysis & Development

Labor : $37,420.00
Expense : $0.00

Wade Trim

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Federal ID 38-1802386

INVOICE

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 200 -- Preliminary Design
Task: 2D4 -- 30% Structural

Rate Schedule Labor

Class Name	Date	Hours	Rate	Amount
CADD Technician V				
	04/23/2019	1.00	$110.00	$110.00
		1.00		$110.00
Senior Professional				
	05/13/2019	4.00	$215.00	$860.00
	05/14/2019	2.00	$215.00	$430.00
	05/15/2019	2.00	$215.00	$430.00
	05/16/2019	2.00	$215.00	$430.00
	05/20/2019	2.00	$215.00	$430.00
	05/21/2019	5.00	$215.00	$1,075.00
	05/22/2019	5.00	$215.00	$1,075.00
	05/24/2019	2.00	$215.00	$430.00
		24.00		$5,160.00

Total Rate Schedule Labor ***$5,270.00***

Total Task : 2D4 -- 30% Structural
Labor : $5,270.00
Expense : $0.00

Total Phase : 200 -- Preliminary Design
Labor : $64,432.50
Expense : $288.04

Phase: 600 -- Subcontractors
Task: 6A1 -- Applied Science

Regular Expenses

Vendor Name	Doc Nbr	Date	Cost	Amount
Subconsultants				
	20015508	05/23/2019	$7,648.00	$8,030.40
				$8,030.40

Total Regular Expenses ***$8,030.40***

Total Task : 6A1 -- Applied Science
Labor : $0.00
Expense : $8,030.40

Task: 6A2 -- NTH Consultants

INVOICE

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734.947.9700 • FAX: 734.947.1380 • www.wadetrim.com
Federal ID 38-1802386

Terms: Net 30 Days
1.5% Per Month After 30 Days
18% Annual Rate

Invoice Date : May 31, 2019
Invoice # : M2014760
Project # : MCW200501T

Phase: 600 -- Subcontractors
Task: 6A2 -- NTH Consultants

Regular Expenses

Vendor Name	*Doc Nbr*	*Date*	*Cost*	*Amount*
Subconsultants				
	20015509	05/23/2019	$37,806.58	$39,696.91
				$39,696.91
Total Regular Expenses				***$39,696.91***

Total Task : 6A2 -- NTH Consultants
Labor : $0.00
Expense : $39,696.91

Total Phase : 600 -- Subcontractors
Labor : $0.00
Expense : $47,727.31

Chapaton RTB Canal Upgrade:

Project management and coordination of design activities, staff and team meetings. Prepared monthly invoice and progress report. Performed site survey for additional point locations. BIM teleconference on April 23, 2019. Geotechnical Update meeting on April 26, 2019. Project Progress teleconference on April 30, 2019. Prepare Preliminary Geotechnical Summary and periodic updates. Performed preliminary calculations of sheeting options and potential for groundwater inflow. Drill Test Boring Nos. 4 and 5 on April 24th and 25th, 2019. Performed laboratory testing on selected samples. Developed a hydraulic model of the existing Chapaton Canal. Developed hydraulic models for proposed alternatives of canal geometry and control gate options. Continued investigation of control gate equipment alternatives. Developed hydraulic design criteria for hydraulic assessment of the proposed alternatives. Prepared hydraulic profiles for meeting demonstrations. Internal team meeting on May 9, 2019 to discuss design concepts / geotechnical impacts / hydraulic impacts. Site visit on May 13, 2019 to review condition of existing sheeting for length measurements with Jim Lynch (UDM). Design Workshop meeting with MCO staff on May 15, 2019. Utilized design parameters to develop canal expansion options in BIM and commenced preliminary opinion of construction cost.

NTH Consultants, Ltd.

Infrastructure Engineering and Environmental Services

INVOICE

Wade-Trim Associates, Inc.
25251 Northline
Taylor MI 48180

Invoice #: 618462
Project: 62190022
Invoice Group: **
Invoice Date: 05/23/2019

Attention: Accounts Payable

For Professional Services Rendered through: 5/17/2019

P.O./Ref #: Authorization per NTH/Wade Trim Standard Subconsultant Agreement dated February 28, 2019.

Engineering services related tot he expansion of the Chapaton Basin

Phase Name	Maximum Budget	Previous Billings	Current Charges	Remaining Budget
10 -- Project Management	28,890.00	3,254.97	2,150.00	23,485.03
20 -- Preliminary Design	99,060.00	10,929.20	35,656.58	52,474.22
30 -- Final Design	91,200.00	0.00	0.00	91,200.00
40 -- Bidding Assistance	9,360.00	0.00	0.00	9,360.00
Project Total	**228,510.00**	**14,184.17**	**37,806.58**	**176,519.25**

Amount Due This Invoice : **$ 37,806.58**

REMIT TO: NTH Consultants, Ltd. – 41780 Six Mile Road – Suite 200 – Northville MI – 48168-3459
Please include Project No. and Invoice No. on remittance.

TERMS: Due upon receipt. One percent (1%) interest per month charged on invoices over 30 days old.

Payment for all invoices is expected as per contract terms. All retainers are held and applied to final invoice for a project. Checks will be issued for any amounts collected as retainers that exceed the final invoice. Call 248-553-6300 with questions.

Project : 62190022 -- MCO - Chapaton RTB Canal Upgrades **Invoice # : 618462**

Phase : 10 -- Project Management

Rate Schedule Labor	Date	Hours		Rate	Amount
Senior Officer					
Roarty, Charles	04/22/2019	0.50		215.00	107.50
	04/23/2019	1.50		215.00	322.50
	04/24/2019	0.50		215.00	107.50
	04/25/2019	1.50		215.00	322.50
	04/26/2019	2.00		215.00	430.00
	04/30/2019	1.00		215.00	215.00
	05/11/2019	2.00		215.00	430.00
	05/15/2019	0.50		215.00	107.50
	05/16/2019	0.50		215.00	107.50
Rate Schedule Labor		*10.00*			*2,150.00*

Total Phase : 10 -- Project Management **Labor :** 2,150.00
Expense : 0.00

Phase : 20 -- Preliminary Design

Rate Schedule Labor	Date	Hours		Rate	Amount
Cadd Operator					
Bryan, Stephen H.	04/23/2019	1.25		85.00	106.25
	04/24/2019	0.50	Overtime	85.00	42.50
	04/24/2019	0.75		85.00	63.75
	04/25/2019	1.50	Overtime	85.00	127.50
	04/25/2019	1.00		85.00	85.00
	04/26/2019	1.00		85.00	85.00
	05/02/2019	1.50		85.00	127.50
	05/03/2019	1.50		85.00	127.50
	05/09/2019	1.00		85.00	85.00
	05/13/2019	1.00	Overtime	85.00	85.00
	05/13/2019	4.25		85.00	361.25
	05/14/2019	1.50		85.00	127.50
Project Professional					
Ventura, Erik	04/22/2019	0.50		120.00	60.00
	04/23/2019	1.00		120.00	120.00
	04/24/2019	0.50		120.00	60.00
	04/26/2019	2.00		120.00	240.00
	04/29/2019	0.50		120.00	60.00
	04/30/2019	0.50		120.00	60.00
	05/02/2019	0.50		120.00	60.00

NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

INVOICE

Project : 62190022 -- MCO - Chapaton RTB Canal Upgrades **Invoice # : 618462**

Phase : 20 -- Preliminary Design

Rate Schedule Labor	Date	Hours	Rate	Amount
Project Professional				
Ventura, Erik	05/08/2019	1.00	120.00	120.00
	05/09/2019	3.00	120.00	360.00
	05/13/2019	2.00	120.00	240.00
	05/14/2019	3.75	120.00	450.00
Hassan, Samer	05/02/2019	1.00	120.00	120.00
	05/03/2019	4.50	120.00	540.00
	05/05/2019	3.00	120.00	360.00
	05/06/2019	4.00	120.00	480.00
	05/07/2019	4.00	120.00	480.00
	05/08/2019	4.00	120.00	480.00
	05/09/2019	0.50	120.00	60.00
	05/13/2019	4.00	120.00	480.00
	05/14/2019	3.00	120.00	360.00
	05/15/2019	3.00	120.00	360.00
Senior Officer				
Roarty, Charles	04/22/2019	0.50	215.00	107.50
	04/23/2019	1.50	215.00	322.50
	04/24/2019	0.50	215.00	107.50
	04/26/2019	1.00	215.00	215.00
	04/29/2019	0.50	215.00	107.50
	04/30/2019	1.00	215.00	215.00
	05/01/2019	0.50	215.00	107.50
	05/02/2019	3.50	215.00	752.50
	05/03/2019	1.00	215.00	215.00
	05/06/2019	1.00	215.00	215.00
	05/07/2019	0.50	215.00	107.50
	05/08/2019	4.50	215.00	967.50
	05/09/2019	4.00	215.00	860.00
	05/09/2019	4.00	215.00	860.00
	05/10/2019	2.00	215.00	430.00
	05/11/2019	3.00	215.00	645.00
	05/13/2019	6.50	215.00	1,397.50
	05/13/2019	2.50	215.00	537.50
	05/14/2019	4.50	215.00	967.50
	05/15/2019	0.50	215.00	107.50
	05/15/2019	4.00	215.00	860.00
	05/16/2019	1.00	215.00	215.00
Sr Staff Professional				

NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

INVOICE

Project : 62190022 -- MCO - Chapaton RTB Canal Upgrades **Invoice # : 618462**

Phase : 20 -- Preliminary Design

Rate Schedule Labor	Date	Hours		Rate	Amount
Sr Staff Professional					
Warning, Kurt D.	04/22/2019	2.50		100.00	250.00
	04/23/2019	3.50		100.00	350.00
	04/24/2019	12.00		100.00	1,200.00
	04/25/2019	9.50		100.00	950.00
	04/26/2019	0.50		100.00	50.00
Staff Professional					
Nymberg, David	04/29/2019	1.00		95.00	95.00
Word Processor					
McKiever, Marguerite A.	04/29/2019	0.75		65.00	48.75
	05/14/2019	0.75		65.00	48.75
Comerford, Dawn E.	04/23/2019	0.25		65.00	16.25
	04/25/2019	0.25	Overtime	65.00	16.25
	04/25/2019	0.50		65.00	32.50
	05/14/2019	0.75		65.00	48.75
Rate Schedule Labor		*143.25*			***20,400.00***

Regular Expenses	Date	Cost	Multiplier	Amount
Drilling Services				
DLZ American Drilling, Inc.	05/17/2019	9,272.00	1.15	10,662.80
Regular Expenses				***10,662.80***

Unit Pricing Expenses	Units		Rate	Amount
Per Unit Expenses				
SIEVE ANALYSIS (WASHED THROUGH NO. 200 SIEVE) ASTMD422	5.00	EACH @	80.00	400.00
HYDROMETER ANALYSIS ASTM D422	4.00	EACH @	115.00	460.00
ATTERBERG LIMITS ASTM D4318	14.00	EACH @	110.00	1,540.00
WATER CONTENT ASTM D2216	6.00	EACH @	18.00	108.00
UNCONFINED COMPRESSION TEST (ASTM D 2166)	9.00	LINER(S) @	100.00	900.00
UNCONFINED COMPRESSION TEST	7.00	SHELBY(S) @	100.00	700.00
REIMBURSED MILEAGE	116.00	MILE(S) @	0.58	67.28
CADD Supplies	16.75	HOUR(S) @	6.00	100.50
COMPANY VEHICLE MILEAGE	318.00	MILE(S) @	1.00	318.00
Unit Pricing				***4,593.78***

Total Phase : 20 -- Preliminary Design

Labor : 20,400.00
Expense : 15,256.58

Project : 62190022 -- MCO - Chapaton RTB Canal Upgrades — Invoice # : 618462

Total Project : 62190022 -- MCO - Chapaton RTB Canal Upgrades 37,806.58

Applied Science, Inc.
300 River Place Suite 5400 Detroit, MI 48207
Phone: (313) 567-3990 Fax: (313) 567-3750
www.asi-detroit.com

May 23, 2019

Invoice #3 (ASI Inv. #7358)

John Arvai, P.E.
Wade Trim
25251 Northline Road
Taylor, Michigan 48180

RE: RTB Canal Upgrades
(ASI Job No. 1831)

Services provided from April 21, 2019 through May 18, 2019

Employee	Classification	Direct Labor Hrs.	Hourly Rate	Total
John Michalski	Sr. Project Manager	15.5	$ 155.00	$ 2,402.50
Doria Herold Jackson	CADD	3.0	$ 96.00	$ 288.00
Paul Szaga	Project Engineer	8.0	$ 115.00	$ 920.00
Erika Campbell	Staff Engineer	26.0	$ 85.00	$ 2,210.00
Elise Walker	Staff Engineer	21.5	$ 85.00	$ 1,827.50

Total this invoice:	$ 7,648.00
Previous Amount Invoiced:	$ 2,842.50
Total Invoiced To-Date:	$ 10,490.50
Not To Exceed:	$ 68,005.00
Amount Remaining:	$ 57,514.50
Total Amount Due This Invoice:	**$ 7,648.00**

SpringAhead

Applied Science Inc.

Created 5/23/19 1:36pm

Time by Project

4/21/2019 (Sun) - 5/18/2019 (Sat)

(Single Project)

	Hours	Date	Task	Type	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Approver	Status	Description
Macomb Co. Public Works:1831 Chapaton Canal & Gate														
Campbell, Erika	3.50	04/21/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	3.50	0	0	0	0	0	CEC	05/05/19	
	6.50	05/05/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	0	3.50	3	0	0	CEC	05/20/19	
	16	05/12/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	1	5	0	8	2	0	CEC	05/20/19	
Subtotal	26													
Herold-Jackson, Doria A.	3	05/05/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	0	2	0.50	0.50	0	CEC	05/20/19	
Michalski, John R.	2	04/21/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	1	1	0	0	0	CEC	05/06/19	
	3	04/28/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	1	1	1	0	0	CEC	05/06/19	
	4	05/05/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	0	1	3	0	0	CEC	05/20/19	
	6.50	05/12/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	1	1	2.50	2	0	0	CEC	05/20/19	
Subtotal	15.50													
Szlaga, Paul J.	3	05/05/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	0	0	0	3	0	CEC	05/20/19	Help Elise set up model
	5	05/12/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	1	2	2	0	0	0	CEC	05/20/19	SWMM runs and profiles with Elise and Doria.
Subtotal	8													
Walker, Elise	13	05/05/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	0	0	0	6	7	0	CEC	05/20/19	SWMM model, gate research, comparison table
	8.50	05/12/19	1831 Chapaton Canal & Gate:1-001 Proposal	Reg	0	8.50	0	0	0	0	0	CEC	05/20/19	Built and ran SWMM Model, determined elevations
Subtotal	21.50													
Subtotal	74													
Total	74													

About v8.5 (r24712)

Budget to Actual
8.5 Mile Relief
As of May 31, 2019 = 67%

DESCRIPTION	2019 FINAL BUDGET	ENCUMBERED	ACTUAL	REMAINING BUDGET	PCT UTILIZED
REVENUE ACCOUNTS					
Interest Earned	26,000		59,625	(33,625)	229.3%
Other Revenue	1,500		26,913	(25,413)	1794.2%
State Grant	-		3,000,000	(3,000,000)	100.0%
8.5 O&M/Charge Required Revenue	3,898,266		3,898,266	-	100.0%
PY Revenue-Fund Balance	1,946,000			1,946,000	0.0%
Rental Fee	15,360		10,242	5,118	66.7%
Total Revenue Accounts	5,887,126	-	6,995,046	(1,107,920)	118.8%
EXPENSE ACCOUNTS					
Application/Permit Fee	3,000		3,000	-	100.0%
Dues, Training, Conf, Subs.	5,750		7,305	(1,555)	127.0%
Engineering					
Chapaton East Disinfection System Improvement	50,000		17,937	32,063	35.9%
Disinfection Systems Improvement Study	120,000		74,279	45,721	61.9%
RTB/PS Ventilation Design	120,000			120,000	0.0%
Design of Improvements	50,000			50,000	0.0%
As Needed Engineering	75,000		38,265	36,735	51.0%
Chapaton Improvements-Office Space	250,000			250,000	0.0%
Phase 1 TRC Basin Equipment	100,000		990	99,010	1.0%
9 Mile & 8 1/2 Mile Rehab	100,000			100,000	0.0%
Basin Structural Integrity Study	60,000			60,000	0.0%
Basin Expansion Design	1,000,000		169,316	830,684	16.9%
In-System Storage Design(Gates on 8.5 Tunnel)	500,000			500,000	0.0%
New Equipment	161,500		54,069	107,431	33.5%
Office Supplies	750		508	242	67.7%
Operating Supplies	82,750		54,268	28,482	65.6%
Other Professional Srvcs	47,920		34,432	13,488	71.9%
Personnel Services	875,405		620,062	255,343	70.8%
Repair & Maintenance	100,615		91,245	9,370	90.7%
Switch gear	45,000			45,000	0.0%
Painting interior and garage facade	20,000			20,000	0.0%
Instrumentation all buildings	30,000			30,000	0.0%
Canal seawall sheeting	5,000			5,000	0.0%
Driveway grate	12,000			12,000	0.0%
Pumping and screening improvements	1,250,000		61,854	1,188,146	4.9%
CHA-EB Chem Flow Meter - Basin Gates (Pumps 4-5)	10,000			10,000	0.0%
Security Fence Structures Around Gate Actuators	60,000			60,000	0.0%
Electrical Upgrade Program	10,000			10,000	0.0%
Pump Station Exterior Wall Upgrades-Basin Kneewall	4,000			4,000	0.0%
9 Mile Dewatering Gate	5,000			5,000	0.0%
SRF Replacement Reserve	259,215			259,215	0.0%
Scada System	190,073		165,377	24,696	87.0%
Utilities	284,148		59,303	224,845	20.9%
Total Expense Accounts	5,887,126	-	1,452,210	4,434,916	24.7%

	O&M Balance 9/30/2018	O&M	Total 5/31/2019
Cash - Operating	4,445,246	5,542,836	9,988,082
Accounts Receivable			0
Assets			0
Liabilities			0
Revenues		6,995,046	6,995,046
Expenditures		1,452,210	1,452,210
			0
Equity*	4,445,246		9,988,082

Detail of 2018 Equity*

5 year maintenance of switchgear	38,000	Instrumentation all buildings	30,000
9 Mile Dewatering Gate	5,000	Outfall Gate Reserve	7,000
Canal seawall sheeting	5,000	Painting interior and garage facade	20,000
CHA-EB Chem Flow Meter - Basin Gates (Pumps 4-5)	10,000	Pump Station Exterior-Basin Kneewall	4,000
Chapaton East disinfection system improvement	50,000	Pumping and screening improvements	1,250,000
Design of Improvements	50,000	RTB/PS Ventilation Design	80,000
Disinfection Systems Improvement Study	120,000	Sampling Pumps	2,500
Driveway grate	12,000	Scada Reserve	80,000
Electrical Upgrade Program	10,000	Security Fence Structures -Gate Act	60,000
Emergency Reserve	818,956	Spare Rain Gauge	2,500
Flow Meter	150,000	SRF Replacement Reserve	1,555,290
HVAC Design	60,000	Switch gear(Label and maintenance)	45,000